

PN - AAL - 147

AID/afr-790  
no project #

ISN 13186

Jones  
3.5 - Reports

**The College of Veterinary Medicine  
Colorado State University  
and  
the United States Agency  
for International Development**



**Program of Technical Assistance  
at the  
Faculty of Veterinary Medicine  
University of Nairobi, Kenya**

**Final Report**

## C O N T E N T S

TOPIC	PAGE
Foreword	1
Summary of Project Since 1965	5
Veterinary Medicine in Kenya	
The Livestock Industry	8
Employment of Veterinarians	11
Livestock Diseases	14
Zoonoses	16
Research, Extension and Continuing Education	17
Operational Plan, Contract AID/afr-790	21
Scope of Work	22
Contract Staff	22
History of the Faculty of Veterinary Medicine	24
Beginning of Colorado State University Program of Technical Assistance	27
Faculty of Veterinary Medicine	
Structure	29
Undergraduate Program of Study	29
Structure of Curriculum	30
Courses of Study	30
Examination Scheme	31
Outlines of Courses	33
Postgraduate Programs of Study	39
Faculty of Veterinary Medicine, Departmental Structure	
Clinical Studies	41
Pathology and Microbiology	43
Anatomy and Histology	45
Animal Physiology	46
Public Health, Pharmacology and Toxicology	47
Kenyanization of the Faculty	48
Government of Kenya Contribution to the Project	49
Professional Staff Supplied by C.S.U.	
Field Staff in Nairobi	54
Campus Coordinators	60
Administrative Staff	60
Recruitment of Field Staff	62
Publications by C.S.U. Field Staff	64
Publications by Counterparts	66
Unpublished Research	68
Post Graduate Courses	69

Graduate Student Supervision	70
International Meetings	72
External Examiners from C.S.U.	73
Participant and Counterpart Training	
Summary	74
Distribution of Participants in U.S. Universities	74
Selection of Participants	75
Support of Participants Upon Return to Kenya	77
Participants	78
Counterpart Training	85
Final Reports of Field Staff	
Parasitology, Dr. A. E. Sollod	87
Clinical Studies, Herd Health, Dr. D. E. Ward	90
Tables of Disease Incidence	96
Clinical Studies, Surgery, Dr. W. A. Wolff	98
Project Expenditures	108
Other International Donor Involvement	109
Commodities	111
Furniture and Appliances, Grant-in-Aid	115
Projection to the Future	119
Veterinary Manpower Needs in Kenya	119
Table: Current Undergraduate Enrollment	121
Table: Graduates Since 1970	122
Post Graduate Education	123
Department of Clinical Studies	124
Clinical Case Accessions	127
Department of Pathology and Microbiology	131
Department of Public Health, Pharmacology and Toxicology	132
Textbooks	132
Continuing Relationships	133
Appendices	
A - Veterinary Manpower in Kenya	135
B - Address to Kenya Veterinary Association	142
C - Loan Proposal for Practicing Veterinarians	146
D - Research on Cysticercosis and Hydatidosis	154
E - Dr. A. F. Alexander, Pathology (External Examiner Report)	187
F - Dr. D. G. Low, Clinical Studies (External Examiner Report)	197
G - Dr. W. V. Lumb, Clinical Studies (External Examiner Report)	202
H-1 Commodity Situation	205
H-2 Latest Commodity Shipment	209
I - Work Plan, Colorado State University	215
J - Dean Tietz Report	225
K - Drs. York and Konnerup Report	243
L - Prof. McIntyre Report on the Department of Clinical Studies	258

## TABLES AND CHARTS

TITLE	PAGE
Outlines of Courses, Faculty of Veterinary Medicine	33
Professional Staff, Faculty of Veterinary Medicine	40
Kenyanization of the Faculty	48
Government of Kenya Contribution	49
Publications, CSU Field Staff	64
Publications, Counterparts	66
Unpublished Research	68
Graduate Student Supervision	70
Distribution of Participants in U.S. Universities	74
Disease Distribution, Herd Health Program	96-97
Project Expenditures	108
Commodities Purchased, Dollar and Shilling Values	114
List of Grant-in-Aid Furniture and Appliances	117
Students Enrolled, Faculty of Veterinary Medicine	121
Graduates, Faculty of Veterinary Medicine, 1970-77	122
Clinic Case Accessions, 1977	127
Veterinary Manpower Requirements for Kenya	138
Estimated Livestock Numbers in Kenya	141

F I N A L R E P O R T

A PROGRAM OF TECHNICAL ASSISTANCE

at the

FACULTY OF VETERINARY MEDICINE  
UNIVERSITY OF NAIROBI  
KENYA

July 1971 - July 1978

Presented by

THE COLLEGE OF VETERINARY MEDICINE  
AND BIOMEDICAL SCIENCES

COLORADO STATE UNIVERSITY

to the

UNITED STATES AGENCY FOR INTERNATIONAL  
DEVELOPMENT

CONTRACT AID/afr-790

## FORWARD

This final report is submitted as part of contract requirements following phaseout of the Colorado State University/United States Agency for International Development Project at the Faculty of Veterinary Medicine, University of Nairobi, Kenya.

The term of this contract, designated AID/afr-790, was 7 years and continued the previous contract which started in January 1965, with some overlap of personnel from the previous contract. The objectives of the two contracts were similar but with major emphasis being placed by USAID on development of post graduate capabilities within the Faculty of Veterinary Medicine. The scope of the work, as stated in the contract, was that the Contractor, in cooperation with officials of the University of Nairobi, should perform but not be limited to the following services:

- 1) Teach courses at both graduate and undergraduate levels at the Faculty of Veterinary Medicine.
- 2) Improve the relevance of the curriculum to the veterinary needs of Kenya and East Africa.
- 3) Establish a vigorous program of post graduate research within the Faculty.
- 4) Assist in selection and training of East African citizen replacements for all contractor positions by June 30, 1978 , or sooner if possible.
- 5) Two external examiners will be provided annually by the contractor for the first 5 years of the project activity. One is to be selected from the Contractor University and one from another institution. The external examiners will serve the following purposes: a) to provide external examiner services to the University; and b) to assist the Mission in determining if project purposes are being accomplished.

Additionally, the Contractor was to provide one staff member who would qualify for and assume the duties of Chairman of the Department of Clinical Studies.

Money was provided in the budget for purchases of commodities and equipment in support of teaching and research activities of Colorado State University veterinarians and their African counterparts.

Realistic goals were attained under this contract and in some cases went beyond the expectations of the initial statement of scope of the work. All technicians were intimately involved in the teaching of undergraduate courses and in the improvement of the relevance of the curriculum. Nineteen Kenyans were identified as participants and subsequently were trained at Masters or Ph.D. levels in the United States. One CSU veterinarian served as Chairman of the Department of Clinical Studies for 1½ years. External examiners from Colorado State University performed their prescribed functions and equipment purchased through USAID funds has been put into use to the benefit of the Faculty. Numerous research programs were proposed and carried out with the subsequent publishing of professional papers by CSU professional staff and their counterparts.

The one area of controversy during this contract was the establishment of courses taught at the graduate level at the Faculty. The USAID Mission in Nairobi was highly critical of failure of this phase of the project but, at the same time, recognized the major accomplishments of the other phases of the project, especially the Kenyanization of the Faculty through the participant program and the improvement of the undergraduate curriculum and its relevance to the needs of veterinary medicine in East Africa. Colorado State University technicians did attempt to establish graduate courses but they were subsequently dropped due to lack of interest within the Faculty in general and by Kenyan counterparts in particular. It must be understood

that the University of Nairobi follows the European system of graduate education where the graduate student is assigned a supervisor with whom he works closely, usually in private library research relevant to a research project and thesis which is the major or even the only part of degree requirements. Taught graduate courses are few in number within the University but that number is increasing as the University recognizes the need to support graduate students with coursework of high professional quality that can be classified as post graduate. The time was not propitious for the introduction of a vigorous program of postgraduate coursework. Improvement of the undergraduate program assumed first priority and occupied nearly all the time and efforts of CSU professionals.

The time would now seem to be ripe for the introduction of further efforts specifically designed to establish a "vigorous" graduate program at the Faculty of Veterinary Medicine, and it seems likely that the University of Nairobi would be very receptive to negotiations with USAID and Colorado State University for this specific purpose. It is hoped that such discussions could begin in the very near future. The job is there to be done, the undergraduate infrastructure is adequate, the University of Nairobi is very interested, and the College of Veterinary Medicine and Biomedical Sciences, Colorado State University, through its long experience at the Faculty of Veterinary Medicine, has the expertise and the desire to do the job.

Finally, it will become obvious to the reader of this report that it is the effort of one individual, the last Chief-of-Party of the project. In fact, no one else was available to do the job. The reader is therefore cautioned that there may be omissions and errors which would not have occurred had more individuals been able to contribute.

The author of this report expresses deepest gratitude to all who were

involved in the project: the Deans and Faculty at the University of Nairobi, University of Nairobi officials, USAID officials both in Nairobi and Washington, the Deans and Faculty at Colorado State University, all CSU professors who worked in Kenya, the participants, the Veterinary Department at Kabete, and the many friends who assisted so materially in the success of this project. Very special thanks are given to Campus Coordinators Dr. Rue Jensen and Dr. Cleon Kimberling, and to our long-suffering secretaries Mrs. Jean Kipping in Fort Collins, Colorado and Mrs. Virginia Kirumba in Nairobi. Needless to say, without their efforts, project goals would have been difficult to attain.

Colorado State University personnel who served the project in Kenya will always remember their experiences with a sense of accomplishment, although at times frustrated accomplishment, and with a deep affection for the people of Kenya and their country. Lasting friendships established between Kenyan and Colorado State University professionals and their families are perhaps the most important accomplishments of the contract, and these friendships cannot be measured in terms of goals accomplished nor dollars spent.

## SUMMARY

The College of Veterinary Medicine and Biomedical Sciences, Colorado State University, through bilateral contracts with the Government of Kenya financed by USAID, has provided technical assistance to the Faculty of Veterinary Medicine, University of Nairobi, over the past 13½ years. The program began following negotiations with the United States Agency for International Development and the Contractor's representatives, Dr. Rue Jensen and Dr. O. R. Adams in 1963. In September of that year Drs. Jensen and Adams visited the Faculty of Veterinary Medicine in Nairobi and presented their findings and recommendations for support and assistance to USAID/Washington. Subsequently a proposal was prepared for providing assistance and was submitted to A.I.D. in April 1964. Following an Advisory Committee meeting in October of 1964, a revised proposal contract was written and submitted to U.S.A.I.D. in November of that year. Technical assistance started in January 1965 under Contract AID/afr-227. This contract was changed to AID/afr-425 in August 1966. The first phase of this project continued until June 30, 1971. The next contract, AID/afr-790, started July 1, 1971 and continued through June 30, 1978, for the on-site technical assistance phase. Participant training was extended to December 31, 1978.

During the course of the 3 contracts from January, 1965 through June, 1971, Colorado State University provided on-site technical assistance through 26 professional staff members who were employed at the Faculty for periods varying from 3 months to 5 years. Of this professional staff 3 individuals were hired on short-term contracts to perform specific functions at the Faculty. A total of 789 man-months of professional, technical assistance was provided during the 13½ years. The largest share of technical assistance was provided in the Department of Clinical Studies with the Department of Pathology

and Microbiology second, the Department of Pharmacology and Toxicology and Public Health third, and the Department of Physiology and Biochemistry fourth.

Of the total combined budget of nearly \$4 million, the largest portion was spent for field staff, including salaries, allowances, travel and transportation. The next largest budgeted item was in the participant category. During Contract AID/afr-790 some \$285,000 will have been spent on participant training and support.

The project has provided post-graduate training in the United States for 19 Kenyans: 15 at the Master's Degree level, 2 Ph.D., 1 non-degree candidate for Ph.D. coursework, and 1 who did not complete the program. Seven of the participants received Master of Science Degrees and 2 received Ph.D. Degrees at Colorado State University. The remaining 10 participants received Master of Science Degrees or did Ph.D. coursework in 7 other Colleges of Veterinary Medicine including Michigan State University, New York State Veterinary College, University of Minnesota, University of Pennsylvania, Kansas State University, Texas A & M, and University of California at Davis. In addition, Colorado State University professionals were instrumental in the training of 36 post-graduate students and numerous undergraduate students at the Faculty of Veterinary Medicine.

During the course of the 3 contracts, 18 professional papers have been published or submitted for publication by C.S.U. veterinarians and their counterparts, and some 70 investigations and research projects were started, some of which are still in process and others were incomplete because of inadequate funding.

Approximately \$120,000 was spent during the 13½ years of the project on equipment and commodities, mostly in building of undergraduate capabilities in the various departments at both the Kabete and Chiromo campuses, and also in support of individual research projects of CSU staff and their counter-

parts. Sources of these funds were from Kenyan Government contribution to the project and contract funds from U.S.A.I.D.

Post-graduate training by C.S.U. professionals was done mostly in their capacities as supervisors of M.Sc. and Ph.D. programs of African graduate students. All CSU field staff members supervised graduate programs of at least one African and some served as supervisors for up to 12 graduate students. Four "taught" graduate courses were introduced and instructed by CSU veterinarians but were not continued by Kenyan counterparts.

## VETERINARY MEDICINE IN KENYA

### THE LIVESTOCK INDUSTRY

The livestock industry in Kenya is concentrated in the highlands plateau in the central portion and westward to Lake Victoria. Another major concentration of livestock production is along the southern coastal plains. The northern frontier district and the remainder of the northern region of Kenya is classified as desert and is sparsely populated with very little livestock production that reaches the money economy. Over half of the country is semi-arid or arid and in 80% of the country there is an average yearly rainfall of 20 inches or less. Cash-crop areas are concentrated on the southern coastal plains, the central highlands, from Nairobi to the Mount Kenya and Aberdare highlands, the Rift Valley West, and the area adjacent to Lake Victoria as far north as Mount Elgon. This cash-crop area amounts to something less than 12% of the total land area of the country.

The livestock industry in Kenya may be classified as extensive and intensive. The extensive portion would include the nomadic tribes with their cattle, sheep and goats which occupy the arid and semi-arid regions. It also includes the settlement schemes, mostly concentrated in the central highlands, and the extensive beef ranches which are mostly private enterprise and contribute significantly to the meat supply of the country.

Intensive livestock raising includes the subsistence farms and developed dairies in the central highlands, the semi-confined production units such as the swine operations, the feedlot operations located near Nairobi and in the central Rift Valley, some artificial stations in controlled environments for feeding cattle, and the total confinement units for swine and poultry.

The livestock industry accounts for only a small portion of total Kenyan

exports, about 9% in 1971. The total money value of marketed livestock made up about 30% of total marketing in 1971 and the position hasn't changed materially in recent years (Agricultural Sectors Survey of Kenya International Bank of Reconstruction and Development, December 30, 1973). Most of the livestock industry is outside the money economy of the country, with 75% of dairy products, 80% of beef, and over 90% of sheep and goat output being consumed on the farms and ranches where they are produced (Annex 6, *ibid*).

In a survey of the value of gross marketed production from sale of livestock during the period of 1970-75, cattle and calves for slaughter increased in value by \$12,500,000 and the value of sheep, goats and lambs for slaughter was up \$2,500,000. Dairy products rose by \$4,675,000, and the value of pigs for slaughter increased by \$500,000 (Current Economic Position and Prospects of Kenya, World Bank, Oct. 15, 1976). Dairy production remained essentially stable, measured by the whole milk equivalents while at the same time the price of milk rose sharply due to inflationary trends and severe drought conditions during the years 1973 and 1975, making the supply of fluid milk decrease by the end of 1975. The whole milk equivalent (liters X 1000) was 232,000 in 1970, rose to 279,000 in early 1973 and dropped again to 230,000 by the end of 1975. During the same period of time there was overall 22% increase in the value of fluid milk reaching the markets.

The human population and cattle numbers in Kenya are increasing proportionately and there is a greater spending power of the population in general which is increasing the demand for meat and liquid milk. An accurate survey of the livestock numbers in Kenya is difficult and the estimated numbers vary widely from one survey to another. According to the planning division of the Ministry of Agriculture, livestock numbers have remained relatively stable over the past 10-15 years. Current estimates place the number of grade dairy

cattle at approximately 850,000 of which 75% are on small holdings (subsistence farms). There is a projected increase in the number and importance of dairy cattle on small holdings over the next 10 years. The Ministry of Agriculture estimates that the milk production from small holdings, that is the small farms with 1 to 8 or 10 cows, accounts for approximately 50% of the fluid milk supply consumed in Kenya. The projection of increased importance of the small holdings in the future would seem to indicate that even a larger proportion of the dairy production will come from the small farmers, with a corresponding and proportionate reduction in the contribution by the larger, developed dairies, mostly European owned and managed, as they are Kenyanized.

Numbers of grade beef cattle, many of which are improved by crossbreeding with exotic species such as Charolais, fluctuate a great deal, depending on availability of feed. Estimates vary from 600,000 to 1 million of grade beef cattle in Kenya.

Indigenous Zebu cattle are estimated to be from 8-10 million head in number and are principally owned by nomadic tribes in the arid and semi-arid regions. These cattle are widely scattered, highly mobile, and numbers from one time to the next would be difficult to estimate. There have been some recent efforts by the Government of Kenya to establish some "portable" marketing centers and distribution points for the nomadic tribes to make it easier for them to sell the cattle and purchase basic necessities at the same locations.

By rough estimate there are about 11 million sheep and goats in Kenya, mostly in the arid and semi-arid regions, although there are some intensive sheep raising areas in the Kenya highlands. Recently the Government of Kenya has placed a great deal of emphasis on increasing production of small ruminants by increasing numbers efficiency of production. USAID has also shown considerable interest in small ruminants and has funded a semi-arid regions survey

which includes an estimate of small ruminant potential and has funded, through Title XII, a major world-wide program specifically designed to increase small ruminant production in lesser developed countries.

There are approximately 50,000 domestic pigs in Kenya, mostly in total confinement units, some of which are part of small holder operations but most are confined to a few large farrowing and pig-rearing units in the highlands.

#### EMPLOYMENT OF VETERINARIANS

Estimated total numbers of livestock, exclusive of poultry, are 21-23 million head. Veterinary care required for this number of livestock varies considerably, depending upon the type of operation, the type and quality of livestock, farm concentration, farm size, feed availability, and other factors.

The Third FAO Veterinary Education Committee Report of August 1965 recommended the calculation of livestock units which took into account these various factors. Based on this graded calculation (see Veterinary Manpower, p.135) there are approximately 6.1 million animal units in Kenya and the recommendation of the FAO Committee was that in developing countries one veterinarian is needed for each 30,000 animal units. Therefore, the current and projected need for veterinarians to provide adequate services to the livestock industry is 205.

The Government of Kenya, through the veterinary department of the Ministry of Agriculture, employs about 90% of the Kenyan graduates of the University of Nairobi each year. Currently there are 108 veterinarians employed in the 40 agricultural districts established throughout the country as Disease Control Officers. The duties of these officers vary from district to district and their actual contact with livestock producers depends upon concentrations of livestock within districts, their mobility (availability of transportation) and the availability of basic necessities for providing on-the-farm veterinary

services. In general, their function tends to be regulatory in nature, as they carry out major vaccination programs against foot and mouth disease and rinderpest, supervise movement of livestock, and enforce quarantine regulations when a disease outbreak occurs. In addition, some district veterinary officers do meat inspection at outlying slaughterhouses.

Research in livestock diseases is a major mission of the Veterinary Department and 16 Kenyan veterinarians are employed in this capacity at Kabete. In addition, there are 5 senior veterinary research officers and administrators employed by the Veterinary Department.

In direct support of the veterinary needs of livestock producers, 18 clinical centers have been established at strategic locations throughout the country. Each employs one veterinarian and auxiliary animal health technicians and animal attendants. These centers have the basic mission of providing on-the-farm and diagnostic services to the livestock industry. The clinical centers are expected to expand their capabilities as producers become aware of the availability of veterinary services. Clinicians in the centers work closely with district veterinary officers in the identification of possible contagious disease and in disease control and vaccination programs.

Ten government veterinarians are employed in meat inspection at the Kenya Meat Commission slaughterhouses at 3 locations in Kenya. The Kenya Meat Commission Plant at Athi River also functions as a teaching laboratory for the Faculty of Veterinary Medicine and provides reproductive and pathological samples to the Faculty.

Four investigation centers have been established with technical and financial assistance from the Norwegian and Dutch Governments, which are presently providing some expatriate staff. These centers employ 10 Kenyan veterinarians in research of livestock diseases, coordinated with the central laboratories at Kabete. The number of Kenyans at these investigation centers

is expected to increase in the very near future as expatriot positions are phased out.

The Central Artificial Insemination Station at Kabete employs 5 Kenyan veterinarians who provide both laboratory and field expertise for a very vigorous and ambitious artificial insemination program throughout the country.

The wildlife section of the Veterinary Department also employs 2 Kenyan veterinarians in wildlife disease research, particularly as it relates to reservoir hosts and disease transmission to livestock. The Ministry of Wildlife and Tourism also employs 1 veterinarian as clinician and consultant.

The total number of Kenyans employed by the Veterinary Department of the Ministry of Agriculture is about 150. In addition, there are 15 expatriots employed at Kabete and at the outlying Investigation Centers, and their positions are expected to be Kenyanized within the near future.

The Faculty of Veterinary Medicine at the University of Nairobi employs approximately 53 Africans. The large majority are Kenyans (see "Faculty of Veterinary Medicine by department, p. 40 ). Including some positions which have not been filled to this point and returning participants, the East African staffing within the next 6 months should be around 60 at the Faculty. The 10-year goal for full staffing at the Faculty is 83 on permanent establishment.

Private enterprise accounts for a very small portion of total employment of Kenyan veterinarians, with only 10 or 12 with commercial enterprises such as pharmaceutical companies and 8 in private practice. Expatriots, some 14 in number, do most of the private practice in various locations throughout the country and their major commitments are to companion animals such as horses, dogs, and cats.

The Veterinary Department and the Faculty of Veterinary Medicine have both expressed interest in expanding and promoting the private sector for

Kenyan graduates. Kenyan manufacturer of drugs and biologicals which are presently produced outside Kenya and imported could greatly increase the employment of Kenyan veterinarians in the pharmaceutical industry (see "Chairman's Address to the Kenya Veterinary Association", Appendix B ).

Private practice has attracted very few Kenyans to this point, mostly because of constraints on adequate initial capitalization. There is some interest in providing initial financing for Kenyan veterinarians wishing to engage in private practice in the major livestock producing areas of the country (see Loan Proposal for Practicing Veterinarians, Appendix C ).

### LIVESTOCK DISEASES

East Africa has a number of economically devastating diseases among its domesticated animals. All major etiological categories exist. The important infectious diseases include: East Coast Fever, African Swine Fever, Contagious Bovine Pleuropneumonia, Rinderpest, Babesiosis, Anaplasmosis, Trypanosomiasis, Anthrax, Rift Valley Fever, Foot and Mouth Disease, Newcastle Disease, Malignant Catarrhal Fever, and the entire spectrum of gastro-intestinal parasites. A number of these diseases have been controlled such as African Swine Fever, Rinderpest, and Contagious Pleuropneumonia in cattle. There are major efforts by the International Laboratory for Research in Animal Diseases (ILRAD) and the Kenya Veterinary Research Organization (KVRO), the offspring from the East African Veterinary Research Organization in the control of East Coast Fever and Trypanosomiasis.

East Coast Fever of cattle is of major economic importance, not only because of death loss, but also because of money, labor and time spent in controlling the tick vector. Dipping or spraying is effective in controlling vectors but this is related to adequacy of the dips or spray races which, in turn, depends upon proper supervision. This is often lacking and many of the

dips and spray races, especially in the subsistence farm areas, are of little value in controlling the tick vector, and the disease itself causes significant, often alarming, death loss in these small holder zones. Another important factor is the increasing resistance of ticks to the various acaracides that are currently approved for use in Kenya. One cannot help but wonder how many years it will be in the future before the development of new and more potent acaracides with longer residual effect will be outstripped by resistance of the ticks.

There are other advantages to the required weekly or bi-weekly dipping or spraying for control of the tick vector of East Coast Fever and other tick-bourne diseases. Major among these is the fact that ectoparasites, which in themselves would cause tremendous economic loss, even if they weren't vectors of infectious disease, are controlled to some extent. Without frequent application of the acaracides, economic loss caused directly by ectoparasites would increase. Another advantage is that the cattle, especially those in extensive operations, are observed at frequent intervals and diseases of non-vector origin, gastrointestinal parasite control, nutritional problems, and general management of the herds are seen and action can be taken early before the problem gets out of control. When an effective vaccine against ECF is produced, the Ministry of Agriculture, through its Extension Service, should emphasize the need for continued control of ectoparasites.

The economic constraint caused by Trypanosomiasis is the elimination of up to 40% of potential grazing areas in Kenya because of the presence of the Tse Tse fly vector. Certainly Trypanosomiasis is a major clinical and economic entity when improved and exotic breeds of cattle are introduced to the "fly belts" as their natural resistance to Trypanosomiasis is low or non-existent. Probably the most worthwhile development in Trypanosomiasis control at this particular time is the work of Leroy Williamson and his

colleagues at Tanga on the north coast of Tanzania. They are releasing radiation sterilized male Tse Tse flies on selected ranches in the "fly belt" of Tanzania in the hope that results will be similar to the very effective control of the screw worm in northern Mexico and the southern United States, using this same method.

Contagious bovine pleuropneumonia has been adequately controlled through use of an effective vaccine. Contagious caprine pleuropneumonia has not stimulated the same response and development and use of an effective vaccine for goats should be of high priority. High mortality caused by CCPP is reported but has not been investigated adequately.

#### Zoonotic Diseases

Diseases intercommunicable between man and animals are of special importance to the public health. Among these diseases are rabies, cysticercosis, brucellosis and Rift Valley fever. Rabies control by vaccination and elimination of stray dogs is almost non-existent in Kenya. The European population of pet owners in Kenya are probably the only ones who have their dogs vaccinated routinely against rabies. Stray animal control as such is non-existent, but there are occasional flurries of activity in rounding up and destroying stray animals in response to diagnosed cases of rabies in certain areas.

The Veterinary Department through its district veterinary officers, does an admirable job under difficult circumstances of attempting to control brucellosis through ABR testing of bulk milk samples and on-the-farm blood testing of cattle. Given the circumstances, the control of brucellosis is probably inadequate. The disease exists in many parts of the country, and is nearly impossible to control because of the nomadic nature of many of the livestock owners of the country, the geographic distribution of the livestock and the near impossibility of gathering representative numbers of cattle, sheep and goats for blood testing. Vaccination programs using strains 19 and 4520

are done but on an irregular basis and there is little or no control over use of the vaccine and no reporting of their use from livestock producers. Recently a member of the CSU Team (Dr. Sollod) became infected with Brucella melitensis, probably transmitted from an experimental sheep, and this brings very close to home the necessity for some sort of adequate brucellosis control program.

#### VETERINARY RESEARCH, EXTENSION AND CONTINUING EDUCATION

Economic constraints of veterinary importance include not only the livestock diseases and their prevention but also reluctance of the Faculty of Veterinary Medicine and the Veterinary Department of the Ministry of Agriculture to enter into cooperative research, extension and continuing education programs. An example of potential but, as yet, unrealized cooperative research is Cysticercosis in cattle.

Cysticercosis and hydatidosis have long been the subject of much discussion, many proposals and some research. Discussions of cysticercosis from the public health aspects often become somewhat emotional because of the occurrence of hydatid disease in the pastoral tribes in northern Kenya. It is a dramatic disease, causing great discomfort to the infected individual and high mortality. However, the major economic importance of cysticercosis is in the condemnation of carcasses and parts of carcasses of beef cattle arriving at the Kenya Meat Commission's slaughterhouses. The overall prevalence of cysticercosis in cattle going to Kenya Meat Commission establishments is over 20% and the average incidence in cattle from arid and semi-arid regions is probably double this or more. Because of the seeming importance of cysticercosis and hydatidosis and the likelihood that research should be done to establish a simple and inexpensive diagnostic test for use in cattle, Drs. A. E. Sollod and C. V. Kimberling designed a well thought out research program (Appendix D ). This research program was first reviewed by USAID officials in Nairobi and was subsequently submitted first to the Faculty of

Veterinary Medicine who, through the Dean, was requested to submit the proposal together with the budget to USAID for funding. The thinking was that the research be carried out at the Faculty of Veterinary Medicine in cooperation with the Kenya Veterinary Research Organization at Muguga. The proposal was lost or at least effectively ignored within the Faculty because of political maneuverings by proponents of competing cysticercosis research projects and outright obstructionism by certain Faculty members and by the residing FAO representative. Next, the proposal was presented to the Director of KVRO who was initially very enthusiastic. The proposal was subsequently reviewed by the Director of Veterinary Services and from that point it died slowly but definitely. The efforts of the Director of KVRO are acknowledged with appreciation. Throughout the long course of attempting to promote this project there was never any objection to the professional quality of the proposal nor to the proposal itself.

Veterinary extension should be a cooperative program between the Faculty and the Veterinary Department. Presently, there is no Faculty input, and no Veterinary Extension Service as such. What extension work is done is carried out through the offices of the district veterinary officers. The amount and quality of activity vary from district to district depending upon the initiative taken by individual DVO's, but none of these district officers are really equipped by either communications training or with the very minimum of tutorial aids for carrying out viable extension programs. The infrastructure through the district offices is certainly adequate, and the Government of Kenya should consider placing graduate Kenyan veterinarians as extensionists beginning with the offices located in the concentrated livestock producing areas of the central highlands. Considering the high potential for underemployment of Kenyan veterinarians arising in the very near future (see "Veterinary Manpower - Kenya", App. A ) a unified veterinary extension effort, in addition to providing a vital service

to livestock producers, would also relieve the employment situation to some extent.

An extension capability requires training of extensionists. The graduates of the Faculty of Veterinary Medicine at the University of Nairobi have the technical knowledge and the professional capabilities for extension. What they lack is training in communications and extension techniques and the necessary hardware to do the job. It would seem logical that the Veterinary Department of the Ministry of Agriculture would be interested in the training of veterinary extensionists over the next 10-15 years. This could be done through contract with the United States Agency for International Development and a land-grant university in the United States, with training both on site in Kenya and at a U. S. university. Colorado State University, with its long-time expertise and interest in international programs, would be most receptive to a proposal from the Veterinary Department of the Government of Kenya and the Faculty of Veterinary Medicine, and would be very interested in designing a program for the training of veterinary extension experts.

Continuing education for veterinarians at the professional level has been the subject of some committee meetings, a great deal of discussion, and a proposal which was submitted as part of the agenda for a faculty board meeting in March 1978. That particular meeting went overtime and the continuing education proposal was tabled until the next faculty board meeting. As of the final writing of this section of the report, the proposal had not been discussed at the Faculty. During the initial stages of discussion, everyone seemed in agreement that there should be a continuing education program sponsored and produced by the Faculty of Veterinary Medicine. There was some confusion in correspondence between the Director of Veterinary Services and the Dean as to who should be invited to or be required to attend the continuing education courses. The Faculty position was that all veterinarians

throughout the country -- both Government employees and those in the private sector -- should be invited to attend the courses on a first-come, first-serve basis. The Veterinary Department on the other hand seemed to feel the courses should be designed primarily for and attended by private practitioners, a very small potential audience in Kenya. The attitude of the Veterinary Department seemed to be that the Department internally provided adequate continuing education for district veterinary officers, clinicians, and other veterinarians employed by the Government. A questionnaire was designed for distribution to all veterinarians throughout the country, requesting feedback on courses preferred, the length of the courses, suggestions as to financing of the courses, frequency of the courses, and other details. It is hoped that the Faculty will pursue the continuing education proposal despite inertia in the Veterinary Department. Such a program is of vital importance to the veterinary profession in Kenya.

CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND  
COLORADO STATE UNIVERSITY

Contract AID/afr-790

Date of Plan: June 1971

OPERATIONAL PLAN

I. Objectives

- A. Contractor, in cooperation with officials of the University and the Mission, shall provide technical advice and assistance to further develop the Faculty, with particular emphasis on the improvement of clinical studies and to initiate and develop post-graduate training and research closely related to Eastern and Southern African veterinary problems.
- B. Such other countries as West Germany, United Kingdom and Norway, as well as the Rockefeller Foundation are each contributing to, and cooperating with, the University of Nairobi in bringing about the desired changes in the Faculty. Contractor shall work and cooperate with the other donor representatives and the University officials to make the most efficient use of the available resources.
- C. In order that East Africans shall be trained as rapidly as possible to assume academic and professional positions in the Faculty, the Contractor will assist in identifying, selecting, and training outstanding students of East Africa.
- D. Research programs for improving comprehension and control of livestock diseases will be supported, and veterinary health programs will be developed. Contractor, in cooperation with personnel of the University, including graduate students, will plan and execute formal research projects relating to the needs of East Africa. Information derived therefrom may be used by graduate students for theses as well as for solving public problems.

E. Develop and foster a close relationship between the Faculty and Contractor which will be of mutual and lasting benefit to both institutions.

## II. Scope of Work

A. The Contractor, under the general guidance of the Mission Director, or his designee, in cooperation with officials of the University shall perform (but not be limited to) the following services:

1. Teach courses in their individual fields at both undergraduate and graduate levels at the Veterinary Faculty.
2. Improve the relevance of the curriculum to the veterinary needs of Kenya and East Africa in general.
3. Establish a vigorous program of post-graduate research within the faculty.
4. Assist in the selection and training of East African citizen replacements for all six contractor positions by June 30, 1978, or sooner, if possible.
5. Two external examiners will be provided annually by the Contractor for the first five years of the project activity. One is to be selected from the Contractor's university and one from another institution. The external examiners will serve the following two purposes:
  - a. To provide external examiner services to the University.
  - b. To advise the Mission on whether or not project purposes are being accomplished.

## III. Contract Staff

The Contractor shall provide the following staff members:

### A. Regular Staff Members

1. One Parasitologist

2. One Microbiologist
3. One Pharmacologist
4. One Clinical Surgeon (Large Animals)
5. One Expert in Clinical Laboratory Medicine
6. One Expert in Clinical Medicine (Large Animals)
7. One of the above staff (1 through 6) shall be Contractor's Chief-of-Party who will be a senior academician, qualified for appointment as a professor at the University and as a department head.
8. Recruitment is not to be limited to Contractor's home campus.
9. The composition of the above staff (1 through 6) may be revised as approved by the Contracting Officer. Staff members furnished are to be acceptable to the University and qualified to teach at the graduate level and to organize and manage graduate research programs.

B. Short-Term Staff Members

Such short-term staff members in categories as agreed upon by the Mission, the Contractor and the University and are within budget limitations.

C. Campus Staff

Contractor shall maintain at Colorado State University a Campus Coordinator (1/2 time), a full-time secretary (and as approved by the Contracting Officer), and such additional professional and administrative services as are necessary to effectively supervise and coordinate the activities under this contract and are within budget limitations.

## HISTORY OF THE UNIVERSITY OF NAIROBI AND FACULTY OF VETERINARY MEDICINE

The idea of an institution for higher learning in Kenya goes back to 1947, when the then Kenya Government drew up a plan for the establishment of a Technical and Commercial Institute, in Nairobi. By 1949, this plan had grown into an East African concept, aimed at providing higher technical education for all the territories of East Africa. In September 1951 this concept received a Royal Charter, under the name 'Royal Technical College of East Africa'. With a grant from the Colonial Development and Welfare Funds, the foundation stone was laid by the then Governor, Sir Phillip Mitchell, in April 1952.

The Royal Technical College opened its doors to the first intake of students in April 1956. Immediately the need was felt for expert advice on the pattern of Higher Education in East Africa. This led to the appointment of a Working Party and among the chief recommendations, when they reported to the East Africa Governments in March 1959, was that the Royal Technical College should be transformed into the second Inter-Territorial University College in East Africa. The recommendation was accepted by the East African Governments, and on 25 June 1961, by an Act of the East African High Commission, the Royal Technical College was transformed into the second University College in East Africa, under the name 'Royal College, Nairobi'. On 20 May 1964, the Royal College Nairobi was renamed 'University College, Nairobi'.

Since the translation of the College into a University College much has been accomplished in terms of physical development. That this was made possible

is due largely to the generosity of a number of donor bodies and private benefactors. Buildings erected since 1961 include the Library (1962), Chemistry (1962), the Engineering Buildings (1964 and 1968), Pre-Clinical and Clinical Buildings for Veterinary Science (1964 and 1966), Pre-Clinical Buildings for the Medical School (1968), buildings for Botany and Zoology (1964) and a Library lecture hall, cafeteria at Chiromo (1969) and Education Buildings (1971). The Faculty of Agriculture building, the field station and the Large and Small Animal Clinics were all completed in 1973 while the Physical Sciences Complex at Chiromo was completed in 1975. In addition, seven Men's Halls of Residence (six on the main campus, one at Kabete) have been added and the Women's Halls extended.

With the inauguration of the University of East Africa in June 1963, the students who joined the College in the following September enrolled for degree and diploma course of the University of East Africa.

The University of East Africa was dissolved with effect from 1 July 1970, and the three East African countries set up their national Universities. This saw the birth of the University of Nairobi set up by an Act of Parliament. The University was formally inaugurated by the Chancellor, His Excellency Mzee Jomo Kenyatta, the President of the Republic of Kenya, on 10 December 1970.

Recent developments in the University of Nairobi include the introduction of a Biochemistry course in the Faculty of Science and the establishment of a Department of Public Health, Pharmacology and Toxicology in the Faculty of Veterinary Medicine at Kabete. Physical expansion includes the completion of Faculty of Agriculture laboratories at Chiromo, the Agriculture Field Station at Kabete, and the main Faculty of Agriculture Building also at Kabete. In the Faculty of Veterinary Medicine also at Kabete, extensions to the library have been completed as well as modern Animal Clinics and a Nutrition Unit for

the Department of Animal Production. The new buildings for the Faculty of Architecture, Design and Development was occupied in the second half of 1972. The latest development was the establishment of Pharmacy and Dentistry in 1974 and completion of the Computer Science Building at Chiromo.

Development of veterinary medical education in East Africa has a history dating back to 1928 when a two-year course was started for training veterinary assistants. This two-year training course was given throughout the 1930's and in 1940 it was upgraded to a three-year program. In 1949 the course was extended to become a four-year diploma granting course with the first two years of training in basic sciences being given at Makerere College at Kampala in Uganda and the second two years, including training in pathology and clinical studies being given at the Kabete campus near Nairobi, Kenya, the site of the present Faculty of Veterinary Science. Students receiving their diplomas from the four-year course were employed as assistant veterinary officers but were not licensed as veterinarians, and those Africans wishing to make a career in veterinary science went abroad where they could receive a full professional degree. In the 1950's the number of students entering the diploma course began to diminish and by 1961 there were no qualified students applying for the course. It thus became evident that if East Africa were to meet its demands for trained veterinarians, a new approach had to be sought. An international consortium was held in London in 1961 to discuss the possibilities of developing a faculty in East Africa capable of granting degrees in veterinary medicine. Included in the international consortium were donor groups from the United States, Great Britain and the West German Federal Republic. This international consortium agreed that sufficient international support to provide a degree-granting faculty would be made available by various donor governments and from foundations in the several countries. Soon

links were established with faculties of veterinary science including Justus Liebig University in Giessen, Glasgow University in Scotland, Colorado State University in the United States, and the Veterinary College of Norway in Oslo, and each of these universities through their donor governments, and the Rockefeller Foundation of New York, provided staff for the new faculty.

The first class of four students began training in the first year of the degree course in July 1962 along with 26 former graduates of the diploma granting course who were given the opportunity to take a conversion course of two years which would make them eligible for a professional degree in veterinary medicine. These latter students completed the conversion course and received their degrees from the faculty in 1964.

In 1963 the Agency for International Development (AID/W) with the authorization of the University of East Africa invited Dr. Rue Jensen, Dean, and Dr. O. R. Adams, Head of the Department of Clinics and Surgery, of Colorado State University to conduct a survey and study of the faculty to determine the feasibility of providing long-term support to the faculty through a contract with AID/W. Drs. Jensen and Adams visited the faculty in Nairobi in August and September of 1963 and presented their findings and recommendations for support and assistance to AID/W. Colorado State University was then asked to prepare a proposal for providing assistance and this was submitted to AID/W in April 1964.

An Advisory Committee on Veterinary Education was established by the University of Nairobi and met in October 1964. The Advisory Committee reported to the Council of the University on matters relating to staffing the veterinary faculty, present and long-term, an appropriate organizational pattern for the faculty, both short-term and long-term, a basis for continued international cooperation within the faculty, the institution of graduate studies in veteri-

ary medicine and to make recommendations to the Council on these matters as well as immediate and long-term problems of financing the faculty. Colorado State University asked Dr. R. H. Udall to serve as representative for them on the Advisory Committee.

Following the meeting of the veterinary Advisory Committee and further negotiations with AID/W and USAID/Nairobi, Colorado State University submitted on November 4, 1964 a revised proposed contract for support to the faculty to AID/W.

Colorado State University support in the Faculty of Veterinary Science at the University of Nairobi was initiated January 11, 1965 through a contract with the Agency for International Development of the United States State Dept. This contract, initially identified as AID/afr-227, replaced in August 1966 with AID/afr-425, provided for year to year budget funding depending on annual congressional appropriations and on progress in reaching the AID objectives. The basic objectives were reached in the 1970-1971 academic year and this contractual agreement was terminated on June 30, 1971. Continuing support was anticipated under a new contract with AID beginning July 1, 1971 which would include a realignment of objectives and staff to provide an optimal future input into the growing faculty.

## FACULTY OF VETERINARY MEDICINE

The Faculty of Veterinary Medicine is located in two campuses: Chiromo and Kabete. The Chiromo Campus houses the Pre-Clinical Departments: Anatomy and Histology, Physiology and Biochemistry.

At Kabete the Department of Veterinary Pathology and Microbiology is housed in a very modern building, with very well equipped laboratories for teaching, routine diagnosis and research. The department has a modern electron microscope for research.

The Department of Clinical Studies is housed in the Animal and Small Animal Clinics with exceptionally modern facilities for treating all animal diseases including very modern surgical and X-ray equipment.

The Department of Animal Production has recently acquired a new nutrition teaching and research unit. The teaching laboratory is adequate for the need of teaching 80 veterinary and 60 agriculture students. For practical training in animal management and animal production, the Faculty has a 150-acre farm attached to the Department of Animal Production. The Farm has 150 dairy herd with 30 breeding sows weaning 400 weanerpigs a year. Plans have been finalized for adding 200 breeding ewes and 100 breeding goats. A second farm of 175 acres has just been acquired and is now being developed. The Department of Animal Production also has a poultry research unit attached to it which also provides teaching facilities in Poultry Nutrition & Management.

A new Department of Public Health, Pharmacology and Toxicology has been established in recognition of the veterinarian's role in the health of man and his animals.

### UNDERGRADUATE PROGRAM OF STUDY

Regulations for the Degree of Bachelor of Veterinary Medicine (B.V.M.)

Admission Requirements:

1. Candidates must satisfy the minimum University entrance requirements

with a principal level pass in Chemistry and the other in Biology, Zoology, Physics or Mathematics. If the second principal level pass is offered in Physics or Mathematics, Biology and Zoology must be offered at subsidiary or 'O' level.

## 2. Structure of Curriculum

The curriculum for the degree shall comprise courses of study extending over not less than four academic years. After the end of the first, second and third years of three terms each there is a fourth term of 8 weeks.

## 3. Courses of Study

The approved structure shall comprise courses in the following subjects, all of which are compulsory:

### a. First Year

- 1) Anatomy and Histology
- 2) Physiology
- 3) Biochemistry

### b. Second Year

- 1) Animal Production
- 2) Microbiology
- 3) Parasitology
- 4) Pathology

### c. Third Year

- 1) Special Pathology (including Clinical Pathology)
- 2) Medicine
- 3) Surgery
- 4) Reproduction and Obstetrics
- 5) Pharmacology
- 6) Toxicology
- 7) Public Health (Epidemiology, Zoonoses & Food-borne diseases)

### d. Fourth Year

- 1) Medicine
- 2) Public Health
- 3) Surgery
- 4) Reproduction and Obstetrics
- 5) Pathology
- 6) Animal Production
- 7) Law and the Veterinarian

The Faculty of Veterinary Medicine, in addition to the courses of study indicated above, has a Fourth Term of 9 weeks affecting 3 of the 4 years, and commences immediately after the end of the professional examinations. This Fourth Term program is scheduled as follows:

- After the First Year, students spend 6 weeks involved in Animal Production practical work. The remaining 3 weeks are used for Introductory Microbiology.
- After the Second Year, students spend all the 9 weeks attached to a veterinarian in the field to acquire some experience of livestock diseases.
- After the Third Year, each student spends 3 weeks doing practical inspection at various slaughterhouses and dairy processing plants. The remaining 6 weeks are spent on practical clinical sessions.

#### 4. Examination Scheme

##### First Year

Anatomy and Histology	- 2 x 3 hour paper + 2x3 hours practical/oral
Physiology	- 1 x 3 hour paper + 1x3 hour practical/oral
Biochemistry	- 1 x 3 hour paper + 1x3 hour practical/oral

##### Second Year

Animal Production	- 3 papers
Ecology and Management	- 1 x 2 hour paper + practical/oral
Genetics and Animal Breeding	- 1 x 2 hour paper + practical/oral
Nutrition and Feeding	- 1 x 2 hour paper + practical/oral
Pathology	- 1 x 3 hour paper + 1 x 3 hour practical/oral
Microbiology	- 1 x 3 hour paper + 1 x 3 hour practical/oral
Parasitology	- 1 x 3 hour + 1 x 3 hour practical/oral

##### Third Year

Special Pathology	- 1 x 3 hour paper + oral/practical
Medicine	- 1 x 3 hour paper + oral/practical
Surgery	- 1 x 2½ hour paper + oral/practical
Reproduction and Obstetrics	- 1 x 2 hour paper + oral/practical
Pharm. & Toxicology	- 1 x 3 hour paper + 1x3 hour practical/oral

#### Fourth Year

Medicine	- 2 x 3 hour paper + oral/practical
Public Health	- 1 x 3 hour paper + oral/practical
Surgery	- 1 x 3 hour paper + oral/practical
Reproduction and Obstetrics	- 1 x 3 hour paper + oral/practical

5. A candidate shall not be admitted to an examination unless he has attended the prescribed course of instruction as specified in University regulations.
6. A candidate will be admitted to the first University examination not less than three terms after being admitted to the Faculty of Veterinary Medicine.
7. A candidate who fails to satisfy the examiners in any examination subject(s) of the first, second, third or fourth University examinations may, at the discretion of the examiners, be referred in that examination subject(s) and may present himself on one further occasion for re-examination in that examination subject(s) only. If on re-examination the referred candidate again fails, he must repeat the session in all examination subjects and take the whole examination again.
8. All examinations shall have a resit examination which will take place not later than the end of the long vacation.

## OUTLINE OF COURSES

### First Year

- I. ANATOMY
- II. PHYSIOLOGY
- III. BIOCHEMISTRY

Lects. hrs	Practs. & Tuts. hrs	Total hrs
---------------	---------------------------	--------------

#### Gross Anatomy

100	170	270
-----	-----	-----

A combination of the functional morphology or organ systems and topographic studies using complete animals for dissection, usually ruminants in a standing position. Courses in Fowl Anatomy and radiographic anatomy.

#### Microscopic Anatomy

50	80	130
----	----	-----

Systematic and functional presentation of cytology/ultrastructure, histology, comparative microscopic organology of the domestic animals, the fowl and man.

#### Embryology

20	30	50
----	----	----

Comparative aspects of the dynamics of embryonic development.

#### Physiology

90	135	225
----	-----	-----

Endowments of living tissue: the internal environment; the temperature regulation. Muscle function and basic reflexes; heart circulation and blood. Kidney and acid base balance; fluid balance, respiration. Digestion, metabolism and excretion. Endocrinology; reproduction.

#### Biochemistry

90	135	225
----	-----	-----

This course considers the cell's ultra-structure, emphasizing the role of proteins, nucleic acids, carbohydrates and lipids in cell function, the role of energy in cell function, the specialization of cellular organization. Integration of body functions and the biochemistry of specialized tissues. Introduction to clinical biochemistry, ruminant biochemistry of hormones.

#### Statistics

15	15	30
----	----	----

Total hrs for the year	=	365	565	930
------------------------	---	-----	-----	-----

## Second Year

- I. ANIMAL PRODUCTION
- II. MICROBIOLOGY
- III. PARASITOLOGY
- IV. PATHOLOGY

	<u>Lects.</u> <u>hrs</u>	<u>Practs. &amp;</u> <u>Tuts.</u> <u>hrs</u>	<u>Total</u> <u>hrs</u>
<u>Animal Production</u>	135	185	320
a) <u>Animal Nutrition and Feeding</u> Digestibility, energy and protein value of feeds, vitamins and minerals. Feeding standards for maintenance, growth, milk production, etc. feeding of dairy and beef cattle, sheep, goats, pigs, poultry.			
b) <u>Animal Genetics and Breeding</u> Principles of genetics, genetics of populations, breeding and selection methods, evaluation of production records and their application to breeding methods of domestic animals.			
c) <u>Animal Ecology and Management</u> The ecology of domestic animals. The growth and development of the body. The quality characteristics of animal products and their variation. Management systems for dairy cattle, beef cattle, sheep, goats, pigs and poultry.			
<u>Pathology</u>	130	120	250
a) <u>General Pathology</u> This course gives basic undertaking of the alterations in tissues as a result of disease and the emphasis is laid on practical diagnostic procedures of gross lesions and microscopic lesions.			
b) <u>Systematic Pathology</u> This course consists of systematic examination of individual organ by organ and descriptions of gross and histological alterations resulting from infectious or parasitic diseases, malnutrition, trauma and toxic substances.			

	<u>Lects.</u> hrs	<u>Practs &amp; Tuts.</u> hrs	<u>Total</u> hrs
<u>Microbiology</u>	130	120	250
1. Bacteriology	100	100	200
<u>Fundamental aspects of Bacteriology.</u> Classification, the structure and functions of the bacterial cell, bacteriological cultivation and reproduction, bacterial genetics, antimicrobial agents, mechanisms of infection.			
<u>Immunology</u> Theories of infections and immunity with emphasis on innate resistance, acquired resistance, antibodies, antigens, techniques of detecting antibodies, antigens reactions, hypersensitivity.			
<u>Pathogenic Microorganisms</u> Relation of animal and human pathogens to health and disease of animals: including techniques of isolation and identification of various genera of pathogenic fungi and bacteria.			
2. Virology	30	20	50
Fundamental aspects of viruses and rickettsiae with emphasis on their characteristics, laboratory procedures employed, virus-host relationship, immunology and serology and diagnostic procedures; preparation and use of viral vaccines and serums.			
<u>Parasitology</u>	90	60	150
a) <u>Helminthology</u>	40	20	60
A study of the pathogenic helminth parasites of domestic animals (including relevant aspects of game animals). Emphasis is on life history, epidemiology pathogenicity, clinical signs diagnosis, treatment and control.			
b) <u>Entomology</u>	30	20	50
This course considers the arthropod parasites infestations in domestic animals. Emphasis is on life history, identification, pathogenicity, clinical signs, diagnosis, treatment and control.			

	<u>Lects hrs</u>	<u>Practs &amp; Tuts. hrs</u>	<u>Total hrs</u>
c) <u>Protozoology</u> A study of the protozoan parasites of domestic animals. Emphasis is on life history, epidemiology, pathogenicity, clinical signs diagnosis, treatment and control.	20	20	40
Total hrs for the year	= 485	485	970

### Third Year

<u>Special Pathology</u> A course describing the diseases of domestic animals, including Poultry; and some of game animals. This course will include etiology, epidemiology, pathogenesis, clinical signs, necropsy features, immunology, diagnosis treatment, control and prevention of each disease.	135		135
<u>Medicine</u> A course describing the diseases of domestic animals including special therapeutics. Emphasis is on diagnosis, treatment and control on basis of animal species, body system, and clinical signs. Hence emphasis is also placed on differential diagnosis.	130		130
<u>Surgery</u> Principles of surgery, differential diagnosis, operative surgery and radiology of both large and small animals.	100		100
<u>Reproduction &amp; Obstetrics</u> Differential diagnosis of breeding and obstetrical conditions, pregnancy diagnosis.	60		60
<u>Pharmacology</u> a) <u>General Pharmacology</u> Basic aspects of the mode of action of drugs including brief information about regulations in connection with prescription writing.	40	45	85

	<u>Lects hrs</u>	<u>Practs &amp; Tuts. hrs</u>	<u>Total hrs</u>
b) <u>Special Pharmacology</u> A detailed study of sources, chemistry, actions toxicity and uses of drugs available for therapeutic purposes. Special emphasis is given to the actions of drugs important for general pharmacological orientation and to drugs used in Veterinary Medicine.			
c) <u>Applied Pharmacology</u> Tutorials with special stress on the therapeutic implications of Pharmacology.			
<u>Toxicology</u>	40	30	70
Introduction, toxic agents and their characteristics, residues of pesticides in foods of animal origin, symptoms, lesions, diagnosis, treatment and legal implications.			
<u>Clinical/P.M. Demonstrations</u>		120	120
Clinical Group Work		120	120
Clinical Anatomy		20	20
Clinical Pathology	10	20	20
Pathology Group Work		20	20
Public Health (Epidemiology, Zoonoses and Food-borne Diseases)	33		33
Total hrs for the year	= 548	375	923
 <u>Fourth Year</u>			
<u>Medicine (including 20 hrs Clinical Therapeutics)</u>	50	200	250
Continuation of certain aspects of third year medicine with emphasis on preventive medicine, also large and small Animal Hospital Clinics, Ambulatory Clinic-Farm, Animal Field Clinic in Herd Problems, including Animal Production aspects, Outpatient Clinic.			
<u>Public Health</u>	40	140	180
Meat and Food Hygiene, inspection and relevant state regulations; milk hygiene; inspection of game, poultry/eggs and fish hygiene.			

	<u>Lects hrs</u>	<u>Practs &amp; Tuts. hrs</u>	<u>Total hrs</u>
<u>Surgery</u>	30	200	230
Continuation of certain aspects of third year surgery. Large Animal Hospital Clinic Anesthesia, Small Animal Hospital Clinic, Surgical Anatomy.			
<u>Reproduction and Obstetrics</u>	5	120	125
Continuation from third year. Artificial Insemination Clinic Field Clinic in Herd Infertility, Clinical Anatomy and Obstetrics Clinic.			
<u>Special Subjects to be Examined Within Relevant Examination Subjects:</u>			
1. Pathology		100	100
a. Necropsy training and experience in the Post Mortem Room			
b. Clinical Laboratory Methods (Clinical Pathology)		50	50
2. Animal Production	30		30
a. Agricultural and Farm Economics	10		10
b. The influence of husbandry methods on disease	20		20
3. Radiobiology	10		10
The influence of irradiation on animals. Fall-out as a public health problem.			
4. Law and the Veterinarian	15		15
Jurisprudence, Legislation with reference to disease control and animal transport.			
Total hrs for the year	= 180	760	940

## POSTGRADUATE PROGRAMS OF STUDY

### Regulations for the Degree of Master of Science in the Faculty of Veterinary Medicine (M.Sc.)

1. The Common Regulations of the Master's Degree in all Faculties shall be applicable.
2. The following shall be eligible for registration for the Degree of Master of Science in the Faculty of Veterinary Medicine:
  - a. a Bachelor of Veterinary Medicine or a Bachelor of Science of the University of Nairobi.
  - b. a graduate of another recognized University who has been admitted by the Senate to the status of Bachelor of Veterinary Medicine or of Bachelor of Science in the University - provided that any person wishing to be registered for the degree may be required to show evidence of his or her competence in a preliminary examination in the discipline of the proposed studies.
3. The examination for the degree shall consist of a thesis showing the results of supervised research, acquaintance with methods of research and knowledge of the background of the area of specialization, as the Faculty Board may recommend and the Senate may approve.
4. The candidate is required for the degree to present himself for an oral examination, in addition to such written examination as may be prescribed.

### Regulations for the Degree of Doctor of Philosophy (Ph.D.) in the Faculty of Veterinary Medicine

1. The Common Regulations for the Degree of Doctor of Philosophy in all Faculties shall be applicable.
2. The following shall be eligible for registration for the Degree of Doctor of Philosophy in the Faculty of Veterinary Medicine:
  - a. a Master of Science of the University of Nairobi;
  - b. a Bachelor of Veterinary Medicine or a Bachelor of Science of the University of Nairobi;
  - c. a graduate of any other recognized University who has been admitted by the Senate to the status of either of the degrees in (a) or (b).
3. A candidate for the degree shall be required to pursue study or research on some subject connected with Veterinary Medicine.

FACULTY OF VETERINARY MEDICINE

UNIVERSITY OF NAIROBI

-- BY DEPARTMENTS --

JULY 1978

DEPARTMENT OF CLINICAL STUDIES  
Faculty of Veterinary Medicine  
University of Nairobi

Appointment	Name & Degrees	Terms of Service	Nationality	Assignment
Professor	Vacant			
Assoc Prof	Vacant			
Sr. Lecturer	P. D. Sayer F.R.C.V.S., B.V.M.	Extended to June 1979	British	Clinic Head Small Animal
Sr. Lecturer	W. Z. Lutu B.V.Sc., M.Sc., D.T.V.M.	Permanent	Ugandan	Medicine
Sr. Lecturer	Vacant			
Sr. Lecturer	Vacant			
Lecturer	G. J. Agumbah B.V.M., M.Sc.	Permanent	Kenyan	Reproduction/ Obstetrics
Lecturer	Susan S. Iird B.V.S., M.R.C.V.S.	Extended to Sept 1979	British	Small Animal
Lecturer	C. J. Kiptoon B.V.Sc., M.Sc.	Permanent	Kenyan	Section Head Ambulatory
Lecturer	J. M. Maribei B.V.M., M.Sc., Ph.D.	Permanent	Kenyan	Medicine
Lecturer	S. W. Mbogwa B.V.M., M.Sc.	Permanent	Kenyan	Small Animal
Lecturer	E. R. Mutiga B.V.Sc., M.Sc.	Permagent	Kenyan	Reproduction/ Obstetrics
Lecturer	C. G. Ndiritu B.V.M., M.Sc.	Permanent	Kenyan	Small Animal
Lecturer	J. S. Oгаа B.V.Sc., D.V.M.	Permanent	Ugandan	Head, Reprod/ Obstetrics
Lecturer	J. E. Price B.V.Sc., M.Sc.	Permanent	Kenyan	Clin Lab/ Small Animal
Lecturer	A. M. Shatry B.V.Sc., M.S.	Permanent	Kenyan	Head, Medicine

DEPARTMENT OF CLINICAL STUDIES  
Faculty of Veterinary Medicine  
University of Nairobi

<u>Appointment</u>	<u>Name &amp; Degree</u>	<u>Terms of Service</u>	<u>Nationality</u>	<u>Assignment</u>
-- Continued --				
Lecturer	V. Varma B.V.Sc., M.S., Ph.D.	Permanent	Kenyan	Head, Surgery
Lecturer	J. P. Wamukoya B.V.Sc., M.S.	Permanent	Kenyan	Acting Chrm, Medicine Dept
Lecturer	S. Mbiuki B.V.M., M.Sc.	Permanent	Kenyan	Surgery
Asst Lecturer	R. Desai B.V.M.	Contract Study Leave	Kenyan	Small Animal USAID Partici pant. Return- ing Jan 79
Asst Lecturer	H. S. Kiniya B.V.M.	Permanent	Kenyan	Medicine/ Ambulatory
Asst Lecturer	J. O. Masera B.V.M.	Contract Study Leave	Kenyan	Reprod/Obstet USAID Partici pant. To retu Nov 1978
Asst Lecturer	J. Masha D.V.M., 1976 U. of Nairobi	Contract	Kenyan	Ambulatory/ Herd Health
Asst Lecturer	D. I. Karioli B.V.M., 1977 U. of Nairobi	Contract	Kenyan	Ambulatory/ Herd Health
Asst Lecturer	Vacant			Ambulatory/ Herd Health

DEPARTMENT OF PATHOLOGY AND MICROBIOLOGY

Faculty of Veterinary Medicine  
University of Nairobi

<u>Appointment</u>	<u>Name &amp; Degrees</u>	<u>Terms of Service</u>	<u>Nationality</u>	<u>Assignment</u>
Professor	G. M. Mugeru Dip. Vet. Sc., M.Sc., Ph.D.	Permanent	Kenyan	Dept Chairman
Assoc Prof	J. G. Wandera Dip. Vet. Sc. M.Sc.	Permanent	Kenyan	Pathology
Sr. Lecturer	J. S. Kaminjolo B.V.Sc., D.M.V.	Contract Apr 28, 1978	Malawian	Virology
Sr. Lecturer	B. K. Arap Kimeto B.V.Sc., C.M.V.	Permanent	Kenyan	Pathology
Sr. Lecturer	Vacant			
Sr. Lecturer	W. K. Munyua B.V.M., M.Sc., Ph.D.	Permanent	Kenyan	Parasitology
Sr. Lecturer	P. G. Waiyaki B.A., M.Sc., Ph.D.	Permanent	Kenyan	Parasitology
Lecturer	P. N. Nyaga B.V.M., Ph.D.	Permanent	Kenyan	Virology
Lecturer	J. K. Omuse B.V.Sc., M.Sc.	Permanent	Kenyan	Pathology/ Clin. Path.
Lecturer	J. A. Kamau B.V.M., M.Sc.	Permanent	Kenyan	Pathology
Lecturer Grad Student U. of N.	D. K. J. Kagunya B.V.M., M.Sc.	Permanent	Kenyan	Pathology
Lecturer	J. M. Ayuya B.V.M.	Permanent	Kenyan	Parasitology
Asst Lecturer	T. A. Ngatia B.V.M.	Contract Study Leave	Kenyan	Diag., Micro. USAID Partici- pant. To return Dec. 1978.
Asst Lecturer	L. C. Bebora B.V.M.	Grad Student U. of Nairobi	Kenyan	Microbiology

DEPARTMENT OF PATHOLOGY AND MICROBIOLOGY

Faculty of Veterinary Medicine

University of Nairobi

<u>Appointment</u>	<u>Name &amp; Degrees</u>	<u>Terms of Service</u>	<u>Nationality</u>	<u>Assignment</u>
-- Continued --				
Asst Lecturer	S. M. Njiro B.V.M.	Grad Student U. of Nairobi	Kenyan	Pathology
---	E. Kaggwa B.V.M., M.Sc.	Grad Student U. of Nairobi	Ugandan	Parasitology

DEPARTMENT OF ANATOMY AND HISTOLOGY  
 Faculty of Veterinary Medicine  
 University of Nairobi

<u>Appointment</u>	<u>Name &amp; Degrees</u>	<u>Terms of Service</u>	<u>Nationality</u>	<u>Assignment</u>
Professor	Vacant			
Sr Lecturer	W. M. Mathai (Mrs.) B.V.Sc., M.Sc., Ph.D.	Permanent	Kenyan	Dept. Chrm.
Sr Lecturer	Vacant			
Sr. Lecturers (3)	Vacant			
Lecturer	D. O. Okelo B.V.Sc., M.Sc. Dr. Med. Vet.	Permanent	Kenyan	

DEPARTMENT OF ANIMAL PHYSIOLOGY  
Faculty of Veterinary Medicine  
University of Nairobi

<u>Appointment</u>	<u>Name &amp; Degrees</u>	<u>Terms of Service</u>	<u>Nationality</u>	<u>Assignment</u>
Professor	G. M. O. Maloiy B.Sc., Ph.D.	Permanent	Kenyan	Dean
Assoc Prof	S. Gombe B.V.M., Ph.D.	Permanent	Kenyan	Dept. Chrm.
Sr. Lecturer	Vacant			
Lecturer	O. S. Bamford B.A., Ph.D.	Contract	British	
Lecturer	J. M. Z. Kamau B.V.M.	Permanent	Kenyan	
Lecturer	D. Gilbert B.Sc., Ph.D.	Contract	British	
Lecturers (2)	Vacant			
Asst Lecturer	M. C. Bambra B.V.Sc.	Grad Student U. of Nairobi	Kenyan	Zoology
Asst Lecturer	J. M. Wango B.V.M.	Grad Student U. of Nairobi	Kenyan	

DEPARTMENT OF PUBLIC HEALTH, PHARMACOLOGY & TOXICOLOGY

Faculty of Veterinary Medicine  
University of Nairobi

Appointment	Name & Degrees	Terms of Service	Nationality	Assignment
Professor	Vacant			
Professor	Keare Lindqvist, D.V.M., M.S., Ph.D. M.R.C. Patist	Visiting (June 79)	Norwegian	
Assoc Prof	Vacant			
Sr Lecturer	J. M. Gathuma B.V.Sc., M.Sc., Ph.D.	Permanent	Kenyan	Dept Chrm
Sr Lecturer	M. Haugum D.V.M.	Visiting (Sept 78)	Norwegian	
Sr Lecturer	M. Valland D.V.M., M.Sc.	Visiting (May 79)	Norwegian	
Lecturer	P. M. K. Nderu B.V.M., M.P.V.M.	Permanent	Kenyan	Public Hlth
Lecturer	D. J. Muchiri B.V.M., M.Sc.	Permanent	Kenyan	Pharmacology/ Toxicology
Lecturer	M. M. Kagiko B.V.M., M.Sc.	Permanent	Kenyan	
Asst Lecturer	E. Mitema B.V.M.	Contract Study Leave	Kenyan	Pharmacology USAID Partici- pant. Return- ing Jan 79)
Asst Lecturer	S. M. Arimi B.V.M.	Contract Grad Student U. of Nairobi	Kenyan	
Asst Lecturer	N. G. Binta B.V.M.	Contract Grad Student U. of Nairobi	Ugandan	NORAD staff development grant
Asst Lecturer	T. E. Maitho B.V.M.	Contract Grad Student U. of Nairobi	Kenyan	
Asst Lecturer	A. Chewulukey B.V.M.	Contract Grad Student U. of Nairobi	Ugandan	NORAD research funds

PROFESSIONAL STAFFING

Faculty of Veterinary Medicine  
University of Nairobi

Kenyanization of the Faculty

Department	<u>Nationalities of Professional Staff</u>	
	July 1971 <sup>1/</sup>	July 1978 <sup>2/</sup>
Anatomy and Histology	Kenyan - 1 African - 1 Ugandan - 1 German - 1	Kenyan ----- 2 Open Posts - 6
Physiology	Kenyan - 3 British - 4 American- 1	Kenyan ----- 5 British----- 2 Open Posts - 3
Pathology and Microbiology	Kenyan - 2 Ugandan - 2 Malawian- 1 Tanzanian 1 American- 3 German -- 2	Kenyan -----13 Ugandan ---- 1 Malawian --- 1 Open Posts - 1
Clinical Studies	Kenyan -- 3 Ugandan - 1 British - 7 German -- 4 American- 2	Kenyan -----16 Ugandan ---- 2 British ---- 2 Open Posts - 4
Public Health, Pharmacology and Toxicology	Data not available	Kenyan ----- 7 Ugandan ---- 2 Norwegian -- 3 Open Posts - 2

1/ Final Report, Contracts AID/afr-227 and 425

2/ Thirteenth Semi-Annual Report, Contract AID/afr-790

GOVERNMENT OF KENYA CONTRIBUTION  
TO THE PROJECT

The University of Nairobi, on behalf of the Government of Kenya, provided support to Colorado State University technicians and their Kenyan counterparts throughout the tenure of the project. The amount of money in Kenya shillings deposited to a special University Vote (652/101) was determined by varying formulas during the project. In fiscal year 1971-72, income to the Vote was based on contributions equal to housing allowances for the 6 C.S.U. technicians on board plus contributions equal to salaries for two of the technicians. During F.Y. 1972-73, salary-based contributions were increased to four and then to six for fiscal years 1973-74 and 1974-75.

Housing allowances remained stable at K. Sh. 1360 per month throughout the project. Senior Lecturers' salaries were K. Sh. 2000 per month through F.Y. 1974 and increased to K. Sh. 3760 beginning F.Y. 1975. Thus, the University contribution increased sharply in July 1972, July 1973 and July 1974 (Table 1 ).

Table 1 . University of Nairobi Contribution to Support of the Colorado State University/USAID Project in Kenya

<u>Fiscal Year</u>	<u>Kenya Shillings</u>
1971-1972	129,600
1972-1973	185,760
1973-1974	229,920
1974-1975	268,780
1975-1976	97,920
1976-1977	65,280
1977-1978	<u>65,280</u>
	K. Sh 1,042,540
	U. S.\$ 139,005*

\*At an average exchange rate over the seven years of K. Sh 7.5 per U. S. Dollar.

A dramatic reduction occurred in the University contribution in July 1975 following designation of one or more counterparts for each C.S.U. technician. It was reduced to the equivalent of 6 housing allowances only, and the salary equivalents were eliminated. It was further reduced to the equivalent of 4 housing allowances in July 1976, as the project entered the final two years with reduced field staff.

Project Agreements of 1971, 1973 and 1974 established a special account for the University of Nairobi contribution to the support of C.S.U. technicians. Income to the account was based on equivalents in Kenya shillings of salaries and housing allowances at Senior Lecturer level for the number of C.S.U. technicians on site at the beginning of each fiscal year. The formula was not followed exactly, and University contributions were frequently below the amounts specified in Project Agreements.

This special account was established as University Vote #652/101. At the beginning of each fiscal year a budget for disbursement of funds in the Vote was prepared by the Chief-of-Party in consultation with the Dean and Department Heads.

This fund was used, in general, to pay salaries for project administration (assistant and secretary), project office expenses, reimbursement of postage, telegrams, international telephone calls, local travel of C.S.U. technicians, purchase and maintenance of project vehicles, research grants and research equipment for C.S.U. technicians and their counterparts, student vacation employment, fellowships for professional improvement of Kenyan staff members in other African countries and elsewhere, and purchase of local commodities and supplies.

A significant quantity of the total University of Nairobi contribution -- K. Sh 255,500, about 25% of the total -- was spent for research grants and

local purchase of equipment in direct support of research efforts of Africans and C.S.U. technicians. This money was spent in support of 16 research programs within the Faculty and for purchase of 12 pieces of major research equipment. This funding furthered the post-graduate programs of 12 Kenyans and supported independent research for four C.S.U. technicians. Local expenditures in support of research were probably the most important and realistic effort made by the project to increase research output and support post-graduate study programs.

Another K. Sh 40,000 reverted to the general fund during fiscal year 1975-1976. This was unspent because of disagreement between the Dean and the Chief-of-Party as to how it should be spent. The loss of these research funds seriously delayed the Ph.D. programs of Drs. Price and Shatry, both CSU/USAID participants.

Student employment during school vacations was financed from this fund for 4 of the 7 years of the project. An approximate total K. Sh 73,300 was spent in this category during the project. The idea of this was to keep laboratories and clinic functional during vacations as is done at most teaching hospitals in the United States. Also, faculty members and C.S.U. technicians had an opportunity to observe the students closely as potential USAID participants. This effort was obviously successful as 10 of the 18 participants appeared on the rolls of those students employed during vacations.

Another important expenditure from the special Vote was K. Sh 82,300 (approximately) to finance travel and related expenses for African and C.S.U. staff members to attend professional meetings in Africa and Europe. This also qualifies as one of our better efforts in support of project objectives in post-graduate training and continuing education. From July 1971 through October 1974, this fund financed attendance at meetings of 7 Africans and

1 C.S.U. technician. Of special interest was the participation of 4 faculty members, including Dr. Johnson, at the Third International Congress of Parasitology in Munich, Germany in the fall of 1974. Each man presented a professional paper on current research being done in Kenya on parasitic diseases.

Approximately K. Sh 217,500 was spent for local purchase of clinical and laboratory equipment. This is detailed in "Commodities". The balance of money in the fund, approximately K. Sh 413,900, was spent on the "nuts and bolts" items of project management: salaries for secretary and administrative assistant, telephone, postage, office equipment, local travel for project business, vehicle maintenance, etc.

It is necessary to point out that all above figures are approximate but should fall within 10% error either way. A more accurate accounting could be done by a careful examination of project files for expenditures from Vote #652/101.

University of Nairobi accounting of this fund, or lack of it, was a rather large issue during the project and was mentioned several times to the Chief-of-Party. USAID/Nairobi also expressed displeasure at the lack of timely and accurate accounting, or any accounting at all! The project Vote was not singled out for this treatment, as this seems to be accepted procedure at the University Finance Office. It seems, however, that the promised funds were spent on project management and objectives and bills were paid in spite of this accounting gap. Someone in the Finance Office must have had some idea of the status of the fund because notification was given very quickly when the Vote was overdrawn.

Despite some problems of fund management, the money was spent and was very important to project goals. It is unfortunate that the contribution was reduced during the last three years of the project due to designation of

Kenyan counterparts. By eliminating the salary equivalent contribution to the Vote at that time (May 1975), K. Sh 171,000 was removed from the Faculty budget. The decision didn't seem to be based on much forethought.

In addition to the University of Nairobi contribution, the Government of Kenya provided one-way air travel for project participants: 18 participants at an average cost of \$900 per airfare is \$16,200.00.

PROFESSIONAL STAFF, COLLEGE OF VETERINARY MEDICINE AND BIOMEDICAL SCIENCES,  
COLORADO STATE UNIVERSITY

FIELD STAFF IN NAIROBI

During the 7 years of Contract AID/afr-790, from July 1971 to July 1978, 18 individuals served for periods varying from 4 to 60 months, for a total input of 420 man-months at the Faculty of Veterinary Medicine, University of Nairobi. Four of these individuals were carried over from the previous contract. Of the total of 18, nine were assigned in the Department of Clinical Sciences, six were in the Department of Pathology and Microbiology, two in the Department of Public Health, Pharmacology and Toxicology, and one in the Department of Animal Physiology.

Department of Clinical Studies:

Dr. Cleon V. Kimberling was in the Department of Clinical Studies, large animal medicine, for one year, July 1971-July 1972 of this contract and for two years of the previous contract. Dr. Kimberling developed the herd health program which continued to the end of the contract. He worked closely with several African counterparts and was instrumental in the identification of two participants. Dr. Kimberling returned to Colorado State University in July 1972 where he served very ably in the capacity as backup for field staff in Nairobi. In 1974 Dr. Kimberling became Campus Coordinator and served in that capacity to the end of the contract.

Dr. Gail Gilbert served on this contract from July 1971-July 1972 and for one year of the previous contract, in large animal surgery. Dr. Gilbert developed the student surgery laboratory which has continued to be of major importance in the clinical practical program. He also assisted in the development of a standard curriculum for surgery and worked closely with several African counterparts. Dr. Gilbert returned to practice in Arvada, Colorado in 1972.

Dr. LaRue Johnson was on the staff in Nairobi from September 1971 until August 1976. He developed the clinical laboratory in the department, worked closely with numerous counterparts but especially Drs. Price and Omuse in the clinical laboratory and Dr. James Maribei in the large animal medicine section. He was Chief-of-Party from March through December 1974 and was department head July 1974 - Dec. 1975. Dr. Johnson served on the graduate committees of six Kenyans in the Departments of Clinical Studies and Pathology and Microbiology and assisted in the research projects of these counterparts. He published four professional papers which were the results of research at the Faculty. Dr. Johnson identified and processed four participants and in cooperation with the Campus Coordinator located them in U. S. universities. He returned to the United States in August 1976 and is Associate Professor in the Department of Clinical Sciences, Colorado State University. At CSU he has assisted in the graduate programs of three Kenya participants.

Dr. Edward Usenik was Head of Large Animal Surgery from June 1972 until June 1974. He served on the curriculum committee and revised the curriculum for large animal surgery lecture and laboratory. The student surgery laboratory has continued essentially unchanged because of the excellence of his efforts. Dr. Usenik also developed techniques for experimental surgery in East African wildlife. He returned to the University of Minnesota in June 1974 and is presently on staff at that institution.

Dr. George Burrows served from August 1972 through July 1974 as the Director of Herd Health Programs. He enlarged upon and expanded the previously developed programs in this discipline and involved several Kenyan counterparts. Dr. Burrows identified and carried out six field investigation projects and assisted in the establishment of numerous visual aids and the photographic laboratory in the department. He returned to the University of Washington in July 1974.

Dr. Bruce Brodie served in the herd health program from June 1974 through June 1976. Dr. Brodie expanded the field trips of the herd health program to three days per week and designed student rotation schedules for the section of large animal medicine. He carried out two field investigation projects for which manuscripts are being written and should be published in the near future. Dr. Brodie returned to the University of Illinois where he is professor in the Large Animal Clinic.

Dr. Thomas Thedford served in the Faculty from June 1974 to June 1976 as Director of the Ambulatory Clinic. During his tenure he developed a new and innovative records system for the Ambulatory Clinic, revised student scheduling in the Ambulatory Clinic, and assisted in the training of three Kenyan counterparts. He identified and assisted in the training of one participant, and did two field investigations, one of which has been published and one which is nearly ready for publication. He returned to Oklahoma State University where he is the State Extension Veterinarian.

Dr. William Wolff served in Nairobi from June 1974 through July 1978 in Large Animal Surgery. He served as Head of Large Animal Surgery until January 1977 when his counterpart Dr. Varma was designated as Head of Large Animal Surgery. From January 1975 to the end of the project he served as Chief-of-Party and from July 1978 through September 1978 served as Campus Coordinator for final project details and writing of the final report. Dr. Wolff identified eight participants, processed them in Nairobi, and assisted in their matriculation in U. S. universities in cooperation with the Campus Coordinator. He developed eight autotutorial programs for student surgical exercises and numerous transparency series as teaching aids. Dr. Wolff was co-investigator in two field investigations, both of which are nearing publication status. He returned to Colorado State University as temporary Campus Coordinator to finish project details and to write the final report.

Dr. David Ward served in Nairobi from July 1976 to July 1978 as Head of the Herd Health Program. During his tenure he designed a records system for the herd health program and programmed the accumulated data for subsequent computer analysis through University of Nairobi facilities. Dr. Ward was very active in field investigations of disease outbreaks and three manuscripts are in the process of publication in cooperation with Kenyan counterparts.

Dr. Ward returned to practice in California.

The Department of Pathology and Microbiology:

Dr. Lloyd Lauerman was a member of the field staff from July 1971 to July 1972 of this contract and for three years on the previous contract. Dr. Lauerman worked closely with many Kenyan counterparts, including Dr. Saleh Mohammed who was the first Kenyan to receive the Ph.D. degree at Colorado State University. Dr. Lauerman published seven professional papers of high quality, established the diagnostic microbiology section in the department and was very active in cooperative teaching and research programs at EAVRO, the Veterinary Department at Kabete, and other departments within the Faculty. Dr. Lauerman returned to Colorado State University where he has been very helpful as backup for field staff.

Dr. John Cheney was on the field staff from July 1971 to July 1972 of this contract and for four years during the previous contract. Dr. Cheney was assigned to Parasitology where he developed a new curriculum for the course and numerous transparencies as teaching aids. Dr. Cheney was Chief-of-Party for one year of this contract and for one year of the previous contract and he was instrumental in developing the philosophy and work plan for this contract. Dr. Cheney returned to Colorado State University where he was very helpful in support of field staff in Nairobi to the end of the contract.

Dr. Robert Rubin was in Nairobi from May 1972 to June 1974 as Professor of Parasitology. He took over the position of Chief-of-Party from Dr. Cheney where he did an admirable job of developing bookkeeping methods and standardizing the administrative aspects of the project. By the time Dr. Rubin assumed this position the administrative load had become so great that professional production beyond the required teaching of undergraduate courses was nearly impossible. A project secretary was hired by the University at the beginning of Dr. Rubin's tour and in May 1974 an administrative assistant was hired by the University. Dr. Rubin had very little assistance in undergraduate teaching and most of his efforts were in that direction. He developed a new syllabus for the course in parasitology and expanded the laboratory material and diagnostic capabilities of the parasitology section. Dr. Rubin returned to Colorado State University as Professor in Parasitology where he was very helpful in indoctrination and as a backup for field staff.

Dr. Dale Grant served in Nairobi from June 1972 to July 1973. His overseas tour was cut short by illness in his family and he returned to the United States one year early. During his one year Dr. Grant was extremely active in undergraduate teaching and attempted to develop graduate study programs in microbiology. Dr. Grant worked closely with his counterpart Dr. Saleh Mohammed and together they developed autotutorials and assisted in the training of technical staff. Also during this short time he designed four research projects, two of which were carried to completion and published by Dr. Mohammed. Dr. Grant returned to Colorado State University as Professor of Microbiology.

Dr. Glynn Frank was on the field staff in Nairobi as Senior Lecturer in Microbiology from June 1974 to June 1976. Dr. Frank developed six research programs, two of which are in the process of publication and four are being carried on by counterparts. He and Dr. Sollod established good working relationships with ILRAD and he supervised two graduate students at EAVRO.

Dr. Frank was on the graduate committees of six students within the Faculty. Until his two counterparts returned from study leave in 1975, Dr. Frank was overloaded with undergraduate teaching responsibilities but still managed to be as productive in research as conditions would allow. Dr. Frank returned to the National Animal Diseases Laboratory at Ames, Iowa.

Dr. Albert Sollod served in Nairobi from June 1974 to July 1978 as Senior Lecturer in Parasitology. Dr. Sollod's main efforts were in establishing a viable research program in immunoparasitology in which he was highly successful given the existing conditions. One paper is in process of publication and four others are being written as a result of the efforts of Dr. Sollod and Dr. Frank. Dr. Sollod worked very closely with his counterparts Dr. Mango and Dr. Munyua and supervised the graduate programs of eight Africans. Dr. Sollod presented professional papers at two international parasitology congresses and attended the World Veterinary Congress in Greece in 1975.

Dept. of Public Health, Pharmacology and Toxicology:

Dr. Lowell Parsons served only 3 months at the very beginning of this contract. Dr. Parsons accomplishments are detailed in the final report of the previous contract. When he left Nairobi he accepted a job in the Veterinary Pharmacology Section at the Royal (Dick) Veterinary School, Edinburgh University.

Dr. Lloyd Davis was a member of the field staff in Nairobi from June 1972 to June 1974. Dr. Davis worked closely with his counterparts in the development of the teaching and laboratory capabilities of the Pharmacology and Toxicology Sections. He published a formulary which is still used by the Faculty and designed a number of research projects, some of which were carried out after his departure. Undergraduate teaching occupied the majority of Dr. Davis's time. When he completely redesigned the course in Pharmacology and under the

direction of Dr. Davis, the Pharmacology Laboratory became a functioning part of the curriculum. Dr. Davis returned to CSU as Professor of Pharmacology where he was of considerable assistance to field staff.

Department of Animal Physiology:

Dr. James Cunningham served in Nairobi from November 1971 to July 1972. He was assigned in the Department of Physiology to assist in undergraduate teaching and to do applied research.

COLORADO STATE UNIVERSITY CAMPUS COORDINATORS

June 1971 to June 1974 ----- Dr. Rue Jensen  
July 1974 to January 1978 ----- Dr. Cleon V. Kimberling  
July 1978 to September 1978 ----- Dr. William Wolff  
July 1972 to December 1978 ----- Mrs. Jean Kipping (Proj. Sec.)

ADMINISTRATIVE STAFF - UNIVERSITY OF NAIROBI

May 1974 to July 1977 ----- H. O. Justo (Proj. Admin. Asst.)  
July 1972 to July 1978 ----- Mrs. V. N. Kirumba (Proj. Sec.)

Professional field staff in Nairobi was at full complement throughout the contract with the exceptions of the Microbiology position vacated one year early by Dr. Dale Grant due to illness in his family and the Ambulatory Clinic position which was eliminated because of meddling in University of Nairobi and CSU project business by the USAID Mission Director in Nairobi. The following extract from the Twelfth Semi-Annual Report details the situation:

Fourth Position, CSU Technician

As of April 1977, following the AID/Nairobi rejection of Dean Maloiy's plea for a CSU clinician in the Ambulatory Clinic, 1977-1979, the fourth position became a dead issue. Perhaps the subject would be best left in its grave, yet the problems created by loss of this position are not easy to ignore.

Basically, we have been unable to carry out our contract training commit-

ent in the Ambulatory Clinic because of loss of this position. The rejection by USAID/Nairobi of Dr. Cook and the subsequent rejection of Dean Maloiy's request for extension of the position seems to have been done without consideration of our training goals. Historically, mistakes were made by myself (Wolff - protocol, procedure), and Colorado State University (inadequate recruiting) on the nomination of Dr. Cook. We assumed, without forethought of possible problems, that Dr. Cook would fill the Ambulatory Clinic position as of July 1976. Everyone was in agreement - the Deans (Mugera, then Maloiy), Colorado State University, AID/Washington and the Chief-of-Party - that this was the logical, sensible and economic appointment.

AID/Nairobi thought otherwise, apparently based on a procedure mistake and the contract commitment of Dr. Cook with the University of Nairobi. The University of Nairobi and Colorado State University made every attempt to convince the Mission that Dr. Cook's appointment was desirable and that his appointment would have removed him from the Faculty establishment, thus creating a post for a Kenyan. All of this was rejected by the Mission. By the time the smoke had cleared, it was too late to identify and nominate another veterinarian for the Ambulatory Clinic position. Another man, Dr. Ray Adams, had been nominated, but at the last minute was unable to accept the appointment.

Regarding the rejection of Dean Maloiy's request for an Ambulatory Clinician, July 1977 to July 1979, I am admittedly lacking in knowledge as to possible contract extensions, one year in this instance. However, I am impressed that the rejection was out-of-hand, without a thorough investigation of possibilities for such an extension through AID/Washington and Colorado State University. The reply to the Dean really didn't explain anything except that the Mission seemed unwilling to pursue the matter.

So we are short of our training goal in the Ambulatory Clinic. Somewhere along the line it would seem that the Mission could have recognized this gap and been more sympathetic to the training commitment of CSU.

RECRUITMENT OF PROFESSIONAL FIELD STAFF  
BY COLORADO STATE UNIVERSITY

A contract of this type presents special recruitment problems. Specific positions must be filled at definite times (by contract stipulation) after advertising and satisfying the other requirements of equal opportunities. The process usually consumes 6 to 8 months. Once the staff member is selected he must be approved by the host country and the AID Mission. This requires an additional 3 to 6 months. So, the total time lapse from advertising until the staff member is on site in the host country is usually 9 to 12 months.

Recruiting of specialists from very limited pools who are willing to live overseas, can be available for the time required, and whose home institutions will grant them leave-of-absence is a difficult and often frustrating endeavor. However, despite difficulties the College of Veterinary Medicine and Biomedical Sciences at C.S.U. did a superior job of recruitment. With the above noted exception, all positions were filled for the designated lengths of time. It is again noted that the exception was not a recruitment failure by C.S.U.

As a personal note (Wolff), my four years in Kenya were very enjoyable and reasonably productive, mostly due to the excellent personal and professional relationships that existed among all of us: Bruce Brodie, Glynn Frank, LaRue Johnson, Cleon Kimberling (at CSU), Al Sollod, Tom Thedford and Dave Ward. I take this opportunity to express my deepest gratitude to these individuals for their patience, professionalism and friendship. The recruitment efforts which resulted in such a compatible and productive group must have been superior.

RESEARCH  
PUBLICATIONS  
POST-GRADUATE COURSES  
GRADUATE STUDENT SUPERVISION  
INTERNATIONAL MEETINGS

PROFESSIONAL PUBLICATIONS  
by  
COLORADO STATE UNIVERSITY FIELD STAFF

1. Cameron, R. D. A. and L. H. Lauerman. 1976. Characteristics of semen changes during Brucella ovis infection in rams. Vet. Rec. 99: 231-233.
2. Krauss, H., J. G. Wanders and L. H. Lauerman. 1971. Isolation, identification and serological investigation of a chlamydia in Kenya sheep. Am. J. Vet. Res. 32: 1433-1437.
3. Cameron, R. D. A., A. B. Carles and L. H. Lauerman. 1971. The incidence of Brucella ovis in some Kenya flocks and its relationship to clinical lesions and semen quality. Vet. Rec. 89: 552-557.
4. Lauerman, L. H., W. A. Greig, H. A. Buck and W. Z. Lutu. 1973. Bovine mastitis in Kenya. Bull. Epi. Dis. Afr. 21: 167-170.
5. Muhammed, S. I., G. G. Wagner and L. H. Lauerman. 1974. Leukocyte migration inhibition as a model for the demonstration of sensitized cells in east coast fever. Imm. 27: 1033-1037.
6. Muhammed, S. I., L. H. Lauerman and L. Johnson. 1975. Effect of humoral antibodies on the course of Theileria parva infection (east coast fever) of cattle. Am. J. Vet. Res. 36: 399-402.
7. Muhammed, S. E., L. H. Lauerman, G. M. Mesfin and C. P. Otim. 1975. Duration of Brucella ovis infection in ewes. Cornell Vet. 65: 221-227.
8. Kaminjolo, J. S., L. W. Johnson, H. Frank and J. N. Gicho. 1974. Vaccinia-like pox virus identified in a horse with a skin disease. Zbl. Vet. Med. 21: 202-206.
9. Kaminjolo, J. J., L. W. Johnson, S. I. Muhammed and J. Berger. 1975. Uasin Gishu skin disease of horses in Kenya. Bull. Anim. Hlth. and Prod. in Afr. 23: No. 3.
10. Johnson, L. W., S. Varma, G. Wagner, E. Usenik and J. M. Maribei. Hematological, biochemical and immunological observations in experimental Theileria parva infection of cattle employing thoracic duct cannulation. (Ready for submission to Am. J. Vet. Res.).

11. Mutiga, E. R. and C. V. Kimberling. 1977. Evaluation of a clinical procedure for management of retained fetal membranes in dairy cows. VM/SAC 72: 1877-1878.
12. Usenik, E. A., D. A. Krueben and P. Duncan. 1977. Oesophageal fistulation in topi and wildebeest. E. Afr. Wildl. J. 15: 207-212.
13. Varma, S., L. W. Johnson, H. L. Ferguson and W. V. Lumb. 1978. Tissue reaction to surgical sutures in infected wounds. J. Surg. Res., March 1978.
14. Varma, S., L. W. Johnson, H. L. Ferguson and W. V. Lumb. 1978. Further studies with polyglycolic acid and other conventional sutures in infected wounds. J. Surg. Res., May 1978.
15. Moulton, J. and A. E. Sollod. Clinical, serologic and pathologic changes in calves with experimentally induced Trypanosoma brucei infection. AJVR, V 37.
16. Kimberling, C. V. and J. R. Ewing. 1973. Equine Trypanosomiasis. Bull. Epi. Dis., Sept. 1973.
17. Gilbert, G. H. and A. W. Shatry. 1973. Hypothermia - A practical aid in surgery. Bull. Epi. Dis., Sept. 1973.
18. Gilbert, G. H. and A. M. Shatry. 1973. An inexpensive method of enzymatic debridement. Bull. Epi. Dis., Sept. 1973.
19. Thedford, T. R., R. Cook and H. I. Kiniya. 1976. Field survey of bovine anaplasmosis incidence in Central Kenya. Trop. An. Hlth. and Prod., V 8: 202.
20. Kaminjolo, J., G. Burrows and J. Maribei. Stomatitis in calves caused by a virus antigenically similar to allergen virus. Bull. An. Hlth. and Prod., Sept. 1975.
21. Brodie, B., G. E. Burrows and T. R. Thedford. Selenium supplementation for young beef cattle in Kenya. Bull. Epi. Dis., July 1978.
22. Burrows, G. E., S. Muhammed and D. Winquist. Corynebacterium ovis infection in cattle in Kenya. AJVR.
23. Mbogwa, S., W. V. Lumb, K. W. Smith and R. Rubin. Plating of Canine Scapular Fractures. AJVR 39 (Aug. 1978), 1327-1330.

## PUBLICATIONS BY COUNTERPARTS

1. Ndiritu, C. G. and L. R. Enos. 1977. Adverse practices to drugs in a veterinary hospital. JAVMA 171, #3, 1977.
2. Ndiritu, C. G. and H. I. Al-Sadi. Canine spirocercosis. MVP, Nov. 1976.
3. Ndiritu, C. G. and H. I. Al-Sadi. Canine hookworm disease in Nairobi, Kenya. J. Sm. An. Prac. 18: 199-205. 1977.
4. Varma, S., H. L. Ferguson, H. Breen and W. V. Lumb. Comparison of seven suture materials in infected wounds - An experimental study. J. Surg. Res. 17: 165. 1974.
5. Mutiga, E. R. and C. V. Kimberling. 1977. Evaluation of a clinical procedure for management of retained fetal membranes in dairy cows. VM/SAC 72: 1877-1878.
6. Varma, S., L. W. Johnson, H. L. Ferguson and W. V. Lumb. 1978. Tissue reaction to surgical sutures in infected wounds. J. Surg. Res., March 1978.
7. Varma, S., L. W. Johnson, H. L. Ferguson and W. V. Lumb. 1978. Further studies with polyglycolic acid and other conventional sutures in infected wounds. J. Surg. Res., May 1978.
8. Gilbert, G. H. and A. W. Shatry. 1973. Hypothermia - A practical aid in surgery. Bull. Epi. Dis., Sept. 1973.
9. Gilbert, G. H. and A. M. Shatry. 1973. An inexpensive method of enzymatic debridement. Bull. Epi. Dis., Sept. 1973.
10. Thedford, T. R., R. Cook and H. I. Kiniya. 1976. Field survey of bovine anaplasmosis incidence in Central Kenya. Trop. An. Hlth. and Prod., V 8: 202.
11. Lauerman, L. H., W. A. Greig, H. A. Buck and W. Z. Lutu. 1973. Bovine mastitis in Kenya. Bull. Epi. Dis. Afr. 21: 167-170.
12. Muhammed, S. I., G. G. Wagner and L. H. Lauerman. 1974. Leukocyte migration inhibition as a model for the demonstration of sensitized cells in east coast fever. Imm. 27: 1033-1037.

13. Muhammed, S. I., L. H. Lauerman and L. Johnson. 1975. Effect of humoral antibodies on the course of Theileria parva infection (east coast fever) of cattle. Am. J. Vet. Res. 36: 399-402.
14. Muhammed, S. E., L. H. Lauerman, G. M. Mesfin and C. P. Otim. 1975. Duration of Brucella ovis infection in ewes. Cornell Vet. 65: 221-227.
15. Kaminjolo, J. S., L. W. Johnson, H. Frank and J. N. Gicho. 1974. Vaccinia-like pox virus identified in a horse with a skin disease. Zbl. Vet. Med. 21: 202-206.
16. Kaminjolo, J. J., L. W. Johnson, S. I. Muhammed and J. Berger. 1975. Uasin Gishu skin disease of horses in Kenya. Bull. Anim. Hlth. and Prod. in Afr. 23: No. 3.
17. Johnson, L. W., S. Varma, G. Wagner, E. Usenik and J. M. Maribei. Hematological, biochemical and immunological observations in experimental Theileria parva infection of cattle employing thoracic duct cannulation. (Ready for submission to Am. J. Vet. Res.).
18. Mbogwa, S., W. V. Lumb, K. W. Smith and R. Rubin. Plating of Canine Scapular Fractures. AJVR 39 (Aug. 1978), 1327-30.

## UNPUBLISHED RESEARCH

1. Toxic metabolites of Talaromyces (Penicillium) duponti. Grant, D. W. 1972-1973.
2. Mycotoxins of thermophilic molds. Grant, D. W. 1972-1973.
3. Effect of Cambendazole on Cysticercus bovis cysts in experimentally infected calves. Rubin, R., Mango, A. M., Mugeru, G. M. and Munyua, W. K. 1973-1974.
4. Survey of internal parasites of pigs. Burrows, G. E. and Rubin, R. 1973-1974.
5. Vulvar squamous cell carcinoma in cattle. Burrows, G. E. 1973-1974.
6. Chemotherapy of East Coast Fever. Grant, D. W. and Muhammed, S. I. 1973.
7. Microflora of the milk gland of the Tse Tse fly. Grant, D. W. 1973.
8. A survey of helminth parasites of ruminants in Kenya. Rubin, R. and A. M. Mango. 1973-1974.
9. Ulcerative lymphangitis in cattle in the Konza area of Kenya. Burrows, G. E. and Muhammed, S. I.
10. Lumpy skin disease: A variant virus. Kaminjolo, J. S. and Burrows, G. E.
11. Incidence of trypanosomiasis and Theileriasis in experimental animals at the East African Veterinary Research Organization. Sollod, A. E.
12. Trypanosomiasis in dogs. Sayer, P. D. and Sollod, A. E. presented at meeting.
13. Immunodiagnosis of cysticercosis. Gathuma, J. W., Kaman, J. and Sollod, A. E. Published as Ph.D. thesis (Gathuma).
14. Immunodiagnosis of Spirocerca cupi. Brodie, R. and Sollod, A. E.
15. An epizootic of ulcerative lymphadenitis - Lymphangitis in cattle and wildlife in Kenya. Ward, D. E. and Shatry, A. W.
16. An epizootic of otitis in beef cattle in Kenya. Ward, D. E. and Shatry, A. W.

POST-GRADUATE COURSES

PREPARED BY

CSU TECHNICIANS AND COUNTERPARTS

A. L. Lauerman and S. Muhammed

1. Advanced Microbiology (see First Semi-Annual Report)

B. L. E. Davis and C. K. Maitai - (taught once each month by Prof. Davis and his counterpart Mr. Maitai)

1. Fate of Drugs in the Animal Body
  2. Laboratory Methods in Toxicology
- (See Fourth Semi-Annual Report - January-July 1973)

C. R. Rubin and A. M. Mango

1. The Pathogenesis of Certain Important Veterinary Helminthoses

GRADUATE STUDENT SUPERVISION  
BY COLORADO STATE UNIVERSITY TECHNICIANS

Dr. Lloyd Lauerman

W. N. Masiga, Ph.D., Major Advisor  
D. P. Kariuki, M.S.  
S. D. Waghela, M.S.  
A. M. Shatry, M.S. (at CSU)  
J. Price, M.S. (at CSU)  
T. Ngatia, M.S., Major Advisor (at CSU)  
A. Molla, M.S. (at CSU)

Dr. Lloyd Davis

G. Mbadi, M.S. (at Nairobi and CSU)

Dr. Cleon V. Kimberling

S. Mbiuki, M.S. (at CSU)  
E. Mutiga, M.S. (at CSU)  
T. Ngatia, M.S. (at CSU)  
A. Molla, M.S. (at CSU)

Dr. Dale Grant

A. Mwangota, M.S., Major Advisor  
E. Muusha, M.S.

Dr. LaRue W. Johnson

J. Maribei, M. S., Major Advisor  
G. Kaaya, M.S.  
S. Varma, Ph.D.  
A. Shatry, Ph.D.  
H. Kinyi, M.S.  
S. Mbiuki, M.S. (at CSU)  
T. Ngatia, M.S. (at CSU) (Major Advisor)

Dr. Robert Rubin

J. Gathuma, M.S.

G. Kaaya, M.S.

Dr. Edward Usenik

S. Varma, Ph.D.

Dr. Glynn Frank

A. Mwangota, M.S., Major Advisor

G. Agumbah, M.S.

Dr. Albert Sollod

G. Kaaya, M.S.

J. Gathuma, Ph.D., Major Advisor

J. Kaman, Ph.D.

J. Omuse, Ph.D.

A. Shatry, Ph.D.

P. Mwambu, M.S., Major Advisor

W. Munyua, Ph.D.

J. Kaggwa, M.S.

Dr. William Wolff

S. Varma, Ph.D.

S. Kambe, M.S.

## INTERNATIONAL MEETINGS ATTENDED

BY

### CSU FIELD STAFF

1. G. E. Burrows - External Examiner in Medicine, Makerere University, Kampala, Uganda, May 1974.
2. L. E. Davis - Presented papers at: Annual Congress of the South African Veterinary Association and The Biennial Scientific Congress of the South African Veterinary Association, Johannesburg and Pretoria, October 1973.
3. L. W. Johnson - Third International Congress of Parasitology, Munich, Germany, October 1974. Presented paper entitled "Hematologic and Immunologic Observations with Thoracic Duct Cannulation in Experimental Theileria parva Infection".
4. A. E. Sollod - Presented paper at Seventh International Conference of the World Association for the Advancement of Veterinary Parasitology, Salonika, Greece, October 1975. Paper entitled "Berenil Resistance in Trypanosoma congolense Infection of Dogs" by A. E. Sollod and P. D. Sayer.
5. A. E. Sollod - 20th World Veterinary Congress, Salonika, Greece, October 1975.
6. A. E. Sollod - Meeting on Immunity in Parasitic Infections, Grignon, France, September 1977. Presented paper by P. C. Kennedy and A. E. Sollod entitled "Trypanosoma brucei rhodesiense Infections in BCG and Levamisole Treated Mice".
7. L. W. Johnson - External Examiner, Ohmadu Bello University, Zaria, Nigeria, Clinical Studies, June 1973, 74, 75.
8. L.H. Lauerma - Symposium on Pharmacology of Bacterial Toxins, Prague, Czechoslovakia, August 1971. Presented paper entitled "Efficacy of Botulinum Toxoid".

## EXTERNAL EXAMINERS

Contract funds financed travel and related expenses for three external examiners during this contract:

Dr. A. F. Alexander, Pathology and Microbiology  
1974, 1975, 1976

Dr. D. G. Low, Medicine  
1972, 1973, 1974

Dr. W. V. Lumb, Surgery  
1974, 1975, 1976

Their reports are included as Appendices E, F and G.

## PARTICIPANT AND COUNTERPART TRAINING

During this contract from 1971 through 1978, 18 Kenyan participants were identified and entered colleges of veterinary medicine at various universities in the United States. Sixteen of these completed Masters Degree programs. One did both the Masters and the Ph.D. Degrees and one participant did not complete his program. As of the writing of this report, 13 of the 17 are now at work in teaching and research programs at the Faculty of Veterinary Medicine. The remaining 4 participants are still in the United States and will return to Kenya in December 1978 and receive appointments at the Faculty.

The College of Veterinary Medicine and Biomedical Sciences at Colorado State University trained the largest number of participants but seven other colleges of veterinary medicine at other universities in the United States were also involved in participant training.

### Distribution of CSU/USAID Participants in Colleges of Veterinary Medicine

University	No. of Participants	Remarks
Colorado State University	8	1 program of both M.S. and Ph.D. 1 program incomplete All programs in Clinical Sciences
Michigan State University	3	All programs in Large Animal Med.
Texas A & M University	1	Toxicology
New York State Veterinary College, Cornell University	1	Large Animal Medicine
University of Minnesota	1	Animal Reproduction
University of Pennsylvania	1	Small Animal Surgery
Kansas State University	1	Pharmacology
University of California, Davis	2	1 Master of Veterinary Public Health 1 Small Animal Medicine

The Department of Clinical Studies has received the greatest benefit from the participant training program. Thirteen of the total establishment of 24

professional staff in the department will have been trained through this program. In the Department of Pharmacology, Toxicology and Public Health, a project-trained professional will occupy each of the three disciplines within that department by January 1979. In the Department of Pathology and Microbiology, one participant was trained in immunoparasitology.

In the Department of Clinical Studies the 13 project-trained professionals are divided fairly equally among the four sections of the Clinic. In the medicine section there are five returned participants of the eight in the section. One of these is Section Head and one is Acting Department Chairman. In the Small Animal Clinic, four of the six professionals are CSU project trained. One of these spends half time as Co-Director of the Clinical Laboratory and another is expected to take over as Director of the Small Animal Clinic in the near future. In the Obstetrics and Reproduction Section, two of the four professionals are project trained. Both of the professionals in the Surgery Section are CSU project trained and one is Section Head.

Of the thirteen project-trained professionals in the Department of Clinical Studies, five are presently being considered for promotion to Senior Lecturer.

In summary, 16 participants received training at the Master of Science Degree level in the United States in various colleges of veterinary medicine, one received training to both Masters and Ph.D. levels at Colorado State University, and one program failed. Thirteen of these seventeen participants have returned to the Faculty of Veterinary Medicine and have been appointed lecturers. The four remaining trainees are still in the United States and will return to the Faculty in December 1978.

The method of selection of participants and some disagreements between CSU Chiefs-of-Party and Faculty Administrators was the subject of discussion in the Second, Third, and Fourth Semi-Annual Reports. The center point of

the matter seemed to be that the Faculty wished to follow normal University of Nairobi procedure by advertising the USAID/Scholarships in the press. The attitude of Colorado State University was that selection of the candidates should be an internal matter based on observation of their performance and grades during undergraduate years. As the program developed and the scholarship positions were advertised in the local press, selections were in fact based on selections made by the Faculty in cooperation with CSU technicians. These selections must have been correct because 17 of the 18 completed their programs and all who are now appointed in the Faculty are demonstrating superior professional abilities and dedication to teaching and research. So the manner of selection assumes minor importance considering the overall success of the participant program.

One area of concern during the last 3 years of this contract was that we had little opportunity to observe the participants before they left for the U. S. Because we were pressed to identify each new participant, send them off for training to the United States, and bring them back to Kenya before the end of the contract in July 1978, we were unable to observe seven of the eight candidates for any length of time following graduation. Because of the necessity of applying to U. S. graduate schools by April 1st for September we were, in fact, selecting candidates based on their grades through the third year and performance to the time of selection in the fourth year. This problem was compounded by the fact that the University of Nairobi school year ends the first week of July and graduation occurs in October. Seven of the eight participants sent to the U. S. in the last three years were literally observed during the various preparation processes and as we put them on the jets. Three of those seven, about whom we knew very little at the time of selection, have returned to the Faculty and are performing very well. We anticipate no problems with the other four. As is clearly stated in terms of

service of the University of Nairobi, a faculty member was to have been on board for at least one year before he or she would be considered for study leave. This is certainly legitimate and a sensible requirement, and this would have been done had it been possible. It is hoped that future participant programs will be designed and positions opened far enough in advance so that there is not the necessity for such a crash program of identification and matriculation of participants in U. S. universities. This is not to say that we selected these participants entirely blind, because they were known as students by their grades and clinical performances through the third year and to the time of selection in May of their fourth year. The fact that the selections made were obviously satisfactory would seem to indicate that the marking and evaluation system at the Faculty is reasonably helpful and even accurate.

Another area of concern is the progression of those who have returned toward Ph.D. degrees at the University of Nairobi. The participants find that immediately upon their return to the Faculty they are swamped with lecture and laboratory material, to the point where any thought of research is almost impossible. This situation obviously exists because staff members have been overworked while the participants were on study leave and are more than ready to share the teaching load. This situation is true in all departments but especially in the Department of Clinical Studies which is understaffed and had the largest number of positions unoccupied because of participants on study leave.

So, realistically, it is not expected that many of the participants will progress very rapidly toward the Ph.D., or that, under the existing teaching and clinical loads—and large numbers of students that they even have any desire to do so. The facts of life are, however, that without the Ph.D.

degree in the University of Nairobi system there is little or no chance for promotion beyond the level of Senior Lecturer. Until the staffing situation is relieved, to the point where each member will have a definite period of time free during each school year for independent research it is doubtful that there will be many Ph.D. degrees granted to CSU project trainees.

Programs for Ph.D. coursework in the United States with on site supervision of Ph.D. research programs in Kenya by U. S. academicians through United States land-grant institutions might be considered by the Faculty of Veterinary Medicine and USAID. Without external assistance of some kind it is doubtful that many of those aspiring toward Ph.D. degrees at the Faculty will reach the goal, especially in the Department of Clinical Studies.

#### PARTICIPANTS

DR. S. VARMA - Dr. Varma received the M.S. Degree in Surgery and, with a 6-month extension of his scholarship, completed coursework for the Ph.D. Degree at Colorado State University. He returned to the Faculty in January 1974 as the first participant under this CSU Contract. He was appointed Lecturer in the Department of Clinical Studies in September 1974. Under the supervision of Dr. William V. Lumb of Colorado State University, he completed his research and wrote the Ph.D. dissertation during academic years 1974-75 and 1975-76. The Ph.D. Degree was granted by CSU in January 1977. Dr. Varma assumed the duties of Head of Large Animal Surgery on January 1, 1977 and he is due for promotion to Senior Lecturer immediately.

DR. A. M. SHATRY - Dr. Shatry obtained the M.S. Degree in Medicine from \_\_\_\_\_ Colorado State University and returned to Nairobi in September 1977. He was appointed Lecturer in the Department of Clinical Studies as a member of the Medicine Section. Along with heavy teaching and clinical duties,

Dr. Shatry is making excellent progress in research leading to the Ph.D. from the University of Nairobi. He has received a research grant from the University and anticipates completion of degree requirements within the next year. Dr. Shatry was appointed Head of Medicine Section in October 1977, and has done an excellent job of coordinating the lecture and clinical practicals in large animal medicine. He is due for promotion to Senior Lecturer immediately.

DR. F. M. NDERU - Dr. Nderu received the Master of Veterinary Public Health degree from the University of California at Davis and returned to the Faculty in September 1974. He has been appointed Lecturer in the Department of Public Health, Pharmacology and Toxicology and has identified and started work on a research program which would lead to a Ph.D. Degree at the University of Nairobi. Dr. Nderu was originally programmed to return to the Department of Clinical Studies to take over the Herd Health Program. As things have worked out, however, he is a very welcomed addition to the Public Health Teaching Program and is doing an excellent job.

DR. J. C. KIPTOON - Dr. Kiptoon obtained the Master of Science Degree in Medicine from the University of Nairobi in October 1974, and immediately departed for Michigan State University where he did coursework for the Ph.D. Degree. Upon his return to the Faculty in July 1975, he was appointed Lecturer in the Department of Clinical Studies in the Medicine Section. Dr. Kiptoon has identified a research project Ph.D. Degree from the University of Nairobi and is presently making slow progress towards his goal. In July 1976 he was designated as Head of the Ambulatory Clinic and is very active and effective in this position. This appointment and the duties associated with it have effectively eliminated any time that he might be able to spend on the research project. There are plans in the Department to relieve Dr. Kiptoon of most of his clinical duties for the coming academic

year so that he may complete his degree requirements.

DR. E. R. MUTIGA - Dr. Mutiga received the Master of Science Degree in Animal Reproduction from Colorado State University and returned to Nairobi in May 1975. He was appointed Lecturer in the Department of Clinical Studies in the Reproduction/Obstetrics Section. He has a very full lecture, laboratory and clinical schedule but, at the same time, is making good progress toward Ph.D. requirements. The degrees should be granted by the University of Nairobi in the next 2 years. Dr. Mutiga is a very effective and very active teacher and clinician.

DR. J. E. PRICE - Dr. Price obtained the Master of Science Degree in Clinical Pathology at Colorado State University and returned to the Faculty in July 1975. She was appointed Lecturer in the Department of Clinical Studies where she divides her time between direction of the Clinical Laboratory and as a small animal clinician. Dr. Price has completed a research project for Ph.D. requirements and is in the process of writing the dissertation. The divided assignment of Dr. Price has been very difficult for her personally and only through her initiative and drive has she been able to progress in her clinical and research duties. She shares her duties in direction of the Clinical Laboratory with Dr. John Omuse of the Department of Pathology and Microbiology. The recent appointment of Mr. James Muraguri as Chief Technician in the Department of Clinical Studies has relieved Drs. Price and Omuse of many of the details of direction of the Clinical Laboratory. Mr. Muraguri's appointment was long overdue and improvement of clinical laboratory services, maintenance of equipment, and management of laboratory technicians has already made the laboratory a much more effective teaching and clinical service.

DR. J. P. WAMUKOYA - Dr. Wamukoya received the Master of Science Degree in Medicine from Michigan State University and returned to Nairobi in July 1975. He was appointed Lecturer in the Department of Clinical Studies in the Medicine Section. Along with his heavy teaching and clinical duties, Dr. Wamukoya has identified a research project for Ph.D. requirements and is making satisfactory progress. In addition to clinical duties Dr. Wamukoya has served as the Faculty Representative on the University Senate. He is now serving as Acting Chairman of the Department of Clinical Studies.

DR. GEORGE MBADI - Dr. Mbadi arrived in August 1973 for a Master of Science Degree training in Pharmacology at Colorado State University under the direction of Dr. Lloyd Davis, a previous CSU professional at the Faculty. Dr. Mbadi was reportedly nearing completion of the M.S. Degree requirements when Dr. Davis applied for a change of Mbadi's program from Plan "A" (with thesis) to Plan "B" (without thesis). The change of plans was not approved by the Graduate Council and Dr. Mbadi returned to Nairobi without completing the requirements for the Masters Degree. His original program was extended for 7 months in the hopes that he would complete the program but he failed to do so. He did not receive an appointment at the Faculty.

DR. C. G. NDIRITU - Dr. Ndiritu arrived in December 1974 at the University of California at Davis and entered a Master of Science program in small animal medicine. Dr. Ndiritu performed with excellence and finished the M.S. degree on schedule, returning to Nairobi in October 1976. He was appointed Lecturer in the Department of Clinical Studies, Small Animal Clinic, and is in line for appointment to Senior Lecturer in the very near future. Dr. Ndiritu is a very active clinician and teacher and is assisting Dr. Paul Sayer with his administration of the Small Animal Clinic. He has published 4 professional papers in the United States and Kenya and continues to do research which will

lead to the Ph.D. Degree within the next year. It is expected that Dr. Ndiritu will take over as Director of the Small Animal Clinic.

Dr. MAINA AYUYA - Dr. Ayuya entered Michigan State University January 1976 for a Masters Degree program and research in immunoparasitology. His performance at Michigan State University was outstanding and Dr. J. E. Williams his major professor, requested that he be allowed to return for the Ph.D. Degree. Dr. Ayuya returned to Nairobi in March 1978 and was appointed Lecturer in the Department of Pathology and Microbiology. He immediately embarked on a heavy teaching and laboratory schedule and worked closely with Dr. Sollod during the last 3 months of his contract. Dr. Ayuya is a very ambitious and well qualified professional with excellent training in immunology. It is hoped that he will be allowed to return to Michigan State University to continue the Ph.D. program at that institution.

DR. STANLEY MBIUKI - Dr. Mbiuki entered Colorado State University in January 1976 for study and research leading to the Masters Degree in Food Animal Surgery. His program was under the direction of Dr. W. V. Lumb and Dr. L. W. Johnson. He performed very well during his stay at Colorado State University, returned to Nairobi in December 1977 and was appointed Lecturer in the Department of Clinical Studies, Surgery Section. Dr. Mbiuki immediately assumed a large share of the teaching and clinical duties of the Surgery Section upon his return and has not had time to identify a research project for the Ph.D. Degree. Since he and Dr. Varma are the two professionals in the Large Animal Surgery Section, there may be some difficulty in allowing time for Dr. Mbiuki to embark on his Ph.D. program.

DR. DANIEL MUCHIRI - Dr. Muchiri entered Texas A & M University in January 1976 for a program of study and research leading to the Masters Degree in Toxicology under the direction of Dr. Murl Bailey. He performed extremely well, completed degree requirements, and returned to the Faculty in January 1978. Dr. Bailey encouraged Dr. Muchiri to return to the United States and

do a Ph.D. program in pathology related to toxic diseases. Dr. Muchiri is the only trained toxicologist in the Faculty and it is expected that his teaching and laboratory duties will be considerable. His return to the United States for the Ph.D. Degree should be encouraged.

DR. H. S. KINIYA - Dr. Kiniya entered the New York State Veterinary College at Cornell University, New York, in October 1976 for a program of study and research leading to the Masters Degree in Large Animal Clinical Medicine. His performance was excellent, and he completed the degree requirements on time, returning to Nairobi in September 1978. He will be appointed Lecturer in the Department of Clinical Studies and Ambulatory Clinic where his presence will be greatly appreciated.

DR. O. J. MASERA - Dr. Masera began training at the University of Minnesota in October 1976 in bovine reproduction, with study and research leading to the Masters Degree. As of the writing of this report his program is nearly completed and he will return to the University of Nairobi in October 1978 where he will be appointed Lecturer in the Department of Clinical Studies and will join the Reproduction/Obstetrics Section.

DR. RITA DESAI - Dr. Desai entered the University of Pennsylvania in November 1976 to do study and research leading to the Masters Degree in small animal surgery. Her program is under the direction of Dr. Robert S. Brodie and satisfactory progress is reported. She will return to Nairobi in December 1978 and will be appointed Lecturer in the Department of Clinical Studies, Small Animal Clinic.

DR. E. S. O. MITEMA - Dr. Mitema entered Kansas State University in December 1976 for a program of study and research leading to the Masters Degree in Pharmacology. His program is under the direction of Dr. Frederick Oehme and excellent progress is reported. He will return to Nairobi December 1978 and he will be appointed Lecturer in the Department of Public Health, Pharmacology and Toxicology where he will be the only trained Kenyan in pharmacology

in that department.

DR. T. A. NGATIA - Dr. Ngatia entered Colorado State University January 1977 and started a program of study and research leading to the Masters Degree in diagnostic microbiology. His program is under the direction of Drs. Kimberling, Lauerman, and Johnson, all ex-CSU field staff members. Progress toward the degree has been slightly bumpy, but seems to have smoothed out at the time of this writing, and Dr. Ngatia is expected to complete degree requirements and return to Nairobi in December. Originally, Dr. Ngatia was to be associated with the Department of Pathology and Microbiology upon his return to the Faculty but the Department Chairman determined that there was no position available and he was subsequently reassigned to the Department of Clinical Studies which is over-establishment. The training in diagnostic microbiology would certainly qualify Dr. Ngatia to return to the Department of Pathology and Microbiology and assist in the building of diagnostic and research capabilities in that department. Unless the Faculty intends to realign its entire philosophy on departmentalization, the assignment of Dr. Ngatia to the Department of Clinical Studies would seem to be diluting the overall diagnostic efforts of the Faculty which, logically, would be concentrated in the Department of Pathology and Microbiology. Possibly this is an attempt to bridge the gap between the two service departments so that there will eventually be a coordinated clinical and diagnostic laboratory approach to problem solving. If this was the intention of the Faculty then Dr. Ngatia should have been notified. The shufflings of Dr. Ngatia back and forth between the two departments has been a source of discouragement to him during his stay at CSU as he has not known exactly where to concentrate his efforts.

## COUNTERPART TRAINING

In addition to participant training in the U. S., the Colorado State University/USAID contract specified that CSU technicians would assist in the training of counterparts in Kenya in their various fields of expertise. In a letter to AID, dated 23 May 1975, Dean Mugeru assigned counterparts to each CSU technician and from that point on technicians on site were on "visiting" status. Dr. A. E. Sollod, in Parasitology, was assigned as counterparts Drs. Mango and Munyua. Dr. Mango and Dr. Sollod worked closely together over the next 2 years in developing a more viable teaching and laboratory course in parasitology for undergraduate students. It was considered that this was an excellent relationship. Then, during the last year of the contract, Dr. Mango changed departments. The relationship between Drs. Sollod and Munyua have been less productive but, during the last 6 months of the contract, especially after the return of Dr. Ayuya, Dr. Munyua had assumed a more leading role.

Dr. G. H. Frank was assigned two highly qualified and motivated professionals in Microbiology, Dr. P. G. Waiyaki and Dr. P. N. Nyaga. Relationships between these 3 men in their teaching and diagnostic duties was excellent and certainly among the best counterpart relationships that have existed in this contract.

Another excellent counterpart relationship was that between Dr. L. W. Johnson and Drs. J. E. Price and J. K. Omuse in the Clinical Laboratory. These three worked very well together and a viable and highly professional clinical laboratory continues to function over 2 years after Dr. Johnson's contract ended.

Dr. Bruce Brodie was assigned as counterparts Drs. Wamukoya, Kiptoon and Mutiga in the Department of Clinical Studies. Dr. Brodie, in his Herd Health Program, worked as closely as possible with his 3 counterparts but none of them chose to assume responsibilities for the herd health programs upon his

departure from Kenya nor did any of them show interest in the program when Dr. David Ward arrived in July 1976 to take over the herd health program. Probably Dr. Mutiga had the greatest exposure to Dr. Brodie and benefited most from his knowledge and professionalism.

Dr. T. R. Thedford was assigned Drs. Lutu, Shatry and Kiniya as counterparts and he did work very closely with Dr. Shatry and Dr. Kiniya, in the development of a new philosophy teaching in the medicine section and in the development of the ambulatory clinic. There was an excellent professional and personal relationship among these three. There was little contact between Dr. Thedford and Dr. Lutu.

Dr. Wolff was assigned Dr. S. Varma as counterpart in May 1975 and Dr. S. E. Mbiuki when he returned to Kenya in December 1977. Dr. Wolff assisted Dr. Varma mainly by allowing him free time for Ph.D. research and 6 months of study leave. Drs. Mbiuki, Varma and Wolff worked together very well for the last 6 months of the contract.

FINAL REPORTS  
OF  
FIELD STAFF

## PARASITOLOGY FINAL REPORT

Period ending 30 June 1978

A. E. Sollod

### Undergraduate Teaching - 40%

The undergraduate teaching of parasitology remains in the same format with 2-4 lectures and one laboratory session per week. The total time allocated makes this one of the most comprehensive parasitology courses taught in any veterinary college. The laboratory sessions are taught mostly by the use of microscope slides. Although the slide kits were refurbished this year, the interest generated in the laboratory could be greatly increased by the use of live and necropsy material and prepared demonstrations with auxillary information drawn and printed on posters. The collection of parasites and affected host tissues requires renewed effort as several times this year it was found inadequate for either teaching or examination purposes.

Staffing is again a problem in parasitology. With my departure, only Drs. Munyua and Ayuya remain to teach parasitology. It is unclear as to who or how many faculty there will be next year, but it is clear that for the present class size (75-80), three faculty are required in order to maintain an acceptable standard.

I was able to stay through June 22, 1978 to administer oral final examinations and to correct the written professional examinations. In both my opinion and that of the external examiner, Prof. Morganti (who only attended two parasitology examination sessions), the students know less this year than in prior years. The reasons for this are speculative and probably complex but efforts in different directions should be made to raise the standard back to what it had been.

### Graduate Teaching - 30%

Dr. Gathuma, for whom I have been major supervisor, successfully defended his Ph.D. thesis entitled "Immunodiagnosis and Seroepidemiology of Cysticercus bovis Infection in Cattle in Kenya". This student has done an excellent job in the administration necessary to proceed with his work, in the laboratory research, and in the writing of his thesis. He has now been appointed acting head of the Department of Public Health and Toxicology. I hope that he does not become so overburdened with administrative matters that he completely abandons the laboratory work for which he has shown an aptitude.

The University of Nairobi Dean's Committee presented a research grant to Dr. Kagwa and myself to work on the immunopathology of canine trypanosomiasis. Dr. Kagwa will use these funds to complete her thesis research for the Ph.D. degree. An alternate major supervisor will have to be appointed.

Although Dr. Munyua passed his thesis defense and external examination, the Graduate Studies Committee of the University of Nairobi has so far not recommended the award of the degree. There were apparently procedural irregularities in the examination process. It remains to be seen how this matter will be resolved.

A graduate course in immunology was presented by Prof. Lindqvist in the Department of Public Health and Toxicology. I was requested to assist in this course and presented approximately one-third of the seminars. The course was taken by students in all departments of the Veterinary College.

### Research - 15%

No new funds became available quickly enough to begin further research during the last six months of the project. A long overdue paper was written

jointly by Dr. Glynn Frank and myself on work done at the University of Nairobi: "Immunological Function in Cattle Infected with Trypanosoma congolense". I am still awaiting data from Prof. Kennedy in order to publish work we have done jointly. The paper will have to be written after I leave the project.

A serum electrophoresis unit and scanner was installed in the Department of Clinical Studies and the technicians were instructed in its use.

Any actual laboratory research which I performed was in aid of the graduate students.

#### Administration - 15%

All matters attended to were either routine or were related to my leaving after four years. All equipment which I had borrowed from the Department was returned and all equipment purchased by USAID was turned over to Mr. Mworia who officially received and recorded it for the Department. Reagents and consumables were distributed on an informal basis, the majority going to Dr. Nyaga for a cell biology/pharmacology project.

HERD HEALTH SECTION

FINAL REPORT

June 1978

David E. Ward, D.V.M., Ph. D.

The Herd Health Section in the Department of Clinical Studies remained a viable part of the clinical teaching effort for 3rd and 4th year veterinary students. No present faculty members were able to consistently participate in the Herd Health Program due to their prior commitments in the Department. However, various Department members expressed interest in continuing the program to support the clinical teaching efforts in the Department.

The following is a summary of the research projects undertaken during 1976 to 1978:

- (1) Serum samples collected from various domestic animal species have been turned over to Dr. Shatry. Approximately 250 samples were collected from normal and diseased animals, cataloged and maintained frozen. Paired samples from one dairy were given to Dr. Wangala, Veterinary Research Laboratories, Kabete, for his use in investigating an outbreak of bovine brucellosis involving 100% of the adult cattle in the herd.
- (2) A standardized epizootiological and clinical record system for use in the Herd Health program was developed and used by 4th year students.

The University of Nairabi Computer Center was utilized for analysis of the records collected from 1976 to 1978. Dr. Allen Carles, Department of Animal Production, was instrumental in developing the record system and Dr. Shatry has been briefed on its use. A summary of the animal diseases encountered over  $1\frac{1}{2}$  years in the Herd Health Section is appended to this report.

(Appendix 1)

- (3) An epizootic of otitis in cattle associated with a Rhabditis nematode was investigated in several herds in eastern Kenya. Preliminary investigation was carried out on the identification of the nematode, its parasitic role, if any, and various treatment methods to limit loss from this disease. Dr. Shatry is continuing this investigation.

#### Research Publications:

- (1) An Epizootic of Bovine Ulcerative Lymphangitis I Clinico-Pathological Observations.  
A. M. Shatry, D. E. Ward, J. G. Wandera, J. S. Kaminjolo, D. P. Kariuki, (submitted for publication to the Veterinary Record).
- (2) An Epizootic of Bovine Ulcerative Lymphangitis II Epizootiological Description.  
D. E. Ward, A. M. Shatry, (submitted for publication to The Veterinary Record).

- (3) Animal Diseases Limiting Production in Central  
Kenya: A Herd Health Survey.  
D. E. Ward (in preparation).

## APPENDIX 1

### Animal Diseases Limiting Production in Central Kenya: A Herd Health Survey

A survey of animal diseases on selected farms in Central Kenya was carried out to determine the relative frequencies of various disease conditions limiting animal production. This information could be used to allocate resources by Kenya Governmental departments and aid donating agencies and to guide subject matter emphasis in the curriculum of the Faculty of Veterinary Medicine at the University of Nairobi.

Data was gathered from 577 medical and surgical cases examined by the Herd Health Section in the Department of Clinical Studies over an 18 month period from September, 1976 to February, 1978. Selected dairies (8), cattle ranches (2), pig farrowing and fattening units (2), settlement schemes (5), and one cattle feed lot, all located within approximately 80 miles of Nairobi, were included in the survey. Each enterprise was visited on a scheduled basis, varying from monthly for the dairies to once every 3 to 4 months for the settlement schemes and ranches. The survey covered 577 animals, which included 530 cattle (92%), 7 sheep and goats (1%), 37 pigs (6%) and 3 horses (0.5%). The majority of the animals were used for milk production (50%), followed by meat production (38%) and breeding (12%). The organ systems affected and tentative diagnoses were determined in each case after consideration of the history, physical examination, and, where appropriate, laboratory and post mortem examinations.

Table 1 shows the relative frequency of the most commonly affected organ systems and the most common tentative diagnoses rendered.

Table 2 lists the four most commonly affected organ systems and the most common tentative diagnoses rendered for each type of livestock enterprise included in the survey. Over 80% of the conditions diagnosed in this survey were not specific to East Africa but occur world wide. The economic significance of these common diseases was not determined in this survey but they likely assume a similar relative importance in Kenya as in other areas of the world.

The most commonly encountered diseases of various domestic animal species located near Nairobi, Kenya, are found in many other parts of the world. The "exotic" viral and bacterial diseases of animals have been largely controlled in this area of Kenya, thereby elevating other disease conditions to prominence. This shift to prominence of the common diseases has occurred because of the effective disease quarantine and vaccination programs administered by the Kenya Veterinary Department.

Increased expertise and training for animal health personnel in proper animal husbandry practices which emphasize proper tick control programs, sanitation, feeding practices, internal parasite control and housing facilities would reduce many of the animal diseases found in this survey. Demonstrating procedures and providing drugs for proper treatment of

infectious keratoconjunctivitis, neonatal enteric diseases and other infectious and parasitic diseases would reduce the production losses associated with these diseases. Educating veterinarians in the methods of increasing bovine reproductive efficiency and limiting mastitis through herd health programs in dairies would provide increased milk production and income for dairy farmers. Control of abortion diseases such as Brucellosis and Leptospirosis on a nationwide basis would make significant contributions to increased animal production efficiency and to improved human health. Continued research effort to control and eliminate insect born protozoal diseases is needed, even though they ranked 4th in prevalence of the diseases encountered in this survey (Table 1). The increased occurrence of production and animal husbandry related diseases and decreased viral and bacterial caused animal plagues has occurred at the large cost of the disease control programs carried out by the Kenya Veterinary Department. These programs should in no way be diminished. Additional emphasis should be placed by veterinary and animal scientist educators to teach effective control measures for the more commonly encountered infectious, nutritional and production diseases which limit optimal animal production in Kenya.

TABLE 1

ORGAN SYSTEM AFFECTED	%	M O S T   C O M M O N   T E N T A T I V E   D I A G N O S E S		
		FIRST	SECOND	THIRD
Gastrointestinal	21	Intestinal Parasites	Rumenitis	Neonatal Enteric Disease
Integument	18	Wounds/Abscesses	Foot Rot	Streptotrichosis
Special Sense	14	Infectious Keratoconjunctivitis	Thelazia Infection	---
Blood-Reticuloendothelial	11	Bovine Trypanosomiasis	Theileriasis	Bovine Babesiasis/ Anaplasmosis
Reproductive	10	Abortion	Ovarian/Uterine Disease	No Observed Estrus
Respiratory	9	Bacterial Pneumonia	Infectious Bovine Rhinothacheitis	---
Mammary	7	Mastitis	Udder Wounds/ Agalactia	---
Musculo-Skeletal	5	Traumatic Lameness	Arthritis	---
Unknown/Normal	3			
Other*	2			

\* Includes the cardiovascular, endocrine, central and peripheral nervous, and urinary systems and the body as a whole.

TABLE 2

FARM ENTERPRISE	FOUR MOST COMMONLY AFFECTED ORGAN SYSTEMS	M O S T C O M M O N T E N T A T I V E D I A G N O S E S	
		FIRST	SECOND
Dairies (8)*	Gastrointestinal Mammary Reproductive Integument	Neonatal Enteric Disease Mastitis Abortion Wounds/Abscesses	Intestinal Parasites Wounds/Agalactia Ovarian/Uterine Disease ---
Beef Ranches (2)	Special Sense  Gastrointestinal Musculo-Skeletal Blood-Reticuloendothelial	Infectious Keratoconjunctivitis Intestinal Parasites Traumatic Lameness Theileriasis	Thelazia Infection --- --- Bovine Trypanosomiasis
-97- Pig Farrowing and Fattening Units (2)	Integument Gastrointestinal Reproductive Musculo-Skeletal	Traumatic Foot Injuries Neonatal Enteric Disease Abortion (Leptospirosis) Arthritis	Abscesses --- --- ---
Settlement Schemes (5)	Gastrointestinal  Special Sense Reproductive Blood-Reticuloendothelial	Intestinal Parasites (Tri- chostrongyles, Fasciola) Infect.Keratoconjunctivitis No Observed Estrus Theileriasis	--- Ovarian Hypoplasia Anaplasmosis
Beef Feed Lot (1)	Integument Blood-Reticuloendothelial Gastrointestinal Respiratory	Streptotrichosis Bovine Trypanosomiasis Rumenitis Bovine Respiratory Dis.	--- Theileriasis --- Infect.Bov. Rhinotracheit:

\* Number in parenthesis indicates number of individual enterprises in each group.

## SEMI-ANNUAL REPORT

Dr. William A. Wolff, Senior Lecturer, Surgery  
and Chief-of-Party

### TEACHING - 15%

With the return of Dr. Mbiuki to Nairobi in December, I phased out of teaching activities, and he and Dr. Varma took over all lectures and laboratories in large animal surgery, and Drs. Susan Mbogwa and Jenny Price teach the small animal surgery laboratory. Over the Christmas holidays, from early December to the first week in January, Drs. Mutiga, Ward and I did the ambulatory work accompanied by a few non-Kenyan students who were unable to return to their countries for the brief period of time. In February, March and April I made five field trips with Drs. Varma and Mbiuki. We performed a number of detector bull operations and did other varied surgical operations on beef cattle. During these field trips I had an opportunity to work closely with my two counterparts and this was perhaps the most valuable contact and training experience that I have had with them during my four years in Kenya.

During the last three months I spent a great deal of time organizing and cataloguing the 35 mm transparencies for the teaching files. In all, I catalogued and subsequently copied some 1200 slides which have become part of the teaching aides for the Department of Clinical Studies. In addition, I finished, edited, and put together six single-concept super 8 mm films of various surgical procedures. I also purchased slide-filing books, and a Super 8 mm camera and tripod from funds remaining in the University of Nairobi Vote. I was able to work with a technician for several days, training him in the use of this equipment.

Toward the end of the school term in May I taught special tutorials for 3rd and 4th year students in bovine lameness, abdominal surgery in cattle, and surgery of the urinary and reproductive tracts in male cattle.

## RESEARCH - 5%

Detector Bull operations done during the field trips and follow-up of these procedures will be part of a publication now in preparation by Drs. Bruce Brodie, Stanley Mbiuki, Vijay Varma and myself. Another publication on splenic translocation in calves by Drs. Thedford, Cook, Varma and myself is nearing its final stages of writing.

## ADMINISTRATION - 80%

Most of my time during the last six months of the contract was involved in administration as Chief-of-Party. During January I made an administrative visit to Colorado State University and Washington to plan the final phaseout. Discussions and planning centered around the turnover of property to the Faculty of Veterinary Medicine, preparation of the final report, and continuing relationships between the College of Veterinary Medicine and Biomedical Sciences at Colorado State University and the Faculty of Veterinary Medicine at the University of Nairobi. Dr. Kimberling and I designed an outline for the final report which was subsequently approved by Dean Phemister and submitted to the USAID Mission in Nairobi.

There were discussions in Fort Collins and in Washington regarding the continuing relationship issue with no real conclusions. It was decided that continuing relationships were desirable but the mechanism, form, and financing of these relationships were not defined. The Dean of the Faculty of Veterinary Medicine is especially interested in future relationships with CSU for the establishment of graduate education at the Faculty, specifically relating to "taught" graduate courses and Ph.D. programs administered by CSU professionals. Officials in Washington seemed open to suggestion along these lines and the next step is for the University of Nairobi and Colorado State University to design and submit to USAID a proposal for the establishment of post-graduation

capabilities at the Faculty, if such is the desire of both institutions.

The details of final close-out of the project involved a great deal of my time during the last three months. Inventory and turnover to the University of Nairobi of grant-in-aid furniture and appliances, which were used by CSU technicians throughout the tenure of this project, was the most time-consuming and difficult part of the close-out. Finally, this was done by letter from me to the Dean which included a listing of original issue, a listing of final property on hand, and an inventory prepared by NOTCO, Nairobi, of furniture and appliances in storage in the name of the Faculty of Veterinary Medicine. Correspondence and inventory relating to this transaction are included in this report (Furniture and Appliances, p. 115).

The final inventory of non-expendable commodities and shipping lists of commodities received during this contract was given to the Dean along with locations of the specific items and dollar values (See "Commodities", p. 111).

Final refurbishing of houses of the 3 CSU technicians on site and turnover to the landlords was accomplished with some difficulties but hopefully few injured feelings on all sides. Payment of final utility and telephone bills on these properties is still pending due to delay in billing from Nairobi.

The imprest account for Colorado State University at the Commercial Bank of Africa Ltd. remains open for payment of these accounts. With the approval of the Director of that bank, I obtained overdraft privileges of 10,000 Kenya shillings, so that final bills could be paid from Fort Collins by shilling check and then the Commercial Bank of Africa reimbursed by dollar check for the amount of the overdraft. Presently, the overdraft amounts to some Kenya shillings 2500 and will probably reach about K. Sh. 5000 before final settlement.

In summary, the last 6 months of this contract were both busy and enjoyable. From the response of Africans at the Faculty, I feel that the project was

successful in many areas but particularly in establishing lasting personal and professional relationships between Africans and Americans and their families.

*W. A. West*

## FINAL REPORT

Dr. William A. Wolff, Senior Lecturer, Surgery  
and Chief-of-Party

### TEACHING

During four years in Kenya the majority of my academic effort was directed in teaching and administration of the large animal surgery section. From the outset I changed my ideas rapidly concerning the role of a foreign technician in undergraduate teaching at the Faculty. The ideal objective was to train and advise counterparts in their teaching, but short staffing necessitated my involvement in the actual preparation of lectures, laboratories, and field trips and carrying these out, usually without the presence of a counterpart. This was most enjoyable to me, as an educator, because I enjoy student contact. However, my efforts would have been more productive in training had my counterpart, Dr. Varma, been able to work more closely with me and if more counterpart had been assigned. Dr. Varma was able to complete his Ph.D. degree and broaden his academic and professional background through study leaves. Because establishment posts in the clinic were at a premium, it would have been impossible to assign more counterparts to me, so my role in filling the position of a clinical teacher at the time was probably productive in the sense that it allowed Kenyans the time necessary to pursue advanced training.

For the most part, I found the students responsive, willing to work, and especially enjoying the clinical practicals, surgical exercises and field trips. The practical experience certainly provided relief to them in the very intensive and overwhelming lecture schedule in the 4th year. I was somewhat disturbed by the apparent decrease in the quality of students during my 4 years in Kenya but, perhaps this was to be expected as the numbers of students increased.

Drs. Varma, Mbogwa, Price, and I developed the regularly scheduled surgical laboratory for both large and small animals. This was merely an extension of the laboratory developed by Drs. Gilbert and Usenik but we had to deal with

rather complicated scheduling and short facility problems because of the increased number of students. Students were more receptive and responsive to the surgery laboratory and clinical surgery than they were to other phases in their clinical training. This isn't surprising considering that the same is generally true in veterinary schools in the United States or Europe. It is perhaps a psychological or ego factor: In wielding the knife we feel more like true medical professionals. I believe that student surgery performs a necessary function, not only in introducing the student to the surgical procedure itself but also in the preparation for surgery, anesthesia, recovery and follow-up after surgery. It, in a sense, forces the student to a better knowledge and understanding of animals. Each student was involved in 4 operations in calves and 4 in dogs. Each group of 10 or 12 students was supervised by at least 2 clinicians and, in my opinion, the laboratories were conducted in a professional manner with adequate attention to anesthesia, asepsis and surgical technique.

Surgical field trips did not develop to the extent which I would have liked but availability of vehicles was a problem. For a time in 1976 we scheduled and carried out twice weekly trips with students to farms and ranches near Nairobi, where we performed some major procedures such as detector bull operations and many minor procedures including dehorning, castrations, eye enucleations, etc. For me, the field trips were the best teaching opportunities considering the close contact with students and being a captive audience for an entire day or, on some occasions, two days. Further emphasis on field orientation and teaching is dealt with in another section of this final report.

The large portion of my teaching efforts were spent in the procurement of animals for surgical exercises and clinical practicals. Calves were purchased direct from nearby farms, usually at exorbitant prices and dogs were rounded up by one of our driver guides in the area near Kabete. We did contribute something to stray dog control and possibly rabies control in the area by using

these dogs in surgical exercises.

Clinical surgery and the occupation of student time in this was often disappointing. On an average, there was sufficient case load in the large animal surgery section to keep students busy for 2 days out of 6. Although the surgery section had the largest clinic caseload in the large animal clinic there was still a lot of time when students were unoccupied. At the same time, there were always possible field trips had vehicles been available.

### RESEARCH

I did two field investigations, one in cooperation with Dr. Brodie and one with Dr. Wagner of EAVRO, both of which were nearing completion. One was a comparison of detector bull operations and their application to field conditions in Kenya and the other was splenic translocation in calves for biopsy in support of an investigation in East Coast Fever done by EAVRO and Veterinary Laboratories. My main efforts in research, if such can be called, were as procurer of funds, animals and equipment in support of other research projects, expediter when projects were not proceeding as expected and the "nuts-and-bolts" man for the many details involved in doing research.

### GRADUATE EDUCATION

My only effort in graduate education was in serving on the Ph.D. committee of Dr. S. Varma. I did try to introduce a graduate course in anesthesiology but this fell flat and was unattended.

### ADMINISTRATION

Upon my arrival in Kenya I was assigned as Asst. Chief-of-Party in support of Dr. Johnson who had assumed the duties of Chairman of the Dept. of Clinical Studies. In January 1975 I became Chief-of-Party and served in that capacity to the end of the project.

In my duties as Chief-of-Party, it soon became obvious that I had numerous bosses. The Chief-of-Party is in the unique position of "directing" the activities of other professionals on the team, in this case 5, and serving as expediter for their demands for commodities, participant and counterpart training, personal details of housing, transportation, and payment of bills. In addition, he is expected to satisfy the demands of University of Nairobi, Colorado State University, and USAID officials on project goals, accomplishments, and details, and at the same time keep everybody happy. When an individual is placed in the middle of so many authorities, some frictions are bound to develop.

On three different occasions in 1975 USAID Mission officials met with representatives of the Faculty of Veterinary Medicine and did not invite me, the Chief-of-Party and representative of Colorado State University, to attend any of these meetings, nor was I ever informed of the results of these meetings. Secretaries at AID kept me informed, unofficially. At these meetings decisions were made regarding counterpart training, a commodity order was submitted by the Dean directly to USAID without consultation or approval from the Chief-of-Party, and CSU staffing was discussed. The ultimate result of all of this was that the positions of Colorado State University and myself as representative of that institution were weakened in later negotiations with the University of Nairobi.

All of the proceeding is not offered in a sense of complaint but as a warning to future USAID contractors that they should be prepared, through their representative to deal directly and positively with USAID Mission Directors. When there is a break in communications AID should act as an arbitrator to smooth the waters and re-establish communications. From 1965 to 1974, Mission Directors in Nairobi were helpful to the CSU Chief-of-Party and the

team, sympathetic with the realistic goals of the project, and willing to serve as arbitrators when occasional frictions developed between CSU team members and administrators of the Faculty of Veterinary Medicine. The USAID Mission recognized that Colorado State University had a contract to assist in the development of a professional capability in a foreign country; they recognized their limitations and did not enter into a professional field where they lacked experience and competence.

In July 1974, with the arrival of Mr. Charles Nelson as Mission Director, the situation changed radically and became intolerable both for CSU technicians and the Faculty of Veterinary Medicine. Mr. Nelson chose to direct the project personally and exclude CSU and, on occasion the Faculty, from decisions. The loss of the 4th position for the last 2 years of the contract was a serious mistake and the direct result of actions by Mr. Nelson.

The commodity negotiations between Mr. Nelson and the Dean of the Faculty should never have taken place. The Mission Director mistakenly assumed he had the authority to approve contract purchase of commodities which were ordered directly by the Faculty. At the center of the issue was the Mission approval of some \$200,000 worth of commodities ordered directly by the Dean and the Faculty when there was something less than \$30,000 remaining in the commodity budget at that time. Anyhow, most of this money had already been committed and commodities were in the pipeline. This information was readily available from my files if either the Director or the Dean had taken the trouble to place one phone call. Although this particular problem was a source of friction, it didn't alter our commodity situation and we proceeded with orders and expenditures as previously planned.

Throughout my tenure as Chief-of-Party, I had excellent support and communication from the Campus Coordinator, Dr. C. V. Kimberling. The success of the project and the excellent personal and professional relationships that developed

between all concerned were in a large part the result of Dr. Kimberling's abilities and efforts in Fort Collins and during his on-site business trips to Kenya. Personally, I am very grateful to him.

PROJECT EXPENDITURES  
 CONTRACT AID/afr-790  
 July 1, 1971 - June 30, 1978\*

	<u>Budget</u>	<u>Current</u>	<u>FY 77-78</u>	<u>Cumulative</u>
	7-1-71 12-31-78	4-1-78 6-30-78	7-1-77 6-30-78	7-1-71 6-30-78
Salaries	1,046,795.00	33,823.26	244,083.49	1,046,794.40
Allowances	512,952.00	22,480.92	100,508.49	525,713.58
Travel and Transportation	310,507.00	1,197.21	78,760.22	261,201.64
ODC (PERA)	245,330.00	7,524.21	73,366.54	207,648.91
Overhead Adjustment	-0-	-0-	(37,511.00)	(37,511.00)
Overhead	322,200.00	13,915.71	95,429.57	338,520.59
Equipment: Materials & Supplies Commodities	110,923.00	2,444.96	27,908.05	98,806.08
Participant Support: Tuition & Fees, Stipends	269,493.00	13,275.85	165,026.91	265,871.98
Totals	2,818,200.00	94,662.12	747,572.27	2,707,046.18

\*Expenditures for five participants and payment of invoices incurred in support of returned field staff and logistic and secretarial support at C.S.U. continue until December 31, 1978.

## OTHER INTERNATIONAL DONOR INVCLVEMENT

### INTERNATIONAL LABORATORY FOR RESEARCH OF ANIMAL DISEASES (ILRAD)

The International Laboratory for Research of Animal Diseases was established in Nairobi in 1974 with the specific mission to investigate theileriosis and trypanosomiasis in cattle. This is a multi-national research organization employing highly qualified specialists in hemoparasitology from throughout the world. During the first 4 years of its existence, ILRAD was in a very ambitious program of building the physical plant and laboratory facilities and in interviewing and acquiring professional and lay staff. Colorado State University field staff members did some cooperative work with members of the ILRAD staff but it was on a personal level rather than an official level. Drs. Frank and Sollod, with 3 of their counterparts, did some research at ILRAD facilities and cooperated with ILRAD staff on two research projects. ILRAD is in the process of developing post-graduate and post-doctoral programs in cooperation with the University of Nairobi. At present there is one post-graduate veterinarian studying for the Ph.D. Degree.

### NORWEGIAN AID (NORAD)

Norwegian Aid agreed on a development program in 1973 and supplied personnel, a new building, and local research funds for a 5-year period, and has been extended for an additional 4 years until 1982. NORAD has provided aid in the Departments of Animal Production and Public Health, Pharmacology and Toxicology. A new building which now houses the Department of Public Health, Pharmacology and Toxicology was in operation early in 1977 and dedicated in May 1978. NORAD provided nine different professionals in four positions in the Department of Public Health, Pharmacology and Toxicology and two of these positions were as department chairmen until the positions were Kenyanized in June 1978. They also provided four different professionals

in two positions in the Department of Animal Production during the agreement.

Two Kenyans received training fellowships in Norway for periods of 6 and 12 months. NORAD also provided 1.4 million Kenyan shillings as staff development awards to Kenyans and for research in animal production and public health. Three Kenyans trained through CSU/USAID scholarships, are in the Department of Public Health, Pharmacology and Toxicology. The present Kenyan Department Head was a Colorado State University counterpart trainee.

#### WEST GERMAN AID (DAAD)

West German Aid provided major technical and monetary assistance in the Department of Clinical Studies from 1971 through 1975, and technical aid in the Departments of Physiology and Animal Production. DAAD provided 7 professionals in 3 departments: 4 in Clinical Studies, 2 in Physiology and 1 in Animal Production. The department chairman of Clinical Studies, from 1971 to July 1974, was provided through DAAD contract. The modern and well equipped buildings for the Department of Clinical Studies were also provided by DAAD through contract with the Government of Kenya.

#### BRITISH OVERSEAS DEVELOPMENT AGENCY (ODA)

During the 1971-1978 period, ODA provided topping-up of local salaries for 4 professionals in the Department of Clinical Studies and 2 in the Department of Animal Production. The development of the Small Animal Clinic is mostly a result of input by ODA.

#### ROCKEFELLER FOUNDATION

Rockefeller provided three scholarships at the Faculty, to:

James Maribei, Ph.D. (Cornell), Dept. of Clinical Studies

Phillip Nyaga, Ph.D. (California), Dept. of Pathology and Microbiology

John Omuse, M.S. (California), Dept. of Pathology and Microbiology

All three individuals are Lecturers at the Faculty in their respective departments

## COMMODITIES

During the seven years of the Colorado State University/USAID Contract AID/afr-790 at the Faculty of Veterinary Medicine, University of Nairobi, commodities valued at a total of \$109,000 were purchased (Table C ). Of this total, some \$77,000 worth of equipment was purchased for dollars in the U. S. and shipped via American carriers by air freight costing \$13,500. In addition, through special approval by USAID/Nairobi, \$2,200 was spent in local purchase of visual aids equipment, film and processing, to assist in building teaching files. Total value of dollar purchases plus shipping to Kenya is \$92,959.55.

As part of the University of Nairobi contribution to the project, \$29,000 was spent locally in Kenya shillings for equipment at the Faculty of Veterinary Medicine. This contribution was used to purchase local laboratory equipment (Coulter counter, laboratory reagents, glassware, surgical instruments) and a Nissan Van for the Herd-Health program in the Clinic. The locally purchased vehicle and most of the laboratory equipment remain functional because of availability of local maintenance.

The details of commodity purchases, including packing lists, inventories, airway bills, AID approvals and commodity orders are included in semi-annual reports.

As part of this final report, the Commodity Summary for phaseout, packing list, airway bill, and correspondence relating to the final shipment (Appendix H ) are included.

The figures in Table C are extracted from project files and semi-annual reports. As AID/Nairobi is well aware, the accounting system demanded by USAID simply doesn't fit the CSU accounting system, especially in relation to commodities. The amount shown in CSU expenditures for commodities (equipment) is considerably less than the real amounts shown in the table.

During fiscal year 1975 the AID Mission in Nairobi were highly critical of CSU accounting procedures and suspended commodity purchases until they were satisfied that the situation had improved. Finally, following a re-evaluation of commodity expenditures, 1971 through June 1976, AID/Nairobi approved further spending in the commodity category (See Semi-Annual Reports Ten and Eleven).

As a final effort, commodities were officially turned over to the Faculty of Veterinary Medicine by means of letter to Dean Maloiy and an accompanying list of all commodities purchased State-side for dollars (letter).

The list of expendables and non-expendables is some 50 pages long and is not included in this report. All of the information is available in semi-annual reports.

Nearly all of the equipment had been in use by the Faculty for many months, even years, before termination of the project. Some of the sophisticated electronic equipment purchased early in the contract has been at the Faculty long enough to have been out-of-service for several years due to breakdown and unavailability of parts and service. However, as a rough estimate, easily 80% of the equipment purchased through this contract, both in the U. S. and in Kenya, is being used for teaching and research at the Faculty. Most of this missing or unused equipment is, as stated, that which is electrical and/or electronic and can't be maintained in Kenya.

Of course, surgical instruments disappear, as do many items of small equipment. It is doubtful that disappearance of instruments and equipment is any greater problem in Kenya than in the U. S. We hope that these missing items are used by veterinarians in the profession.



Kenya Project  
Dean Maloiy,  
Faculty of Vet. Medicine

Colorado State University  
Fort Collins, Colorado  
80523

July 4, 1978

Dear Dear Maloiy,

Enclosed are (1) listings of non-expendable commodities purchase by the CSU/US ID Project up to December 31, 1974, and (2) shipping orders and packing lists of commodities received since January, 1974. Locations of non-expendable commodities are indicated on the packing lists. Expendable items (less than U.S. \$ 100 per item value) have been distributed to individuals in the departments of Pathology and microbiology and Clinical studies, and are in use in teaching and research by those individuals.

The final commodity shipment (see shipping instructions dated June 7, 1978) has not arrived as yet, and probably won't before I leave on July 6th. I have designated Dr. P.D. Sayer as my agent to receive and distribute these commodities when they do arrive.

Very sincerely,

Encl:

William . . Wolff, D.V.M.  
CSH/US ID Chief of Party

c.c. Prof. G.M. Mugeru  
    . g. Chairman, Dept. of Clinical Studies  
    Dr. C.V. Kimberling, Campus Coordinator,  
    C.S.U.

W.M:vnk.

UNITED STATES POSTAL ADDRESS  
College of Veterinary Medicine and Biomedical Sciences  
Kenya Project  
Fort Collins, Colorado 80523

INTERNATIONAL POSTAL ADDRESS  
Post Office Box 14037  
Westlands Nairobi  
Kenya, East Africa

Table C .

COMMODITIES PURCHASED 1971-1978  
for the  
FACULTY OF VETERINARY MEDICINE

<u>Year</u>	<u>Contract</u> <sup>1/</sup>	<u>Air Freight</u>	<u>Local Purchases</u> <sup>2/</sup>
1972	\$ 3,100.00 est.	\$ ----	\$ ----
1973	18,215.27	----	10,184.27
1974	17,395.66	2,972.48	16,598.32
1975	14,614.34	3,727.21	1,103.00
1976	3,334.55	599.00	----
1977	15,975.33	5,382.74	685.00
1978	4,418.07	508.68	352.56
1977-78	2,216.22 <sup>3/</sup>		
1978	<u>1,200.00 est.</u>	<u>300.00 est.</u>	<u>----</u>
	\$80,469.44	\$13,490.11	\$28,923.15

1/ Purchased with U. S. dollars.

2/ Purchased with Kenya Shillings, University of Nairobi contribution to the C.S.U. Project.

3/ Special budget approved by AID/Nairobi. Spent from dollar project funds for photographic equipment and visual aids in Nairobi.

## FURNITURE AND APPLIANCES

Some 217 pieces of furniture and appliances ranging from refrigerators and ranges through household furniture to electric heaters and ironing boards were turned over to the University of Nairobi (documents appended). These household items were in custody of the Colorado State University Project until its termination June 31, 1978. The original issue list closely approximated the on-hand list at the time of turnover. There were some added items from local purchase (beds, bookcases, heaters) and some missing items which were surveyed as they wore out (mattress covers, pillows, rugs, washing machines), and some items simply missing. All transformers were returned to USAID/Nairobi for use by incoming AID families with 110 volt appliances.

The turnover of these commodities was more difficult than anticipated. None of the University of Nairobi officials were willing to accept responsibility. Ultimately, the Chief-of-Party passed responsibility to the Dean of Veterinary Medicine (letter), stored the furniture at NOTCO, Nairobi, and paid for one month of storage in advance. How these items are finally distributed by University of Nairobi officials can no longer be a concern of Colorado State University. It is hoped that future contracts will make better provision for this turnover. Officials are justifiably reluctant to assume responsibility for donated commodities by signing a document or even verbally accepting responsibility. It is unrealistic to expect this, considering the amount of money involved and the difficulty of keeping track of even large items such as refrigerators.

The complete acceptance inventory at NOTCO, signed by the Chief-of-Party, is retained in project files as they are too bulky to include in the report.



Kenya Project

Colorado State University  
Fort Collins, Colorado  
80523

Dean Maloiy,  
Faculty of Vet. Medicine,  
University of Nairobi.

July 4, 1978

Dear Dean Maloiy,

Enclosed is the storage inventory from NOTCO, Nairobi of household goods, appliances and furniture which is hereby donated to the University of Nairobi. This NOTCO inventory together with my previous listing which is in your possession completes this transaction.

Storage on these items is paid through the month of July, 1978. From August, 1, 1978, NOTCO will invoice the University of Nairobi for future storage. Please contact Mr. David Ngugi at NOTCO for information on invoicing and removal of these items from storage.

Very sincerely,

Encl:

William A. Wolff, D.V.M.  
CSU/US.AID Chief of Party

c.c. Kevin O'Donnell, TSS/US.AID  
David Ngugi, NOTCO, Nairobi  
Dr. C.V. Kimberling, Campus Coordinator  
C.S.U.

WAW:vnk.

UNITED STATES POSTAL ADDRESS  
College of Veterinary Medicine and Biomedical Sciences  
Kenya Project  
Fort Collins, Colorado 80523

INTERNATIONAL POSTAL ADDRESS  
Post Office Box 14037  
Westlands Nairobi  
Kenya, East Africa

TRANSFER OF TITLE  
BY THE GOVERNMENT OF THE UNITED STATES  
OF AMERICA

FD 13-73  
Grant in Aid 6-73

Effective 2nd November 1972, THE GOVERNMENT OF THE UNITED STATES OF AMERICA, through the Agency for International Development, represented by the Acting Director of the United States AID Office to Kenya hereby transfers title to the commodities as appended to the Kenya Ministry of Finance, GOVERNMENT OF THE REPUBLIC OF KENYA in accordance with the terms and conditions of Project 615-11-110-158 covering the Colorado State University Program.

<u>Item</u>	<u>Nomenclature</u>	<u>Qty</u>	<u>Item</u>	<u>Nomenclature</u>	<u>Qty</u>
1	BED-Double, complete	1	24	CHAIR-Secretarial, office	1
2	BED-Frame, single bed	18	25	DESK-Household, local	1
3	BOOKCASE	3	26	MACHINE-Washing	6
4	BOX SPRING-Single bed	18	27	REFRIGERATOR	2
5	BREAKFRONT-Base & Hutch	3	28	STOVE-Electric	3
6	CABINET-Cocktail	2	29	STOVE-Gas	1
7	CHAIR-Barrel	9	30	TRANSFORMER	12
8	CHAIR-Club	8	31	BEDSPREAD-Single bed	12
9	CHAIR-Dining/desk	26	32	CHAIR-Card folding	8
10	CHEST-4 Drawer	8	33	CHAIR-Garden	2
11	DESK-Household	4	34	CHAISE-Lounge garden	1
12	DRESSER-6 Drawer	4	35	COVER-Mattress	15
13	HEADBOARD-Single bed	18	36	IRONING-Board	1
14	LAMP-Floor	2	37	PILLOW-Foam	16
15	LAMP-Table	20	38	TABLE-Card	2
16	MATTRESS-Single bed	20	39	PAD-Mattress	8
17	MIRROR	4	40	DRAPES-Panels	16
18	SOFA	4	41	HEATER-Electric	2
19	TABLE-Cocktail	3			
20	TABLE-Dining	4			
21	TABLE-End	3			
22	TABLE-End, step	3			
23	TABLE-Night	9			

It is agreed that these commodities will be officially used as required in the implementation of this project only. The responsibility of THE GOVERNMENT OF THE REPUBLIC OF KENYA will be to assure that the use of the property listed is in strict compliance with the standard regulations as established by the Department to which it is assigned.

THE GOVERNMENT OF THE UNITED STATES  
OF AMERICA

By: *Charles A. James*  
Charles A. James  
Acting Director, USAID  
Mission to Kenya

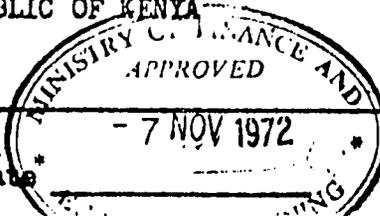
The commodities described  
above were received by

*Robert Rubin*  
Professor R. Rubin

Date 6-11-72

Accepted for the GOVERNMENT OF THE  
REPUBLIC OF KENYA

By:



Date

REQUISITION FOR SUPPLIES & EQUIPMENT LIST

GRANT IN AID 6-73

(1) Name of Article	(2) Quantity usually issued	(3) ON HAND xxxxxxx	ISSUED xxxxxxx
DOUBLE Cot Bed		1	1
HEAD-Double bed	1 per occupant of a bedroom	19	18
HEAD-Single bed	1 per bed		
Box Spring		5	3
Desk		3	3
Chair		3	3
Desk		4	3
Desk	1 per occupied bedroom	7	9
Chair		16	8
Chair		6	8
Chair		27	26
Chair		4	2
Chair		2	2
Chair	1 per 2 occupied bedrooms	10	8
Chair	1 per mattress	7	15
Chair		5	5
Chair	1 per occupied bedroom	6	4
Chair		2	1
Chair		3	2
Chair	2 chairs 1 per 2 occupied bedrooms	19	20
Chair		4	4
Chair	1 per bed	5	16
Chair		2	
Chair		4	4
Chair		4	2
Chair		4	3
Chair		4	4
Chair		5	3
Chair		4	3
Chair	1 per occupied bed	11	9
Chair	1 per mattress	4	8
Chair		1	
Chair		2	
Chair		1	
Chair		1	1*
Chair			
Chair		12	2
Chair		4	6**
Chair		5	2
Chair		4	4

\*At Project Office

\*\*2 Washing Machines broken and disposed.

## PROJECTION TO THE FUTURE

The major accomplishments of this project were in the fields of undergraduate teaching, curriculum revision, counterpart and participant training, and commodity support for teaching and research at the Faculty of Veterinary Medicine. While the accomplishments of this project have been excellent, problems in veterinary education in Kenya are still visible and any thought of future relationship between the College of Veterinary Medicine and Biomedical Sciences at Colorado State University and the Faculty of Veterinary Medicine at the University of Nairobi should address itself to the solution of some of these problems. So, while this particular section may dwell more on problems than might seem necessary, USAID contracts are in the problem-solving business. It is hoped that the lines of communication between the Faculty, USAID and Colorado State University will be kept open.

### Veterinary Manpower in Kenya

The projected veterinary manpower requirements of Kenya have been the subject of two recent studies, one by Mr. Harold Jones of USAID, Nairobi, in cooperation with the Director of Veterinary Services and members of the CSU team (see Appendix A). The second study was done as part of a Ministry of Agriculture and USAID Manpower Development study in 1976-1977. This second study did not deal specifically with Veterinary Manpower or needs and a section dealing with this was not included in the final report of that study. The Jones Report is comprehensive and includes the necessary details. Officials in the Government of Kenya, the University of Nairobi, USAID, and Colorado State University are in agreement that too many Kenyans are entering and being graduated from the Faculty of Veterinary Medicine. In the early 1970's the need for Kenyan veterinarians to staff Government positions increased sharply and the number of Kenyans entering the Faculty increased

proportionately (Tables 3 and 4 ). In 1970 the graduating class of 37 students contained 8 Kenyans or 22% of the class. By 1978 graduates had increased to 73 with 46 Kenyans or 63% of the class. It is projected that the 1981 graduating class will be 100 with 85 Kenyans, supply will have outstripped demand with the possibility that the Government and Veterinary Services will be able to employ very few of the Kenyan graduates.

The large classes of 80-100 students present real teaching difficulties. Facilities and staffing are geared to 50 to 60 students, and with larger classes, lecture, laboratory and clinical facilities are over-extended and individual student contact decreases proportionately. Also, with the large classes the teaching staff is overloaded with undergraduate responsibilities and has no time to develop and carry out post-graduate teaching and research.

The University has shown little inclination toward increasing staffing and facilities to meet the demands of the larger classes. Considering the current trend toward graduating large numbers of Kenyans and the limited employment possibilities, it is doubtful that either the teaching staff or the facilities really need to be increased very much. The immediate necessity is that the Government of Kenya realize the employment opportunities for Kenyan veterinarians and the numbers that could be adequately trained at the Faculty. A coordinated plan for future technical assistance at the Faculty should be designed around realistic manpower needs.

As has been presented in another section of this report, there is interest in expanding potential Kenyan employment through local production of pharmaceuticals and biologicals, by increasing the number of clinical centers, by increased employment of Kenyan veterinarians at ILRAD and the Kenya Veterinary Research Organization, and through the establishment of an active veterinary extension service as part of the Government of Kenya

TABLE 3.

## STUDENTS BY CLASS

Faculty of Veterinary Medicine  
University of Nairobi\*

	First Yr 1977-1978	Second Yr 1977-1978	Third Yr 1977-1978	Fourth Yr 1977-1978
Kenya	86	70	55	46
Zambia	5	1	--	--
Malawi	4	--	3	--
Ghana	2	1	4	1
U.S.A.	1	1	1	1
West Indies	2	--	--	--
Swaziland	1	--	--	--
Tanzania	--	6	7	22
Uganda	--	1	3	2
Canada	--	1	--	--
Japan	1	--	--	--
Botswana	--	--	1	--
Gambia	--	--	1	--
Lesotho	--	--	1	--
Nigera	<u>--</u>	<u>--</u>	<u>--</u>	<u>1</u>
Totals	101	82	76	73

\*Latest figures available as of September 15, 1978.

TABLE 4.

## GRADUATES

Faculty of Veterinary Medicine  
University of Nairobi\*

Country of Origin	1970	1971	1972	1973	1974	1975	1976	1977
Kenya	8	12	8	20	17	30	37	55
Uganda	18	25	17	19	20	11	15	2
Tanzania	7	5	13	7	7	16	11	16
Others	4	4	9	10	7	4	4	3
Totals	37	46	47	56	51	61	67	76

\*Latest figures available as of September 15, 1978

mission. Also, there should be an increase in Kenyans in private practice proportionate to the increased population and its demand for meat and dairy products. The expanded employment possibilities for veterinarians depends, of course, upon the continued expansion of the livestock industry and the Kenyan economy.

### Post-Graduate Education

A great deal of emphasis was placed by AID on the necessity for Colorado State University to establish viable post-graduate education and research at the Faculty of Veterinary Medicine. This was a contract stipulation and was re-emphasized by the 1972-1976 CSU Work Plan (Appendix I ), the visitation report of Dean William J. Tietz (Appendix J ), and the York-Konnerup Report (Appendix K ). Some efforts were made in this direction but to this time there are no "taught" post-graduate courses in the Departments of Clinical Studies and Pathology and Microbiology. Colorado State University technicians have supervised the graduate programs of many Kenya counterparts, assisted in the research, and supervised the writing of their theses. The shortfall in post-graduate education was in the failure to establish these "taught" post-graduate courses. Drs. Rubin and Davis established and, for brief periods, carried out post-graduate courses in pharmacology and parasitology. These courses were poorly attended and were not followed up after these two CSU technicians left Kenya.

The reasons for this apparent lack are directly related to the large classes and the intimate involvement of CSU technicians in the undergraduate teaching. There was neither the time available nor the undergraduate infrastructure which permitted the introduction of viable, post-graduate courses within the faculty. The situation, as it has existed during this contract, is well described by Dr. Lloyd E. Davis in the following extract from the

Sixth Semi-Annual Report. Dr. Davis' remarks are especially worthy of attention as he is recognized as one of the foremost graduate teachers and investigators in pharmacology in the United States.

"The most premature and ill-advised aspect of the Project is the objective of developing graduate studies in the Veterinary Faculty. I believe that all of the Ph.D.'s in the various disciplines in the Faculty, that could be absorbed over the next ten years, can be trained most economically and efficiently by sending them abroad. I am strongly in favor of providing scholarships for such study but feel it a waste to send senior faculty to Nairobi in order to train one or two students. A person could easily offer one or two graduate courses in his field but they would count for nothing as they would operate in a vacuum. There does not exist a critical mass necessary for the successful development of a viable graduate program. In my own field of pharmacology, a Ph.D. candidate at home would be expected to have taken graduate courses in statistics, biochemistry, physiology, neuroanatomy, organic chemistry as well as advanced courses in his major field. Thus, there needs to be collateral development in many fields of knowledge at a University before a sound graduate program can be initiated. This situation doesn't exist at the University of Nairobi."

During the final months of this contract there were discussions between the Dean of the Faculty, USAID, and the Chief-of-Party regarding future relationships of the Faculty of Veterinary Medicine with Colorado State University. These discussions centered around the desirability of a future contract with the express purpose of assisting the Faculty and establishing the post-graduate capabilities. These possibilities should be investigated with the precaution in mind that the facilities and teaching staff of the Faculty are over-extended with large numbers of undergraduate students.

#### Department of Clinical Studies

A real leadership problem developed in the Department of Clinical Studies in January 1976 with the hiring of an unqualified Department Head. Problems created by this individual lasted until July 1978 and will probably continue beyond this for some months, until a qualified and active department head can be nominated, and the department brought back to its sense of cohesiveness and progress. From July 1974 until January 1976, the department under the direction of CSU technician, Dr. Johnson, progressed rapidly and there was a sense

of accomplishment and "belonging" that disappeared when he was replaced. The Vice-Chancellor of the University and the Dean of the Faculty have requested that a qualified American be appointed department chairman for a period of two years with possible extension for an additional two years. Considering the deterioration of the department under the misdirection of the last expatriot chairman, it would seem logical that USAID should be receptive to this request. The largest investments of this contract in participant training, technical assistance, and money have been in the Department of Clinical Studies. There were major accomplishments in all areas but some of these were nullified by the presence of the aforementioned department chairman. To reaffirm the American philosophy of sound and practical clinical teaching, a qualified American department chairman for the next 2 + 4 years would seem to be a good investment on the part of USAID. The University of Nairobi, the Faculty of Veterinary Medicine and the Department of Clinical Studies seem to be in agreement on this and Colorado State University would certainly be receptive. The initiative is with the Faculty of Veterinary Medicine. Dean Maloiy has been in contact with Dean Phemister about this and the next step is to present a package to USAID.

Professor Ian McIntyre, at the request of the University of Nairobi, visited the Faculty in the Fall 1977 to investigate and report on the Department of Clinical Studies. Professor McIntyre's Report is included as Appendix L , page 252. This is a comprehensive report and deals with many of the problems that face the Department of Clinical Studies. Colorado State University technicians (Ward and Wolff) had major input in this report and many of the findings are parallel and agree with our own ideas. Particular attention is invited to the section on the needed emphasis in the Field Services Clinic, including Ambulatory and Preventive Medicine.

Clinical case accessions during the calendar year 1977 (Table 5 ) give an indication of the uneven distribution of students in clinical practical assignments. The large animal internal clinic had 517 case accessions during the year, or about 10 new cases per week. There are 36 students assigned each week in the three sections in the large animal clinic, meaning that there is approximately 0.3 of a case per student per week. With 12 students assigned each week in the ambulatory clinic, each student could have been exposed to 7 cases per week. The herd health program had 1900 cases in 1977 or 36 cases per week. With 6 students assigned weekly in the herd health program, each student was exposed to 6 cases per week.

Both the ambulatory and preventive medicine clinics could be expanded to double or triple the number of case accessions, depending only on availability of clinicians and vehicles. At the same time, the large animal internal clinic will probably have about the same number of case accessions because farmers in the area do not have transportation to bring large animals into the clinic. There are many calls to the field which cannot be attended because clinicians and vehicles are limited. The available vehicles are always overcrowded with 6 students, the clinician, and a driver-guide. If the field services clinic had 6 clinicians with vehicles, carrying a maximum of 4 students per vehicle, 24 students could be in the field most of the time with more case exposure and individual attention by clinicians. This would also reduce the number of students assigned in the internal clinic where student case exposure is low. At present there are 8 clinicians conducting clinical practicals in the large animal internal clinic and 3 in the combined field services clinic. A redistribution of efforts would seem logical with the largest number of clinicians and the greatest emphasis being devoted to field services.

TABLE 5. CLINICAL CASE ACCESSIONS - 1977  
 (Extract from Thirteenth Semi-Annual Report)

In this report no attempt is made to equate case accessions with student case exposure for the simple reason that records are adequate only for ambulatory and preventive medicine sections. It is nearly impossible to extract useful logistic information from in-patient clinic records. Also, a number of field trips were taken and no case records are available. This would increase out-clinic case numbers significantly in the surgery and O.B./Reproduction sections.

A. Large Animal Clinic - Total of 517 cases

<u>Department</u>	<u>Type</u>	<u>No. Cases</u>	<u>Outpatients</u>	<u>Hospitalized</u>
<u>Surgery Sec.</u> (268 cases)	Equine	153	103	50 (1 or more da)
	Bovine	55	--	55 (1 or more da)
	Porcine	39	6	33 (1 or more da)
	Caprine	12	5	7 (1 or more da)
	Ovine	4	--	4 (1 or more da)
<u>Medicine Sec.</u> (114 cases)	Equine	5	--	5 (1 or more da)
	Bovine	75	--	75 (1 or more da)
	Porcine	11	--	11 (1 or more da)
	Caprine	17	--	17 (1 or more da)
	Ovine	6	--	6 (1 or more da)
<u>O.B./Reprod Sec</u> (84 cases)	Equine	2	--	2 (1 or more da)
	Bovine	68	--	68 (1 or more da)
	Porcine	1	--	1 (1 or more da)
	Caprine	10	--	10 (1 or more da)
	Ovine	3	--	3 (1 or more da)

Animals dead on arrival for Necropsy - entered on clinic records:

(51 cases)	Bovine	22
	Porcine	19
	Caprine	5
	Ovine	5

B. Ambulatory Clinic

3666 animals seen on farms as first visits and

550 repeat visits to the same farms

4216 total animals seen on 3800 farm visits. Of these, approximately

90% were bovine

8% were porcine

2% were other

C. Preventive Medicine/Herd Health

1900 cases treated and/or examined during 88 visits to 18 farms or settlement schemes. Total animals "seen" during farm visits is not included.

Distribution of farms:

Dairies -----	8	-----	47 visits
Feedlot (beef) -----	1	-----	11 visits
Cattle Ranches -----	2	-----	6 visits
Settlement schemes -----	5	-----	12 visits
Pig units -----	2	-----	12 visits

Distribution of cases:

Medical cases -----	500
Surgical cases -----	50
Pregnancy examinations -----	<u>1350</u>
Total -----	1900

Each case was examined by at least 2 students = 3800 student case exposures.

D. Small Animal Clinic

5000 Accessions, 90% dogs\*

800 of the accessions hospitalized for one or more days. The vast majority of animals hospitalized for 3 or less days.

\*Other species: cats, rabbits, small rodents, exotics (wildlife), reptiles

The University of Nairobi has shown little inclination to provide adequate clinicians, vehicles and driver-guides to support the field services clinic. The Director of Government Veterinary Services points out, with some justification that the training received at the Faculty does not prepare the students for the field problems they will encounter upon graduation. It would seem that the Dean of the Faculty and the Director of Veterinary Services could bring pressure to bear on the University for the provision of an adequate number of vehicles so that the Department of Clinical Studies could expand the field services clinic. At the same time, the Department of Clinical Studies should realign its priorities, giving emphasis to the field services clinic by assigning more clinicians to the ambulatory and herd health programs, possibly on a rotational basis. The few clinicians who are performing the field services at this time are overworked and completely locked into this duty. They have no time off and certainly no time for research or professional improvement.

In the Department of Clinical Studies considerable emphasis has been placed on a curriculum which would be comparable with international veterinary clinical education standards. As a result of this emphasis there has been a disproportionate amount of time spent in lecturing on diseases and surgical conditions of small animals and horses. There has also been an excessive amount of time allocated to surgery lectures. Total lecture hours are excessive in the 4th year and if they could be reduced by placing teaching emphasis where it really belongs, that is in food animal medicine and surgery, total lecture hours could be reduced allowing students more time for participation in the field services clinic and clinical practicals. In the surgery section, particularly, there is a strong tendency towards lectures on sophisticated surgery in companion animals. In the overcrowded lecture schedules in the 3rd and 4th years, these lectures take time away

from discussions of disease and reproductive problems of food animals. Certainly meat, milk and fiber production must have first priority in Kenya. For the present, the hours spent teaching advanced and expensive surgical techniques in companion animals could be reduced, allowing students more time for practical exercises. As progress occurs and equipment for more sophisticated surgery becomes available in Kenya, the curriculum can be realigned to meet the need. For the present, it would seem that surgery lecture time could be reduced by at least 50% and the lecture course designed around and coordinated with the laboratory.

During the 3rd year there is a real problem of duplication of efforts in medicine lectures by the Departments of Clinical Studies and Pathology and Microbiology. The Department of Clinical Studies gives some 130 hours of lectures in medicine from the clinical viewpoint but at the same time the Department of Pathology and Microbiology gives an equal number of lectures in what is designated "disease description". This duplication of effort has been the subject of some discussion between the two departments with no resolution. The Department of Pathology and Microbiology should have enough lecturing responsibilities without duplicating the efforts of the Department of Clinical Studies. It is suggested that the lecture hours presented by the Department of Pathology and Microbiology be entirely eliminated and that lecturers from that department assist colleagues in the Department of Clinical Studies in the presentation of the unified medicine course for 3rd year students. This coordinated approach has been used in many veterinary schools to the benefit of teaching and as a bridge between departments that tend to isolationism.

In support of Prof. McIntyre's report it is further emphasized that receipts from clinic accessions should be deposited in a separate fund for use by the Department of Clinical Studies rather than going into the general university fund. If the Department were allowed to keep receipts from the

ambulatory and small animal clinics alone, it would be able to purchase drugs, equipment, and vehicles through its own resources. This is a critical need and should be given immediate attention by the Faculty of Veterinary Medicine and University of Nairobi.

The clinical training program at the Faculty is adequate at the present time but with the constraints that there are too many students, too few vehicles for field services, and too many lecture hours in the 3rd and 4th years. The small animal clinic has adequate case accessions and correct student distribution for training. The large animal clinic needs to realign its priorities with the provision of enough clinicians and vehicles to take students to the field where they can be exposed to the real problems of veterinary medicine in Kenya. The clinical staff is well trained, motivated and does an excellent job of teaching under existing conditions. It must also be emphasized that graduate teaching capabilities within the Department of Clinical Studies and research by individual clinicians will remain minimal until teaching and clinical duties are spread over a wider base so that each clinician has time for professional improvement and the development of research projects.

There have been a number of improvements in the Departments of Pathology and Microbiology during this contract, resulting to some extent through input by Colorado State University technicians. In addition, there have been 5 expatriots on University of Nairobi contracts or sabbaticals who have greatly improved the pathology capabilities, especially in necropsy. At present the Department is Africanized but pathological diagnostic capabilities remain inferior. The bacteriology, virology, and parasitology sections within the department perform acceptable and frequently excellent diagnostic services, but pathology and histopathology expertise is lacking. The department should be encouraged to enlist the aid of external donors in the

development of diagnostic capabilities of pathologists on the staff and the identification and post-graduate training of young Kenyans.

The Department of Public Health, Pharmacology and Toxicology has made great strides with the assistance of NORAD and the future of this department appears very bright with the imminent Kenyanization of the department and the introduction of some "taught" graduate courses. This department should work more closely with the Department of Clinical Studies. In the Department of Clinical Studies there are some 30 lecture hours allotted to the teaching of Clinical Pharmacology which should logically be taught by a clinically oriented pharmacologist. Also, the Department of Clinical Studies should enlist the assistance of trained pharmacologists and toxicologists for the solution of problems.

#### Textbooks

There is a real problem with student texts at the Faculty. Veterinary students, with few exceptions, do not have personal copies of basic veterinary texts. The University gives each student an allowance for purchase of books but has no control over how the money is spent. Also, the allowance is so small that usually the money for one term isn't sufficient for the purchase of two books.

So, instead of books, students have reams of handouts prepared by the teaching staff, and they expect voluminous handouts in each course. Most students admit that these handouts serve no function as reference material after graduation, and are usually discarded immediately following examinations.

There must be some solution to this. Even though the handouts serve some useful function (to pass examinations or, as observed by one CSU technician, in the lavatories in student residences) there is no carryover of reference material after graduation without textbooks.

One possible solution is for the Government of Kenya to purchase texts requested by the Faculty of Veterinary Medicine and give them to the students. This would probably be no more expensive than the administration of the present program which doesn't work. Lecturers at the Faculty would have to follow through on the program by forcing students to read the textbooks for class assignments, spot quizzes, etc. Most of the handout materials are extracted from standard textbooks anyhow, so if each student had the required books a lot of time and paper could be saved.

#### Continuing Relationships Between Colorado State University and the University of Nairobi

At various times and at all levels there have been general discussions about continuing relationships between the veterinary faculty of these two universities. The subject was introduced in 1976 by Dean Maloiy and some ideas were presented to USAID/Nairobi. There was no definition of the form of proposed relationships at that time -- there still isn't -- but there was agreement that funding would be necessary for any worthwhile program. The AID/Nairobi position seemed to be that they would give their blessings to whatever the two institutions decided upon, but no money.

In January 1978, there were discussions in Washington and Fort Collins involving Dean Phemister, AID/Washington, Dr. Kimberling and Dr. Wolff, revolving around the continuing relationships issue. The general concensus seemed to be that CSU and the University of Nairobi could be interested in the possibility of a technical assistance contract financed by USAID in developing post-graduate education at the Faculty. There were suggestions that this could be done through short-term contracts for CSU technicians, scholarships for Ph.D. coursework, and research funds for Ph.D. projects done in Kenya. The major points of agreement were the needed thrust in post-

graduate education at the Faculty, USAID financing of a contract to accomplish this and the qualifications of CSU to do the job.

The Dean of the Faculty and most department chairmen are very receptive to this concept. In a change from the initial position, USAID officials in Washington seemed willing to listen, so the next step is for the University of Nairobi and CSU to design and submit a proposal to USAID if both institutions are sincerely interested in continuing relationships.

Meanwhile, both veterinary faculties will search for professional exchange possibilities through sabbaticals, visitors, and exchange students.

## A P P E N D I C E S

## VETERINARY MANPOWER - KENYA

A. Introduction

The purpose of this paper is to appraise and update previous forecasts of the veterinary manpower requirements for Kenya. An examination of manpower surveys conducted in Kenya during 1964, 1968 and in 1972 revealed that veterinary manpower requirements definitely need periodic adjustments to fit the changing situation. The Government's present Development Plan (1974-78) based its veterinary manpower projections upon the 1972 manpower survey. These figures showed that 146 personnel made up the entire Kenya veterinary work force in 1972, and additional staff requirements were projected for the period of 1972-78 at between 174 to 189 personnel. The plan estimated that 350 veterinarians would be trained and graduated over the same period, which could create a surplus of 161-176 veterinarians.

The current situation at the University of Nairobi Veterinary Faculty is a projected 86 student annual intake, of which 50% must be Kenyans. During the first 12 years of the Faculty's existence, 124 Kenyans were graduated. With the present projected intake of Kenyans, it will require only 3 years to graduate the same number of Kenyans (See Table). This means that the absorptive capacity of the job market will be saturated in the near future, and there is the likelihood of producing a substantial surplus of veterinarians over the next five to ten years. Attrition due to retirement, etc., can be expected to be minimal since most Kenyan veterinarians are in the early stages of their career.

B. National Veterinary Work Load

There are several ways of determining national veterinary work-loads and manpower levels. The most accepted way is to approximate the total number of animal units within the country and allocate a given number of animal units

per veterinarian. However, in using this system, limits have to be recognized and considered including the following: 1) whether or not extensive or intensive animal husbandry is being practiced; 2) size of flocks and herds; 3) distribution and concentration of livestock types; 4) extent of communication; 5) export trade; 6) ratio of auxiliary personnel to veterinarians; 7) state of disease control; 8) trend in livestock production, and 9) measure of veterinary work on small animals, sports and pleasure animals, public health, food hygiene and zoonosis.<sup>1/</sup>

While the number of animal units per veterinarian in developed countries ranges from 3,000 to 5,000 units, the recommended upper limit by the International Committee on Veterinary Education (FAO) is 30,000 units per veterinarian in developing countries.

Based upon 30,000 animal units per veterinarian, 205<sup>2/</sup> veterinarians (public and private practitioners) would be required to adequately accommodate Kenya's current 6.1 million animal units (See table).

### C. Government Service

The largest employer of veterinarians is the Veterinary Services Department of Kenya's Ministry of Agriculture, which is responsible for animal health, artificial insemination, meat inspection, hides and skins marketing, the prevention and control of epidemic animal diseases, and the control of zoonosis. It also has a research arm which carries out diagnostic work and applied research and is responsible for the production and/or importation of vaccines.

The Veterinary Services Department presently employs 110 professional veterinarians of which 14 are expatriates. Thirty-two of the veterinary

---

1/ Diseases communicable from lower animals to man under natural conditions.

2/ Does not include teaching requirements, private companies and regional and international research organizations. However, the use of this method to determine accurately the veterinary manpower requirements for Kenya is of little more than academic value at this stage of Kenya's livestock development, since reliable statistics needed to support the factors listed above are not presently available.

assignments involve research. It is expected that at least 5% of the research positions in the future will continue to be filled with expatriates. The Veterinary Services Department estimates that a maximum of 60 additional veterinarians can be absorbed over the next five years, including expatriate replacements bringing the total to 170, meaning 65 new Kenyan positions.

#### D. Private Practice

To date, of the 124 Kenyan veterinarians who have graduated from the University of Nairobi, only eight are with private companies and only six are in private practice. Most of the private practitioners are expatriates. Experts do not agree on the number of private practitioners (Kenyan and expatriate) which the livestock industry could accommodate over the next 5 to 10 years. While the Director of Veterinary Services Department suggests 200 for long-range requirements, a more universally agreed to number is between 40-50 private practitioners.

#### E. Educational Research and Private Companies Requirements

The Veterinary Faculty of the University of Nairobi presently employs the second largest number of veterinary graduates. However, the future requirements are limited mostly to replacements of expatriates (see table). Veterinary manpower for research other than that by the Veterinary Services Department is limited mostly to the International Laboratory for Research on Animal Diseases (ILRAD) and the East African Veterinary Research Organization and to private companies such as Wellcome Laboratories, Pfizer Co. and Hoechst Co., which employ a total of eight veterinarians.

#### Veterinary Manpower Output and Future Requirements:

The Veterinary Faculty of the University of Nairobi is the only institution in Kenya training veterinarians. The following shows the numbers of Kenyan graduate and undergraduate students presently enrolled at the Veterinary Faculty:

<u>1st year</u>	<u>2nd year</u>	<u>3rd year</u>	<u>4th year</u>	<u>Total</u>
60	42	76	32	210
Graduate students				<u>19</u>
				229

From the above it can be seen that 229 Kenyans could be graduated by 1979. If an allowance of 5% wastage is made, the total will be 218 Kenyan graduates.

Following are the total organizational manpower requirements for Kenya based on records and estimates made by key personnel in the organizational categories shown below:

<u>Organizational Requirements</u>	<u>Projected Total 1975-82 Requirements</u>	<u>Present Staff Totals</u>	<u>Future Requirements</u>
Univ. Teaching Staff	82 <sup>1/</sup>	82 <sup>1/</sup>	43 <sup>2/</sup>
GOK Veterinary Services <sup>3/</sup>	170	110	60
Private Companies	30	8	22
Research ILRAD-EAVRO <sup>4/</sup>	7	3	4
Private Practice	<u>50</u>	<u>6</u>	<u>44</u>
Totals	339	209	173

229 Kenyan graduate and undergraduate students are now enrolled in the Veterinary Faculty and will have graduated by the middle of 1979. This will produce a surplus of 45 veterinarians (including an allowance for 5% wastage factor)<sup>5/</sup> when measured against the requirement of 173 as shown above.

---

<sup>1/</sup> Present Faculty staff 82. 43 are non-Kenyans - the requirement for full Kenyanization of Faculty.

<sup>2/</sup> Source: Semi-Annual Report - Colorado State University contract team July-December 30, 1975.

<sup>3/</sup> Based on interview with the Director and Assistant Director of Veterinary Services.

<sup>4/</sup> International Laboratory for Research on Animal Diseases (ILRAD) - located in Nairobi.

<sup>5/</sup> Anticipated attrition factor including illness, inability to maintain academic standard, etc.

The problem is further complicated by the fact that while 50% of the Veterinary Faculty undergraduates are Kenyans, some of the other half (non-Kenyan) are potential job holders in Kenya. The present University student intake projections are 86 per year, of which at least 50% must be Kenyans. Assuming an intake for the next 3 academic years, 1976-77 through 1978-79, of 86 per year this would mean an additional 129 Kenyan graduates by 1982. A 5% wastage factor would reduce this number to 123. The student intake projections indicate the following maximum number of Kenya's surplus veterinarians to approximately 168 by 1982 (45+ 123) after allowing for a 5% student wastage factor.

#### Occupational Distribution of Kenyan Graduates

While the Veterinary Faculty of the University of Nairobi originally was programmed to provide veterinarians for the entire East African Community, the focus now is upon satisfying Kenya's requirements.

Including the Class of 1975, some 124 Kenyan veterinarians have been graduated by the University of Nairobi. In addition, 12 Kenyans have received their degrees from overseas universities. Their present occupational distribution is as follows:

Private Companies	-----	8
Public Service	-----	97
Private Practice	-----	6
Graduate School	-----	<u>25</u>
Total	-----	136

#### Conclusions

Serious consideration should be given by the University of Nairobi to bringing the annual veterinary student intake into line with the projected manpower requirements. The extent to which veterinarians can be absorbed by the existing work force is largely determined by the rate of growth of the livestock sub-sector and the availability of capital resources required

to cover recurrent costs for additional staff.

It appears that the veterinary manpower requirements can best be met by an intake of 50 total students each year, of which 25 would be Kenyans. This would improve the quality of training by lowering the student-teacher ratio and improving the availability and utilization of clinical and teaching materials. However, one factor that the school must determine is the number of students needed to justify the basic operating costs. In addition, the school must consider the administration and management problems plus the quality of teaching and research. Since Kenya's veterinary manpower requirements are within the range of being adequately met, more emphasis might be focused upon recruiting students from other African countries.

Careful thought should also be given to the possibility of increasing the utilization of the Veterinary Faculty facility for training animal husbandry specialists.

Table I. Estimated Animal Units by Species in Kenya<sup>a/</sup>

	<u>A.U. Factor<sup>b/</sup></u>	<u>Livestock Nos. by Species<sup>c/</sup></u>	<u>Total A.U.</u>
Grade Dairy Cattle	1	850,000	850,000
Grade Beef Cattle	.5	800,000	400,000
Indigenous Zebu	.4	9,500,000	3,800,000
Sheep and Goats	.1	11,000,000	1,100,000
Pigs	.2	50,000	10,000
Total			6,160,000

a/ Calculation of Livestock Units is as recommended by the third FAO Veterinary Education Committee Report held in Denmark August 12-21, 1965.

b/ Each type of animal is assigned a factor commensurate with the required intensity of veterinary services. This factor multiplied by the number of each type of animal yields the number of animal units for that type.

c/ Source - Planning Division, Ministry of Agriculture

## CHAIRMAN'S ADDRESS TO KENYA VETERINARY ASSOCIATION

Dr. Walter Masiga  
Director, Kenya Veterinary Research Organization  
May 1978

In order that the planned development of the livestock industry in this country contributes significantly to the total future growth in agricultural production and to the consequent increase for the required protein to the human population, present livestock losses caused by the ravishes of certain animal diseases must be controlled more efficiently.

Livestock diseases are controlled by a wide variety of means including management, disease vector control, vaccination and drug treatment.

The major diseases that can disrupt the livestock industry in Kenya may be divided into two main groups, those that are contained by one or more of the control measures mentioned and those that still provide serious disease losses and are largely outside the control exerted by these measures.

Let us consider an aspect of disease control that is not frequently discussed. Firstly, in relation to diseases, essentially viral, bacterial and helminthological that are successfully controlled by either vaccination or drug treatment. Who develops, produces and markets the vaccines or the drugs used in disease control in this country? Largely foreign, often multinational business concerns whose main aim is profit oriented. How do developing countries fare in their dealings with these companies? The answer lies in the fact that the end product arrives, prepared, bottled, labelled and packaged and is sold without any local input.

It may be further stated that multinational pharmaceutical or biological product companies have a strangle hold on the market. Some of the active chemical ingredients are sold to local subsidiaries for packing. This

arrangement which naturally would involve transfer pricing practices, means that the local firm pays a lot more than what these ingredients cost elsewhere. It would appear that to a large degree this country is subservient and dependent in this important area of drug and vaccine technology. I must say that this is extremely undesirable and costly and something must be done about it.

Foreign firms produce certain vital vaccines in their home countries and export them to this country in various forms. These countries manufacture vaccines, bottle, print labels, pay for labour, and Kenya's contribution may be only to bottle the final products. In the majority of cases, however, Kenya has no technical input into the actual vaccine production process. All these processes are carried out abroad, and with transportation expenses, greatly inflate the costs of the vaccines. It is finally the Kenyan farmer that bears these costs. It would be reasonable to propose, therefore, that these costs could be greatly reduced if all important vaccines were produced locally. It should be noted that Kenya already has developed, in part, this technology. The Foot and Mouth disease vaccine is successfully produced in Kenya by a private firm in collaboration with the Kenya government. It is to be commended that other important vaccines such as Rinderpest tissue culture, Contagious Bovine Pleuropneumonia T<sub>1</sub> broth culture, Newcastle Rabies vaccines, etc. are also currently being produced by institutes in Kenya. These vaccines are produced to international standards and are, in fact, exported to other countries. It can be argued, therefore, that additional vaccine production technology could easily be transferred successfully to Kenya, with the resultant conservation of foreign reserves. It may be suggested, that local private industry and government-owned institutes be instructed to enlarge their production capabilities to cope with the production of all vaccines for major animal

diseases. This is the only way that Kenya can become self-reliant in this important area of disease control.

What about diseases of the second grouping, diseases for which we have no really effective control measures such as protozoal diseases caused by Theileria and Trypanosomes? Effective control can be achieved in certain situations by dipping and spraying but who produces the acaricide or the insecticide? Again the large pharmaceutical concerns from abroad. But, where means of control other than dipping are required, where diseases are limited to developing countries because either they are controlled or eliminated in developed countries or do not exist there, who then turns their interest to the disease plight of the developing country? If there is unlikely to be a market for a drug that can produce a profit, then nobody is interested. It is in such situations that I wish to suggest that private firms and relevant government institutions should be encouraged to pursue the possibility of manufacturing locally, essential drugs for the livestock industry. In so doing, the institutions should concentrate, first of all, on the production of known drugs with the provision of formulating new drugs. It would seem, in general terms, that drug firms are not interested in developing new drugs for human and animal diseases which occur solely in the third world. This was emphasized at the UN Conference on Trade and Development, 1975, (New Scientist, 4th December 1975). The solution to this would be that donor international agencies such as FAO and WHO, and national agencies of countries which have massive pharmaceutical industries e.g. Germany, U.S.A., France, Britain, Etc. be approached to subsidize within their aid budgets cooperative programmes for the development of new drugs for human and animal diseases in the developing countries.

Transfer of technology from developed countries to developing countries can only be effected efficiently where trained local manpower is available.

It is, therefore, paramount that training arrangements in various technologies be given top priority in this country's planning process. It is suggested that where the technology is to be transferred immediately, the local personnel be trained either on the job or in local institutions by foreign experts. Likewise, arrangements should be made to train Kenyan personnel for the various technologies in the countries where they exist as or before the process of transferring them is initiated.

Ladies and Gentlemen, I have attempted to discuss a very important but complicated subject. Of course pharmaceutical development is extremely expensive and in order to effect some of the ideas above, there will have to be careful and considered planning. There are the questions of finances and actual technology. These two aspects may be overcome by bilateral negotiations between the governments of developing countries and pharmaceutical firms, international donor agencies or donor countries.

Many of these ideas may be expensive to realize but animal disease control in the developing world is paramount in the production of protein for the human population and my main objective in this address is to stimulate, I hope, active debate within our profession and, perhaps, within the planning process of this country.



College of Veterinary Medicine  
and Biomedical Sciences  
Kenya Project

Colorado State University  
Fort Collins, Colorado  
80523

June 9th, 1978

Mr. Francis Maina  
General Manager  
Agricultural Finance Corporation  
P. O. Box 30367  
NAIROBI

Dear Mr. Maina:

I am a veterinarian with the Colorado State University/USAID Contract at the Faculty of Veterinary Medicine, University of Nairobi. Our project began 13 years ago and terminates July 1st. During the contract, our major input has been in clinical veterinary medicine with special emphasis on on-the-farm teaching. We feel that our graduates - at least some of them - are qualified to enter general practice, but adequate financing of young Kenya veterinarians has not been available to this time.

I put this loan question to Ben Blanks and he suggested that I present it to you. The major questions seem to be the legality of A.F.C. providing such loans and the benefit that these loans would be to Kenyan agriculture. The first question is for your consideration and judgment. I hope the enclosed proposal answers the second question.

I would be interested in your comments regarding this proposal.

Sincerely,

William A. Wolff, D.V.M.  
CSU/USAID Chief-of-Party

cc: Ben Blanks  
P. O. Box 30367  
NAIROBI

## LOAN PROPOSAL FOR PRACTICING VETERINARIANS\*

### The Situation

Based on a recent survey (July 1976, USAID and Colorado State University), over 200 veterinarians in public service and private practice would be needed to adequately service the health requirements of the Kenya livestock industry. This excludes the veterinary manpower requirements for teaching, research, commercial, artificial insemination, meat inspection and administration.

The number of animal units per veterinarian recommended for developing countries is 30,000 (FAO 1965, International Committee on Veterinary Education). Based on this figure, 208 veterinarians actively engaged in food animal practice, exclusive of poultry, would be required for the present needs of Kenya (Table / ).

The FAO recommendations are probably over-ambitious and a more likely animal unit/veterinarian ratio would be 40,000:1. Using this figure, 156 veterinarians could supply current veterinary manpower needs for meat, milk and fiber production.

About 150 Kenyan veterinarians are employed by the Veterinary Services Department of the Ministry of Agriculture. Of these, about 110 are involved in disease control in the 40 District Offices throughout Kenya. Their duties are primarily regulatory and they provide little on-farm preventive medicine programs and emergency services.

There are 18 Clinical Centers throughout Kenya, each staffed by one veterinarian and auxilliary personnel. The centers are strategically located and have the mission of providing on-the-farm veterinary services including preventive medicine and herd-health programs. To this time, many clinical centers are inadequately supplied with vehicles, laboratories, instruments and medicines necessary to perform their missions.

\*Presented to Agricultural Finance Corporation, Nairobi, Kenya, June 1978.

The remainder of the veterinarians employed by the Government of Kenya are in research, meat inspection, vaccine production and artificial insemination. They do enter the area of on-the-farm practice in supportive capacity.

The private sector of veterinary medicine in Kenya is mainly concerned with what in the United States are designated as "companion animal" practices - dogs, cats and horses. Currently there are 14 veterinarians in Kenya who claim private practice status. Of these, 5 in Nairobi are limited to companion animals.

One practitioner in Mombasa does about 50% food animal practice. One in Naivasha is limited to horses and 4 operated dispensaries and really doesn't engage in practice. Of the total number claiming private practice, 8 are Kenyans. Also, 2 expatriots are semi-retired and practice part-time only.

In support of a viable livestock industry, adequate professional veterinary service is essential. It would appear that Kenyan livestock producers could support more practicing veterinarians. An indication of this is the very successful and busy Ambulatory Clinic of the Faculty of Veterinary Medicine, University of Nairobi. This clinic makes 4000 or more farm visits yearly and charges an average of Shs 10,000/= per month to small holders in the Kabete - Limuru area. Nearly 70% of accounts are collected. The Ambulatory Clinic charges only enough to defray costs of transportation and medicines. A private practitioner would necessarily have to charge 150% to 200% more than the Ambulatory Clinic in order to make a decent living. An economic analysis of the potential for a private practice in the Kabete area has not been done, but a major factor in success would be adequate initial capitalization.

Other major livestock areas in Kenya could also support private practitioners. Nanyuki, with the large intensive beef cattle ranches, is one

example. Nyeri and Murang'a each should be able to support a private practitioner. The Naivasha - Gilgil - Nakuru strip in the Rift Valley would seem to be an ideal location for one or possibly two veterinarians. Mombasa should be able to support at least one more practitioner.

In summary, it seems likely that there is immediate need for at least 5 Kenyan veterinarians in private practice to provide adequate services to livestock producers and owners of companion animals. Projections over the next ten years are pure guesswork but, considering the increasing value of individual livestock units, it would seem reasonable to encourage development of at least 15, possibly 20, private practices by 1990.

### The Problems

A practicing veterinarian must be adequately financed at the outset of practice. In Kenya the practicing veterinarian must have an equipped clinic including minimal facilities for hospitalization of small animals, a surgery theater, a laboratory, instruments, equipment and medicines, and a dependable vehicle. The veterinarian must be self-contained because he does not have centrally located hospital, surgical, and laboratory facilities such as are available to our colleagues in the medical profession. Therefore, the initial capital outlay for a practicing veterinarian is considerably more than it is for a physician.

In the United States, most new practices are adequately financed at the outset so that financial worries are at a minimum during the first 6 to 12 months. Most new practices that fail do so because of "shoe-string" financing. It takes 6 months to 1 year before receipts balance the overhead incurred for drugs, expendable equipment, vehicle running and maintenance and utilities, and amortization of loans for hospital, laboratory, vehicle and non-expendable equipment. A new practice generally does not show a profit for 18 months to 2 years.

In Kenya, the initial financing necessities would be similar but with the added constraints that fees are proportionately lower compared with inflationary trends, and collectability of fees is lower than in the U. S.

Initial financing of a practicing veterinarian in Kenya must include a vehicle, non-expendable surgical and practice equipment, and diagnostic laboratory equipment. In addition, the new practitioner should have financing for 6 months to 1 year rental of a clinic facility, utilities, vehicle expenses, expendable equipment, drugs and laboratory reagents and living expenses. Chances for success of new practices in areas that have concentrated livestock production and some companion animals is good. Without adequate financing, success of the practices would be doubtful.

At present, banks and local lending institutions in Kenya refuse to finance aspiring veterinary practitioners, or extract such a high rate of interest that the Kenyan veterinarian is reluctant to enter private practice.

Livestock production in Kenya operates on the profit motive and is private enterprise. The need for adequate and dependable veterinary service to this sector seems obvious. But there is a shortage of veterinary services to the livestock industry of Kenya. It is proposed that government financing of private practitioners is the best means for providing needed veterinary services to meat, milk and fiber producers.

The earning potential of practicing veterinarians in Kenya is extremely variable, depending on the concentration and economic viability of farms in different areas, companion animal population and the vitality of the veterinarian. Nairobi, Mombasa and the Rift Valley from Naivasha to Nakuru have high potential with good livestock concentrations and the additional advantage of large pet animal populations. The contribution of companion animals to the economic stability of a practice is important. Veterinary fees for services on dogs, cats and horses are proportionately higher - often much

higher - than they are for services on food animals in the same area, and these fees are highly collectable. It would be economically sound to enter practice in an area that has a fairly high density of companion animals.

This proposal is then for financing practices in areas with high concentrations of livestock and companion animals. The private practicing veterinarian depends on animals for his living. There is no likelihood that private practices would succeed or would be necessary in marginal or sub-marginal areas. Veterinary services to these areas will always require public funding.

Income projection is difficult. The established practices gross from Shs 200,000 per year for a one-man general practice near Limuru up to Shs. 4 million per year for group practices in Nairobi which deal mostly with companion animals. The objective of the loans is to establish private practices in concentrated livestock producing areas with enough companion animals to augment the income. An active practitioner in the Naivasha - Nakuru area, for instance, should be able to gross Sh 500,000 within 2 or 3 years after the initial start.

#### The Proposal

The proposed financing is a rough estimate based on today's prices. If inflationary trends continue, the loan amount would have to be adjusted.

Vehicle	Shs. 80,000
Non-expendable equipment (surgery, laboratory, furnishing)	Shs. 100,000
Expendable supplies (medicine, laboratory reagents, syringes, etc), 6-month supply	Shs. 50,000
Vehicle running and maintenance 6 months	Shs. 15,000
Rental of clinic facilities and living quarters, living expenses, 6 months	<u>Shs. 50,000</u>
	<u>Shs. 295,000</u>

It is suggested that loan payments be deferred for 12 months and then paid off at a rate of Sh. 25,000 to 30,000 per year plus interest.

### Conclusion

Adequate low-cost initial financing is the major constraint to Kenyan veterinarians entering private practice. A growing number of young Kenyans have expressed interest in private practice, but they are well aware of the lack of available financing. Availability of money would go a long way toward establishing more Kenyans in private practice, to the benefit of the livestock industry.

Table I.

ESTIMATED ANIMAL UNITS BY SPECIES IN KENYA<sup>a/</sup>

	<u>A.U. Factor<sup>b/</sup></u>	<u>Livestock Numbers<sup>c/</sup> by Species</u>	<u>Total A.U.</u>
Grade Dairy Cattle	1	775,000	775,000
Grade Beef Cattle	.5	600,000	300,000
Indigenous Zebu	.4	8,435,000	4,212,500
Sheep and Goats	.1	9,600,000	960,000
Pigs	.2	56,000	<u>11,200</u>
Total			6,258,700

---

a/ Calculation of Livestock Units is as recommended by the third FAO Veterinary Education Committee Report, held in Denmark August 12-21, 1965

b/ Each type of animal is assigned a factor commensurate with the required intensity of veterinary services. This factor multiplied by the number of each type of animal yields the number of animal units for that type.

c/ Source - Planning Division, Ministry of Agriculture

COLORADO STATE UNIVERSITY  
 FORT COLLINS, COLORADO 80523  
 Project Proposal

RESEARCH ON CYSTICERCOSIS AND HYDATIDOSIS

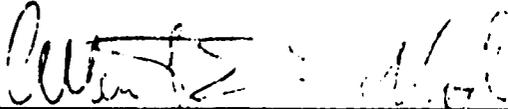
PRINCIPAL INVESTIGATORS:

Albert E. Sollod, V.M.D., Ph.D.  
 Visiting Senior Lecturer  
 Dept. of Veterinary Pathology &  
 Microbiology  
 University of Nairobi  
 Nairobi, Kenya

Cleon V. Kimberling, D.V.M., M.P.H.  
 Campus Coordinator, Kenya Project  
 Contract AID/Afr-790  
 33 Vet Med Bldg.  
 Colorado State University  
 Fort Collins, Colorado 80523

PROPOSED STARTING DATE: 1 July 1978

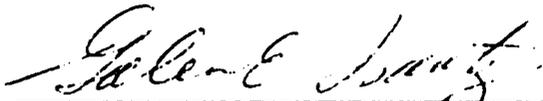
DURATION OF THE WORK: 4 Years



Albert E. Sollod, V.M.D., Ph.D.  
 Associate Professor of Pathology  
 Contract AID/Afr-790



Cleon V. Kimberling, D.V.M., M.P.H.  
 Campus Coordinator, Kenya Project  
 Contract AID/Afr-790



Galen E. Frantz, Contracts & Grants  
 Administrator  
 Office of Sponsored Research  
 Colorado State University

This proposal has not been submitted to other sponsors. It has been informally distributed to the United Nations Environment Programme and the Pan American Zoonoses Center for review.

## Relevance of Proposed Work to A.I.D.

### The Problem; Pertinence to A.I.D.'s Mission

Since 1968 a series of both formal and informal meetings of experts has been held under the auspices of the Food and Agriculture Organisation (F.A.O.) and the World Health Organization (W.H.O.) of the United Nations, dealing with the worldwide problems of cysticercosis, taeniasis and hydatidosis. These meetings culminated in June 1976, with an expert panel held in Nairobi, Kenya and sponsored by the United Nations Environment Programme (U.N.E.P.)/F.A.O./W.H.O. This group was brought together to develop the idea of a coordinated, multidisciplinary approach to research on these problems. The expert panel issued a Report recommending research on practical means of alleviating the socioeconomic burdens these parasitic diseases place on developing countries. The present Title XII research proposal is based on specific recommendations contained in this expert panel Report.

One of Kenya's aims in developing an economic livestock market is to integrate cattle production by pastoral peoples living on semi-arid land into the cash market being created by the Kenya Meat Commission. In order to do this cattle are purchased from the pastoralists and placed in feedlots where they are "fattened" on roughage under a zero grazing scheme (personal communication, Dr. R. Kimani, Kenya Department of Veterinary Services). However, with the prevalence of cysticercosis in these animals consistently over 20%, the economic gain is unacceptably low. In order to make this project economically viable an ante-mortem diagnostic test for cysticercosis is needed so that infected animals can be excluded from the feedlot operation. At present no such test is available.

Currently there are no known methods for the control of hydatidosis in the Turkana people of Kenya as those methods used in other countries do not seem to be applicable to semi-nomadic livestock producers living in a remote region. However, many

cases of hydatid disease are operated on yearly by the Flying Doctor Service without the prior benefit of those immunological diagnostic tests which are used successfully in other parts of the world. Epidemiological research by other scientists will soon begin in Turkanaland with a view to defining the pattern of infections in order to devise a control program. Meanwhile, resident physicians in Turkanaland have expressed great interest in obtaining the services of an immunodiagnostic laboratory to facilitate their diagnosis of clinical cases.

From recent discussions with Dr. Victor Varela-Diaz, Head of the Immunology Laboratory at the Pan American Zoonoses Center (C.P.Z.), Pan American Health Organization, Buenos Aires, Argentina, we have learned that the C.P.Z. is beginning a program to develop an immunodiagnostic test for porcine cysticercosis (Cysticercus cellulosae). We discussed the parallel problem of bovine cysticercosis and agreed that if a research program on this condition is to be pursued in Kenya there would be substantial benefit in developing a cooperative arrangement between the two institutions. Additionally, the C.P.Z., being the foremost center for the immunodiagnosis of hydatid disease, could provide scientists working in Kenya with reagents and technical advice needed to standardize procedures for use in East Africa.

In a recent informal discussion with Dr. Nels Konnerup of the United States Agency for International Development (A.I.D.), Dr. William Wolff, Chief-of-Party, Colorado State University (C.S.U.)/A.I.D. Kenya Project, and Dr. Varela-Diaz, Dr. Konnerup suggested that A.I.D. might be willing to finance a project on cysticercosis/hydatidosis in Kenya especially if the following conditions were met: 1) that the project have strong ties to an institution, such as a land-grant college, in the United States; and 2) that the research carried out is in accordance with the recommendations made by the U.N.E.P./F.A.O./W.H.O. expert committee. Accordingly, we are proposing the initiation of an A.I.D.-sponsored research project, with participation by Kenyan graduate students,

to be undertaken at either the University of Nairobi College of Veterinary Medicine or the East Africa Veterinary Research Organization, with adjunct research and graduate student training at Colorado State University, and with the cooperation of the Pan American Zoonoses Center.

The benefits from progress in research on cysticercosis and hydatidosis will apply to the development of small farming and public health. The term small farming is used here in the broad sense to include East African pastoral livestock grazing on land which will not be suitable for crop production on any large scale in the foreseeable future. Small farming and public health are areas to be stressed for development aid, according to recently published A.I.D. and U. S. Presidential statements, and the proposed project appears to conform to A.I.D.'s global and East African missions.

#### Utilization of Research Results

As indicated by the opening statement of this project proposal, the development of an effective immunodiagnostic test for cysticercosis would allow the culling of infected carcasses during the flow from grazing pastures to feedlot to abattoir and market. The losses from cysticercosis result from carcass condemnation, trimming and freezing, and at the Athi River Abattoir of the Kenya Meat Commission amount to approximately U. S. \$170,000 per annum (Report prepared by Dr. D. G. Wambugu, Kenya Veterinary Officer: Economic Importance of C. bovis at Kenya Meat Commission, Athi River). These direct losses are passed back to the feedlot producer who is paid less for his product.

Indirect losses, which are difficult to calculate but are probably much higher than the direct losses, are suffered by pastoral groups in various locations whose cattle become unsalable because of a reputation of a high prevalence of cysticercosis, and the Kenya Meat Commission which has difficulty in maintaining supplies of top

quality beef for export contract markets. A test which would identify infected animals and permit their suitable disposition before feeding would enhance the credibility of pastoralists attempting to sell their cattle, and allow feedlots to supply the Kenya Meat Commission with up to 25% more exportable beef.

If a diagnostic test is applied to cattle having an anticipated high prevalence of cysticercosis (20% freezing loss, 1% condemnation loss) then, based on current costs for freezing (U. S. \$ .03 per kg), and condemnation (U. S. \$1.60 per kg), a per test cost of U. S. \$1.50 will be covered by the reduction in direct losses. A per unit cost of U. S. \$1.50 will therefore result in cost-free reduction of indirect losses and, since it should be possible to develop a mass test which can be performed for considerably less than U. S. \$1.50, there should also be a net financial benefit to the feedlot producer.

As noted in a previous section of this proposal the total potential losses for the greater East African region may be as high as U. S. \$10,000,000 per annum but, due to the lack of accurate data, it is only possible to give a realistic estimate of the economic gain accruing from the use of a diagnostic test on cattle produced for and processed by the Athi River Abattoir.

The worldwide potential for a diagnostic test for cysticercosis is dependent on two factors: 1) that the infection prevalence be high enough so that the direct cost benefit offsets the cost of testing and, 2) that the production effort is aimed at a cash market. Since this latter factor is related to a country's level of economic development, political factors, market accessibility, etc., it is difficult to critically assess the potential of a test in any given region without an intimate knowledge of that region. Nevertheless, many economically developing countries besides Kenya have a high prevalence of cysticercosis where a test might be used; the following are listed by Froyd (1965): Democratic Republic of the Congo, Guinea, Libya, Nigeria, Sierra Leone, Swaziland, Syria and Uganda.

The anticipated research on human hydatidosis is only an extension of work which is routinely performed in many parts of

Latin America. The worldwide center for this work is the C.P.Z., and other countries wishing to institute immunodiagnosis for hydatidosis would be best served by cooperating with the C.P.Z.

#### Developing Country Participation

The major portion of the research will be performed by the principal investigator (A.E.S.) in Kenya. Kenyan scientists who have expressed interest in joint research on the project include J. Onyango-Abuje, B.S., M.Sc. and J. M. Gathuma, B.V.M., M.Sc., Ph.D.

Three Kenyan graduate students will be selected by C.S.U. faculty from nominees sponsored by the Kenyan veterinary research institutions. The students will pursue a Ph.D. program and therefore will have already attained an M.Sc. degree, or will have an outstanding academic record which would allow them to undertake Ph.D. work directly after their undergraduate education. The students will undertake coursework and laboratory training at C.S.U. for a period of eighteen months. During this time they will each travel to the C.P.Z. to undertake three weeks of training in immunodiagnosis.

Following their training overseas they will return to Nairobi where they will carry out their research and write their theses under the supervision of the principal investigator and other qualified supervisors. Upon completion of their programs they will be awarded the Ph.D. degree from C.S.U.

#### Environmental Impact

The complex epidemiology of cestode infections involves man, his domestic animals, possible wild animal reservoirs, and the external environment which harbors the infective stages for the intermediate hosts. Relieving the socioeconomic and health burdens to which these infections contribute requires a coordinated effort aimed at the hosts, parasites and environment. It is for this reason that U.N.E.P.

sponsored a meeting in Nairobi, Kenya in 1976 on the worldwide problems of cysticercosis, taeniasis, and hydatidosis. The proposed research project, based on recommendations arising from this meeting, is designed to be an integral component of the global attack on these problems.

The proposed research is not designed to alter the environment in order to alter the infection pattern, nor will the laboratory-oriented research itself have an effect on the environment. Nevertheless, the long-term effects of the results of the research may profoundly enhance the environment if appropriate sociological development is simultaneously encouraged.

The increasing population of pastoral herdsmen and the decreasing mortality of their livestock have resulted in devastating overstocking of traditional grazing land in many regions including East Africa. Most of this land is semi-arid and for the foreseeable future will not be placed into crop production. In order to extricate himself from this dilemma the pastoral herdsman will have to cull his herd and adopt modern range management procedures. Traditional cultural and sociological patterns offer little short-term incentive for making these changes. The principal reason for maintaining a herd beyond the size necessary to feed the herdsman and his family is that every animal is a sign of wealth and a large herd, regardless of the condition of the animals, imparts to the owner a measure of prestige among his peers.

A rational, non-coercive solution is to provide incentive to the pastoral groups by offering adequate compensation for disposing of their superfluous stock on the cash market. A diagnostic test for cysticercosis could contribute to the desired change, firstly, by facilitating the cash sale of cattle known to have a very high prevalence of infection and now being rejected en masse by feedlot operators and, secondly, by ensuring a fair price for the livestock and thus rewarding the production of uninfected animals. Obviously, the resolution of the cysticercosis problem is only one of many changes necessary to integrate the subsistence livestock producer

into the cash economy.

### Impact on Food Production and Status of the Poor

The effects of the research results on food production and the status of subsistence livestock producers have been described or implied in previous sections of this proposal. Briefly, if the transition to livestock production for the cash market can be made, the producers will be encouraged to adopt methods which will yield greater sustained productivity from the land, rather than an irrationally large number of animals. The standard of living for these people will rise as long as there is concomitant development of an infrastructure for the delivery of goods and services which they can purchase from the sale of their livestock.

## Scientific Aspects of Proposed Work

### Objectives of the Research

- A. To search for and develop the use of laboratory animals and immunosuppressed calves as hosts of Taenia saginata tapeworm and cyst stages for the production of antigen and infective eggs.
- B. To evaluate various immunological procedures on serum, skin reactivity and lymphocyte reactivity which could be used as ante-mortem diagnostic tests for bovine cysticercosis in East Africa and North America; C.P.Z. will pursue a similar objective for porcine cysticercosis.
- C. To cooperate and coordinate with the Kenyatta National Hospital efforts to adopt the immunodiagnostic tests for human hydatidosis used by C.P.Z./P.A.H.O. and to evaluate their use in East Africa.
- D. To define the antigenic mosaic of T. saginata/Cysticercus bovis and compare it to Echinococcus granulosus, T. ovis, T. hydatigena and T. solium.
- E. To study the ontogeny of antibody production in cattle infected with C. bovis.

### Background to the Problem; Rationale and Estimation of Success

#### A. Hosts and parasites

Metacestode infections of domestic animals (cattle, sheep, goats and swine) and man are caused by five different species of tapeworms, three of which are zoonotic. T. ovis and E. granulosus produce cysts in sheep and goats. Cattle are infected with cysts of T. saginata and E. granulosus, and swine with those of T. solium. T. hydatigena cysts have a wide host range and infect all common domestic animals. Man is the definitive host for the tapeworm stages of T. saginata and T. solium and E. granulosus. Wild carnivores and ruminants play an uncertain role in the maintenance and transmission of these infections.

## B. Geographic distribution

Taenia and Echinococcus occur throughout the world in a multifocal pattern of distribution. The prevalence in each location depends on the local conditions of hygiene, man- or dog-intermediate host contact, intensity of veterinary care and meat inspection, type of animal husbandry, and other factors which influence the life histories of the parasites. The following enzootic areas exist in the Americas and in East Africa:

1. T. ovis and T. hydatigena - ubiquitous
2. T. saginata - throughout East Africa, northeastern and southwestern United States
3. T. solium - Mexico and parts of South America
4. E. granulosus - semi-arid regions of East Africa (northeastern Uganda, Turkana and Maasailand of Kenya), western United States, Argentina and several other countries in South America, northern Canada and Alaska

## C. Livestock infections: significance in East Africa and the United States

As noted above T. saginata, the causative agent of bovine cysticercosis, occurs throughout East Africa but, because of the lack of accurate statistics, an overall assessment of its importance is impossible. The prevalence of infection in cattle from Kajiado District, slaughtered at Kenya Meat Commission, Athi River, or Ngong Abattoir varies from 28 to 64% (Mann, 1974). Assuming an overall minimum infection rate for East Africa (Kenya, Uganda, Tanzania, Burundi and Ethiopia) of 25%, not less than 10,000,000 head of cattle are infected (Ibid.). At present only about 20% of cattle are processed in recognized abattoirs with meat inspection service, but with improved facilities the losses due to carcass condemnation, degrading, freezing, cooking or pickling could reach a minimum of U. S. \$10,000,000/year (Ibid.).

In the United States bovine cysticercosis is detected in 12,000-16,000 carcasses annually (Schultz, 1970). The enzootic areas of the southwestern United States have a constant low level of infection of about 1% (Ibid.). In addition, sporadic epizootics

in feedlots have caused large losses, up to \$250,000 in a single outbreak. While such epizootics had been thought to be a hazard only in the southwestern United States, a recent outbreak in Ontario, Canada showed that geography does not limit the distribution of outbreaks.

The renewed interest in bovine cysticercosis in the U. S. has led to federal legislation prohibiting the tripping of lightly infected carcasses, thus placing a greater economic burden on the beef producer. However, Schultz (1974) states that he and his colleagues in the United States Department of Agriculture do not believe that the new regulations have led to a lowering of the infection prevalence.

E. granulosus occurs in Kenyan livestock over wide areas of pastoral grazing land. Nelson and Rausch (1963) found a prevalence of 30% in Turkana District. Mann (1973) estimated that up to 200,000 kg of edible protein is lost per annum due to condemnation of infected organs from cattle, sheep and goats. Losses from lower dressing-out percentages in infected animals may also be expected.

In the U. S. autochthonous hydatidosis is known to occur in Alaska, California, Arizona, and New Mexico (Williams et al., 1971; Schantz et al., 1976) and may also occur in other western states. The economic losses are probably minimal and the main concern in this situation is transmission of hydatid disease to man.

D. Human infections: significance in East Africa and the United States

Virtually all human hydatid disease in East Africa occurs in the Turkana District of Kenya and possibly in the adjacent Karamoja area of Uganda. The prevalence in some nomadic groups of this region may approach 10% (Mann, 1973). The Flying Doctor Service operates on about 150 hydatid patients per year. An enigmatic situation exists in Maasailand where the apparent prevalence of hydatidosis in man is low in spite of a high rate of occurrence in his livestock.

In the U. S. a constant low level of human cases, previously unknown to exist, has recently been uncovered. Infections have

been described in Basque shepherds of California and Indians of Arizona and New Mexico (Schultz et al., 1970; Schantz et al., 1976). Other minority groups which also live in close association with livestock and have limited access to modern medical facilities may be at risk.

T. saginata tapeworm infection in man occurs in all parts of Kenya with a prevalence of up to 65%, according to hospital records compiled by Dr. H. J. Diesfeld. In the U. S. a survey conducted by State Health Department laboratories over a 5-year period revealed an overall prevalence of 23 per 100,000 (Schultz, 1974). A minimum of one-third of these were indigenously acquired. The incidence appears to be rising as the Parasitic Disease Drug Service dispenses an increasing number of doses of niclosamide to American physicians yearly (Ibid.).

The concern in the U. S. is primarily the risk to livestock, where single infected persons have caused thousands of dollars worth of damage by infecting large groups of cattle. In developing countries the possible effects of tapeworms on populations surviving on low protein and iron-deficient diets must also be considered.

#### E. Rationale

Immunological tests for diagnosis of infectious diseases in the living host are well known and over the years have proven invaluable for the diagnosis of many microbial and viral infections (e.g. tuberculosis, foot and mouth disease). Immunological tests for parasitic diseases are less widely used mainly because suitably specific antigens have not been developed. Nevertheless, such tests are routinely used with varying degrees of success for the diagnosis of certain parasitic infections such as schistosomiasis, hydatidosis, malaria and visceral larva migrans.

It is well known that cattle become immunologically reactive following infection with C. bovis and that this reactivity is detectable with a variety of tests. Recent work at the University of Nairobi and in Germany has demonstrated that the specificity

of tests for cysticercosis can be increased by physicochemical manipulation of antigens. It appears highly probable that a reliable test for cysticercosis can be developed during the four-year duration of the proposed project, and that the test will have high enough specificity and sensitivity to yield an economic advantage when employed in the field. Rapid progress is anticipated since no new methodologies will be developed; the research will apply known techniques to the development of tests.

The anticipated work on immunodiagnosis of human hydatid disease does not involve the development of new tests, but rather the application of standardized tests developed by the C.P.Z. to the hydatidosis problem in Kenya. No specific problems are anticipated. The research is designed to determine if these standardized tests yield satisfactory results with sera obtained from the Turkana people (many of whom are suffering from extreme emaciation) using locally obtained antigens. It is anticipated that this phase of the research program will only amount to a minor portion of the total research effort, depending on the assistance desired by the W.H.O. Immunology Laboratory at Kenyatta National Hospital where research on this problem has already started. Nevertheless, some work with hydatid antigens will be necessary since bovine hydatidosis is probably the major cause of cross-reactions in immunological tests for cysticercosis.

### Literature Review

#### A. The use of laboratory animals for the growth of *T. solium* and *T. saginata*

Large numbers of tapeworm proglottides will be required if products from these are to be used as antigens for immunodiagnostic tests. Even if cyst material is eventually found to provide the most suitable antigens, some tapeworm stages will

be needed in order to infect intermediate hosts. This would be particularly true in the case of T. saginata since the eggs are not hazardous to the technicians handling them. The production of gravid proglottides in laboratory animals would: a) overcome the great inconvenience of collecting them from naturally infected persons, b) provide standardized material of known age, c) eliminate the danger in handling human feces, and d) provide other workers with a laboratory model for drug trials, etc.

Verster (1971, 1974) showed that the golden hamster could be made susceptible to both T. solium and T. saginata if it is immunosuppressed by any of a number of chemical, biological or physical agents. She has also shown that the chacma baboon can be infected by T. solium without any immunosuppressive treatment (Verster, 1965). However, in all cases the worms failed to produce eggs even though proglottides became mature. More work is necessary in this area, especially trials involving different laboratory animals and immunosuppressive regimes less toxic than those reported by Verster (1974).

There is also a need to grow metacestode stages in the bovine and porcine intermediate hosts. Cyst fluid may provide the only antigens which will give satisfactory results in immunological tests. It is well known that the percent of infective eggs to establish infection in the muscles is extremely erratic, and it would be most useful if successful infection could be guaranteed by using immunosuppressed intermediate hosts.

#### B. Immunodiagnostic tests for cysticercosis

In spite of the great worldwide importance of cysticercosis/taeniasis (Pawlowski and Schultz, 1972), there are no good immunodiagnostic tests for use in either man or domestic animals. There are numerous reports of trials with many different procedures, mostly on experimentally infected animals. Gel diffusion and precipitin tests are very insensitive (Biagi and Tay, 1958; Mosina, 1965). Other techniques are more sensitive but lack specificity; among numerous examples are: indirect

hemagglutination (Morris et al., 1968), latex agglutination and complement fixation (Martin, 1972), intradermal test (Buggy, 1961), and indirect fluorescence (Dao et al., 1972). Counterimmuno-electrophoresis may be a better test (Beltran and Gomez-Priego, 1973) but requires further evaluation. There are no reports of in vitro antigen stimulated uptake of radioactive nucleosides by lymphocytes from infected animals.

Dewhirst et al. (1967) found that in the U. S. both the indirect hemagglutination and intradermal tests were more accurate in detecting infected cattle than were the prevailing routine meat inspection procedures. However, in East Africa where intercurrent parasitic infections are prevalent and may give rise to cross-reactions, Froyd (1963) found the intradermal test completely non-specific. It is likely that in East Africa most bovine cysticercosis is acquired neonatally (Urquhart, 1961), a condition which results in relatively low antibody titers (Sewell and Gallie, 1974). Thus, in East Africa there is need for a test which will detect low antibody titers in neonatally infected animals and in the many animals with only a few apparent cysts (personal observation), but that will not cross-react with the many other common parasitic diseases. In view of the successful development of immunodiagnostic tests for hydatid disease using cyst fluid, it seems a reasonable approach to experiment with tests employing Cysticercus fluids as antigen. Alternatively, the specificity of tapeworm derived antigens might be improved by absorbing them with antisera against cross-reacting parasites. A practical test will have to reveal both light and heavy infections in animals of almost any age and regardless of the duration of infection. Hence, it will be necessary to examine the ontogeny of immune reactivity after the onset of infection, as well as the influence of infection level and host age on immune responses.

#### C. Immunodiagnostic tests for hydatid disease

One of the first immunodiagnostic tests for parasitic disease

was the intradermal test using hydatid fluid on suspected human hydatid patients (Casoni, 1911). Although Kagan et al. (1966) and Williams (1972) found good sensitivity for this test in differentiating between infected and non-infected persons, adequate specificity controls for other parasitic diseases were lacking. Varela-Diaz and Coltorti (1974) reviewed the literature on the use of Casoni intradermal test and concluded that this test was obsolete compared with newer immunodiagnostic methods even though it may be the simplest practical procedure.

Extensive work at the Pan American Zoonoses Center has resulted in highly standardized techniques for the immunodiagnosis of hydatid disease in man. Current recommendations include preliminary serological screening with the latex agglutination test followed by immunoelectrophoresis of all positive sera in order to demonstrate the specific anti-arc 5 activity (Varela-Diaz et al., 1975). A booklet detailing the operation of these tests has been published as C.P.Z. Scientific and Technical Monograph No. 7 (Varela-Diaz and Coltorti, 1974a).

These highly reliable tests should be of great benefit to the physicians who must diagnose hydatid disease in the Turkana. In addition, the tests should be indispensable to a general survey of the prevalence of hydatidosis in Turkana land.

Unfortunately, there are still no suitable immunodiagnostic tests for hydatidosis in non-human hosts (Williams and Schantz, 1970).

D. Antigenic analysis of T. saginata/C. bovis and comparisons with other cestodes

Determination of the antigenic mosaic of a parasite can yield practical information in three areas. Firstly, there may be species- or genus-specific antigens which prove suitable for diagnostic purposes. More likely, however, are antigens which prove to be specific in a given host and geographic location, even though they may cross-react with other parasite antigens experimentally. Secondly, there may be diagnostically specific antigens in heterologous parasites which may be easier to extract

in large quantities than antigens from the homologous parasite. Thirdly, laboratory studies on cross-reactivity may give an indication of which parasites and contaminating host components could give cross-reactions in the field.

The arc 5 antigen of Capron et al. (1967) is the only example of an identified parasite antigen subsequently used with great success for immunodiagnosis. Anti-arc 5 activity in the immunoelectrophoresis test is virtually 100% specific for hydatidosis in man (Varela-Diaz et al., 1975a). It is the only one of 13 cyst fluid antigens (Varela-Diaz et al., 1974b) known to induce the appearance of diagnostically specific antibodies.

The use of heterologous antigens because they come from a convenient source may eventually become practical, especially in geographical regions where the population is not infected with numerous parasitic diseases which may cross-react. In the tropics this approach will probably not be useful. Nevertheless, most reports on immunodiagnostic procedures for cysticercosis (e.g., Walther and Grossklaus, 1972) have described the use of strobilate tapeworm antigen for testing the intermediate host.

In East Africa parasites of ruminants are numerous and more often than not an animal is infected with more than one species. C. bovis, C. tenuicollis (T. hydatigena), E. granulosus and Fasciola spp. are often found together in cattle, sheep and goats. This situation demands a high order of antigenic definition to achieve adequate specificity. T. ovis is known to share antigens with T. hydatigena (Blundell et al., 1968), which in turn cross-reacts with hydatid fluid antigens (Schantz, 1973).

Host antigens that occur in preparations of parasite antigens may also be a problem. Hydatid fluid and cyst membranes contain serum antigens from the species of host in which the cysts grow (Chordi and Kagan, 1965; Coltorti and Varela-Diaz, 1972; Varela-Diaz and Coltorti, 1973). Such host components would

probably not present a problem if antigen for immunodiagnosis is produced in the same species of host which is subsequently tested, for example, C. bovis fluid used diagnostically for bovine infections. On the other hand, heterophil antigens such as the ABO blood group could react with isoantibodies of any host species and may have to be removed from diagnostic antigens.

#### E. Ontogeny of antibody production

Few studies have been carried out on the antibody response of cattle to C. bovis. Walther and Grossklaus (1972) and Gallie and Sewell (1974) found that cattle infected at an early age continued to have significant antibody titers for at least one year and probably much longer. Similar experiments will have to be performed during the proposed study as different tests and antigens are likely to detect different classes and specificities of antibodies.

#### General Project Plan

Duration of four years with some preliminary work done by C.S.U./A.I.D. Afr. 790 personnel before the start of funding.

Phase 1: preparatory work, six months; collection of antigens, trials with existing serological tests, antigen production in experimental animals, start of research at C.S.U.

Phase 2: buildup of research in Kenya, one year; stockpiling of experimentally produced antigens, preliminary trials with tests using developed antigens.

Phase 3: major research, two years; research in cooperation with returned Kenya participants.

Phase 4: termination, six months; field trials and writing of reports and papers.

## Methods and Techniques

### A. Phase I: preparatory work

Collection will be made of hydatid cyst fluid, T. saginata and T. hydatigena tapeworm stages, and bovine sera. Portions of these collected materials will be sent to C.S.U. and the C.P.Z. for their work. Necessary reference reagents will be distributed to Kenya and C.S.U. from the C.P.Z.

A field trial involving ante-mortem diagnosis of cysticercosis in 50-100 feedlot cattle, using already existing serological tests, will be carried out by present C.S.U./A.I.D. Afr. 790 personnel and Kenyan scientists.

An experiment will be performed on calves to determine if immunosuppression with cyclophosphamide will allow massive C. bovis infection in order to increase the yield of cyst fluid antigen. Serial serum samples will be collected in order to examine the ontogeny of antibody production in untreated controls, and to confirm immunosuppression in the treated animals.

Reference antisera to all antigens to be used will be produced and distributed to the cooperating agencies.

Consultation will begin on immunodiagnostic tests for hydatidosis with the W.H.O. Immunology Laboratory of Kenyatta National Hospital where Prof. Houba and Dr. H. Pamba have already started such work.

Dr. Leonard Pearson and other scientists at C.S.U. will begin work on immunoadsorption techniques, in vitro lymphocyte stimulation, and other immunological procedures. They will be attempting to work out techniques which could be applied in the research in Kenya. The application of column adsorption methods to the removal of hydatid-like antigens from C. bovis and T. saginata and hydatid fluid preparations will be tested by nucleoside uptake (both thymidine and uridine) for sensitivity to the homologous and heterologous antigens. Antigen preparations will be tested using unsensitized lymphocytes for intrinsic mitogenic

activity, and for mitotic inhibition following exposure to various phytolectins.

B. Phase 2: buildup of research in Kenya for the returning graduate students

This will last until the graduate students return from study in the U. S. to Kenya. C. bovis cyst fluid will be produced by infecting immunosuppressed hosts in accordance with the findings of Phase 1. Preliminary trials with the indirect hemagglutination, latex agglutination and immunoelectrophoresis tests will be performed with cyst fluid antigen and comparisons will be made using strobilate antigen. Bovine lymphocyte cultures will be standardized for antigen-induced uptake of radioactive nucleosides.

C. Phase 3: major research

Cattle of different ages will be infected with different levels of T. saginata eggs.

The ontogeny of immune reactivity will be studied by the serological and in vitro culture methods mentioned above and also by intradermal testing for immediate and delayed hypersensitivity. Bovine sera already collected from abattoirs will be serologically screened. Antigenic comparisons will be made between T. saginata, T. solium, T. hydatigena, E. granulosus and, if possible, T. ovis. T. saginata cyst and strobilate antigens will be compared. The effects of chromatographic segregation and immunoadsorption of antigens on specificity and sensitivity will be examined. The experimental protocols will have been written at the beginning of this phase in conjunction with the graduate students.

D. Phase 4: termination

The only additional research will be to apply the tests which have given the best results in the laboratory to cattle in Kenyan feedlots and to examine the animals at slaughter to confirm the results. The data from previous experiments will be analyzed. The students will write their theses and papers will be prepared for publication.

Over two hundred sera have been collected from abattoirs in different parts of Kenya and the post mortem findings from routine meat inspection procedures have been noted for each. An immunology laboratory developed for this research contains equipment for immunoelectrophoresis, column and thin layer chromatography, preparative ultracentrifugation, serology, and so forth. Thus, a base already exists at the University of Nairobi for the research proposed in this report.

The East Africa Veterinary Research Organization (E.A.V.R.O.) is an alternate suitable location for the proposed project. This laboratory has most of the major equipment necessary, as well as ample animal holding space. This laboratory facility has been used for cysticercosis research in the recent past, and the helminthologist, J. Onyango-Abuje, is anxious to do cooperative research on bovine cysticercosis. The United States Department of Agriculture maintains an immunologist at E.A.V.R.O., attesting to the suitability of this facility for immunological research.

The final choice of location in Kenya is a matter for the Kenyan government to decide in consultation with C.S.U. and A.I.D.

#### Personnel Qualifications

##### A. Principal investigators

A. E. Sollod, V.M.D., Ph.D., Visiting Senior Lecturer, Department of Veterinary Pathology and Microbiology, University of Nairobi; Associate Professor, Department of Pathology, Colorado State University.

C. V. Kimberling, D.V.M., M.P.H., Campus Coordinator, Kenya Project Contract A.I.D./Afr. 790, Colorado State University.

##### B. Co-investigators

The following scientists have stated their willingness to

undertake research and/or training of graduate students. Other scientists with suitable research backgrounds may be identified to undertake research jointly with the principal investigators.

J. M. Gathuma, B.V.M., M.Sc., Lecturer, Department of Public Health, Pharmacology and Toxicology, University of Nairobi.

J. Onyango-Abuje, B.S., M.Sc., Research Scientist, East Africa Veterinary Research Organization.

Dr. Leonard Pearson, Assistant Professor, Department of Microbiology, Colorado State University.

Dr. Robert Rubin, Professor, Department of Pathology, Colorado State University.

Dr. V. M. Varela-Diaz, Head of the Immunology Laboratory, Pan American Zoonoses Center, Pan American Health Organization.

#### Previous Research Contracts and Grants

Prior to his joining A.I.D./Afr. 790 in 1974, Dr. Sollod was engaged in research on the immunology and in vitro cultivation of parasitic diseases at the University of Saskatchewan (Canada) College of Veterinary Medicine. Funding was provided continuously from 1968 to 1974 by the Medical Research Council of Canada. From 1966-1967 he was a U. S. Public Health Service Post-doctoral Trainee at the University of Pennsylvania. Working on A.I.D./Afr. 790 at the University of Nairobi his research has been supported by contract funds in addition to a University of Nairobi Dean's Committee Grant. Other current research projects and grants received by Dr. C. Kimberling are:

<u>Association</u>	<u>Title</u>	<u>Sponsor</u>	<u>Funding</u>	<u>Duration</u>
Campus Coord.	Kenya Project	A.I.D.	\$2,818,200	1 July 71-30 June 78
Director	Health Prof. Special Proj.	H.E.W.	141,096	1 July 75-30 June 78
Director	Health Manpower Educ. Initiative Training	H.E.W.	207,868	1 July 75-30 June 78

## Facilities and Resources

### Institutional Facilities

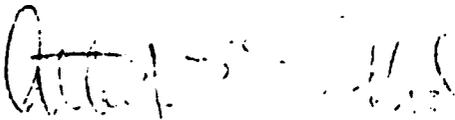
C.S.U. has all the laboratory facilities, major equipment, and animal holding and isolation facilities necessary for the project. Samples submitted on U. S. Animal and Plant Health Inspection Service can be adequately held in isolation and disposed. The C.S.U. College of Veterinary Medicine has a long-standing interest in development aid programs, and both principal investigators are currently employed by C.S.U. to work on Kenya contract project A.I.D./Afr. 790.

The C.P.Z. routinely performs research on the immunology and epidemiology of parasitic infections. The institution serves as a central diagnostic and training facility, and is willing to help cooperating institutions adopt and standardize serodiagnostic tests. We have been informed by Dr. Varela-Diaz that the Immunology Laboratory of the C.P.Z. has been directed to search for an immunodiagnostic test for cysticercosis in pigs. Thus, research will be undertaken on a problem similar to the central research problem of this project proposal, namely, to develop a suitable immunodiagnostic test for a metacestode infection of the natural domestic animal host. The C.P.Z. will not require funds nor facilities to cooperate in this project, but only tuition costs to cover the training of the Kenyan graduate students.

During the past two years preliminary research on C. bovis has been carried out in the Department of Veterinary Pathology and Microbiology, with adjunct research by one faculty member from the Department of Public Health and Toxicology. Work has been carried out on changes in immunoglobulin levels during cysticercosis, without regard to antibody activity. In addition, a seroepidemiological survey is in progress using the indirect hemagglutination test with strobilate tapeworm antigen and the indirect fluorescent antibody test with hatched oncospheres on bovine serum samples.

Summary of the Contributions of Cooperating Institutions

C.S.U. will cooperate with the University of Nairobi or the East Africa Veterinary Research Organization on a program of graduate study for three Kenyan students at the Ph.D. level. The C.P.Z. will provide the students with short training periods in immunodiagnosis. U.S.A.I.D. will finance the research program, the graduate training of the students at C.S.U. and in Kenya, and provide tuition for their training at the C.P.Z. The C.P.Z., operating under their own budget, will provide standardized components for the immunodiagnosis of hydatid disease in man, as well as C. cellulosa antigen to test for cross reactivity with other metacestodes. The Kenyan research facility will provide C. bovis/T. saginata antigens and T. saginata infective eggs and hydatid cyst antigens of East African origin. The Kenyan facility, C.S.U., and the C.P.Z. will exchange scientific and technical information and ideas by maintaining continuous liaison.

  
Albert E. Sollod, V.M.D., Ph.D.

Visiting Senior Lecturer

Department of Veterinary Pathology & Microbiology

University of Nairobi

CSU/USAID Kenya Project

Revised: 15 December 1976

Second Revision: 5 August 1977

- Gallie, G. J. and M. M. H. Sewell (1974). The serological response of calves infected neonatally with Taenia saginata (Cysticercus bovis). Trop. An. Hlth. Prod. 6, 173-7.
- Kagan, I. C., Osimani, J. J., Varela, J. C., and D. S. Allain (1966). Evaluation of intradermal and serologic tests for the diagnosis of hydatid disease. Am. J. Trop. Med. Hyg. 15, 172-9.
- Mann, I. (1973). Request for technical and financial assistance for research into cysticercosis/taeniasis/echinococcosis problems. Memorandum from the Animal Health and Industry Training Institute of Kenya, 4 p.
- Mann, I. (1974). The background and outline of the research programme in echinococcosis (hydatidosis) in Kenya. Abstract of a paper presented at the Third International Congress of Parasitology, Munich, 2 p.
- Martin, C. (1972). La cysticerose bovine au Tchad, Essai de diagnostic serologique. Rev. Eleve. Med. Vet. Pays Trop. 25, 73-7.
- Morris, N., Proctor, E. M., and R. Elsdon-Dew (1968). A physicochemical approach to the serological diagnosis of cysticercosis. J. S. Afr. Vet. Med. Assn. 39, 41-3.
- Kosina, S. K. (1965). Immunological methods for diagnosing experimental cysticercosis in cattle. Uchen. Zap. Kazan. Vet. Inst. 94, 123-6.
- Nelson, G. S. and E. L. Rausch (1963). Echinococcus infections in man and animals in Kenya. Ann. Trop. Med. Parasit. 57, 136-49.
- Pawlowski, Z. and M. G. Schultz (1972). Taeniasis and cysticercosis (Taenia saginata). Adv. Parasit. 10, 269-343.
- Schantz, P. M. (1973). Immunodiagnostic tests with Echinococcus antigens in sheep with homologous and heterologous larval cestode infections. Rev. Inst. Med. Trop. Sao Paulo 15, 179-94.
- Schantz, P. M., Fordham von Reyn, C., Welty, T., and M. G. Schultz (1976). Echinococcosis in Arizona and New Mexico. Am. J. Trop. Med. Hyg. 25, 312.
- Schultz, M. G. (1974). The current status of cysticercosis/taeniasis in the United States. Abstract of a paper presented at the WHO/BGA joint consultations on taeniasis/cysticercosis research, Neuherberg, 11 p.

## REFERENCES

- Beltran, F. and A. Gomez-Priego (1973). Evaluacion de los contraimmuno-electroforesis (CIEF) para la deteccion de anticuerpos en las cisticercosis experimental y humana. *Antioquia med.* 23, 472-3.
- Biagi, F. F. and J. Tay (1958). A precipitation reaction for the diagnosis of cysticercosis. *Am. J. Trop. Med. Hyg.* 7, 63-5.
- Blundell, S. K., Gemmell, M. A., and F. N. Macnamara (1968). Immunological responses of the mammalian host against tapeworm infections. VI. Demonstration of humoral immunity in sheep induced by the activated embryos of Taenia hydatigena and T. ovis. *Exptl. Parasit.* 23, 79-82.
- Bugyaki, L. (1961). Diagnostic de la cysticerose a l'aide de l'intradermoreaction. *Bull. Epizoot. Dis. Afr.* 9, 15-23.
- Capron, A., Vernes, A., and J. Biguet (1967). Le diagnostic immuno-electrophoretique de l'hydatidose. In Le Kyste Hydatique du Foie. SIMEP, Ed., Journees Lyonnaises d'hydatidologie 27-40.
- Casoni, T. (1911). La diagnosi biologica dell' echinococcosi umana mediante l'intradermorazione. *Folia Clin. Chem. et Micro.* 4, 5-16.
- Chordi, A. and I. Kagan (1965). Identification and characterization of antigenic components of sheep hydatid fluid by immunoelectrophoresis. *J. Parasit.* 51, 63-71.
- Coltorti, E. A. and V. M. Vareia-Diaz (1972). IgG levels and host specificity in hydatid cyst fluid. *J. Parasit.* 58, 753-6.
- Dao, C., Arnault, J. P., Petithery, J., and L. Brumpt (1972). L'immunofluorescence indirecte sur coupes de T. solium dans le diagnostic de la cysticerose: Resultats obtenus chez 35 malades. *Nouvelle Presse Med.* 1, 2049-50.
- Dewhirst, L. W., Cramer, J. D., and J. J. Sheldon (1967). An analysis of current inspection procedures for detecting bovine cysticercosis. *J. Am. Vet. Med. Assn.* 150, 412-17.
- Froyd, G. (1963). Intradermal tests in the diagnosis of bovine cysticercosis. *Bull. Epizoot. Dis. Afr.* 11, 303-6.
- Froyd, G. (1965). The incidence of cysticercosis. *Bull. Of. Int. Epizoo.* 63, 311-20.

- Schultz, M. G., Hermos, J. A., and J. H. Steele (1970). Epidemiology of beef tapeworm infection in the United States. Public Health Reports 85, 169-76.
- Sevell, M. M. H. and G. J. Gallie (1974). Immunological studies on experimental infections with the larval stage of Taenia saginata. In Parasitic Zoonoses. Edited by E. J. L. Soulsby, Academic Press, Inc., New York, 187-93.
- Urquhart, G. M. (1961). Epizootiological and experimental studies on bovine cysticercosis in East Africa. J. Parasit. 47, 857-69.
- Varela-Diaz, V. M. and E. A. Coltorti (1974). Limitaciones de la intradermorreaccion de Casoni en el inmunodiagnostico de la hidatidosis humana. Boletin de la Oficina Sanitaria Panamericana, 76, 400-4.
- Varela-Diaz, V. M. and E. A. Coltorti (1974a). Hidatidosis humana, tecnicas para el diagnostico inmunologico. Centro Panamericano de Zoonosis. Monograph No. 7.
- Varela-Diaz, V. M., Coltorti, E. A., Prezioso, J., Lopez-Lomes, M. H., Guisantes, J. A., and L. A. Yarzabal (1975). Evaluation of three immunodiagnostic tests for human hydatid disease. Am. J. Trop. Med. Hyg. 24, 312-19.
- Varela-Diaz, V. M., Coltorti, E. A., Ricardes, M. I., Guisantes, J. A., and L. A. Yarzabal (1974b). The immunoelectrophoretic characterization of sheep hydatid cyst fluid antigens. Am. J. Trop. Med. Hyg. 23, 1022-6.
- Varela-Diaz, V. M., Guisantes, J. A., Ricardos, M. I., Yarzabal, L. A., and E. A. Coltorti (1975a). Evaluation of whole and purified hydatid fluid antigens in the diagnosis of human hydatidosis by the immunoelectrophoresis test. Am. J. Trop. Med. Hyg. 24, 298-303.
- Verster, A. (1965). Taenia solium Lin., (1958) in the chacma baboon, Papio ursinus (Kerr, 1972). J. S. Afr. Vet. Med. Assn. 36, 580.
- Verster, A. (1971). Preliminary report on the golden hamster as a definitive host of Taenia solium, Linnaeus, 1958 and Taenia saginata, Goeze 1972. Onderstepoort J. Vet. Res. 38, 63-4.

- Verster, A. (1974). The golden hamster as a definitive host of Taenia solium and Taenia saginata. Onderstepoort J. Vet. Res.
- Walther, M. and D. Grossklaus (1972). Untersuchungen zur frage der rinderzystizerkose mit hilfe der indirekten hammagglutination. Zbl. Vet. Med. 19, 309-19.
- Williams, J. F., Lopez-Adaros, H., and A. Trejos (1971). Current prevalence and distribution of hydatidosis with special reference to the Americas. Am. J. Trop. Med. Hyg. 20, 224-36.
- Williams, J. F. and P. M. Schantz (1970). Present situation with regard to the use of immunodiagnostic tests to determine the prevalence of E. granulosus infection in lower animals. World Health Organization Memorandum Zoon/WP/70.17, 2 p.
- Williams, J. S., Gore, R. W., and E. H. Sadun (1972). Trichinella spiralis: Antigen-antibody interaction assayed by radioactive iodinated antigen. Exptl. Parasit. 31, 299-306.

PROPOSED BUDGET

for

CYSTICERCOSIS RESEARCH AND TRAINING PROGRAM

	<u>1st year</u>	<u>2nd year</u>	<u>3rd year</u>	<u>4th year</u>
I. SALARIES	118,948	130,822	143,859	159,289
II. PERA	10,055	11,060	12,161	13,489
III. OVERHEAD	62,360	68,598	75,420	83,853
IV. ALLOWANCES	15,950	15,950	16,450	16,450
V. TRAVEL & Transportation	23,950	31,600	13,500	29,150
VI. OTHER DIRECT COSTS	13,794	14,421	15,113	15,873
VII. COMMODITIES & RESEARCH MATERIALS	45,000	45,000	45,000	45,000
VIII. PARTICIPANT COSTS	<u>34,584</u>	<u>34,584</u>	<u>6,500</u>	<u>6,500</u>
TOTALS	324,641	352,035	328,003	369,604

FOUR YEAR TOTAL \$1,374,283

PROPOSED BUDGET

for

CYSTICERCOSIS RESEARCH AND TRAINING PROGRAM

	<u>1st</u> <u>year</u>	<u>2nd</u> <u>year</u>	<u>3rd</u> <u>year</u>	<u>4th</u> <u>year</u>
<b>I. <u>Salaries</u></b>				
<b>A. Field Staff</b>				
1. Principal Investigator (Dr. A. E. Sollod)	28,000	30,800	33,880	37,260
2. Co-Investigator (Local Research Associate)	7,279	7,985	8,783	9,661
3. Sr. Lab. Technician (Local)	3,571	3,928	4,321	4,753
4. Lab. Assistant (Local Grade III)	1,186	1,305	1,436	1,580
5. Animal Attendant (Local Grade II)	735	809	890	979
6. Sr. Administrative Asst.* (Local)	5,505	6,055	6,660	7,326
7. Secretary (Local)	4,705	5,176	5,694	6,263
8. Driver (Local)	<u>1,467</u>	<u>1,614</u>	<u>1,775</u>	<u>1,953</u>
	52,448	57,672	63,439	69,775
<b>B. On Campus</b>				
1. Coordinator (50%) (C.S.U.)	14,500	15,950	17,500	19,310
2. Co-Investigator	28,000	30,800	33,880	37,260
3. Lab Technician	10,000	11,000	12,100	13,310
4. Secretary	<u>14,000</u>	<u>15,400</u>	<u>16,940</u>	<u>18,634</u>
	66,500	73,150	80,420	89,514
<b>II. <u>PERA</u> - 10.64%</b>				
A. Field Staff (I.A. 1. only)	2,979	3,277	3,605	3,965
B. On Campus	<u>7,076</u>	<u>7,783</u>	<u>8,556</u>	<u>9,524</u>
	10,055	11,060	12,161	13,489

\*The Sr. Administrative Assistant and the Secretary position could be combined providing such a person is available.

	<u>1st year</u>	<u>2nd year</u>	<u>3rd year</u>	<u>4th year</u>
<b>III. <u>Overhead</u></b>				
1. Overseas 18.9 (Applicable Salaries and PERA)	5,855	6,441	7,085	7,792
2. Campus 76.8 (Salaries and PERA)	<u>56,505</u>	<u>62,157</u>	<u>68,335</u>	<u>76,061</u>
	62,360	68,598	75,420	83,853
<b>IV. <u>Allowances</u></b>				
A. Housing (Principal Investigator)	8,500	8,500	9,000	9,000
B. Education (c X 2150)	6,450	6,450	6,450	6,450
C. Temporary Lodging	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
	15,950	15,950	16,450	16,450
<b>V. <u>Travel &amp; Transportation</u></b>				
A. Staff Travel to Kenya				
1. Family of 5 @ 1449	7,245			
2. Excess baggage (5 @ 81)	405			
3. Air Freight	2,800			
4. Storage	1,500	1,500	1,500	1,500
B. Home Leave				
1. 5 @ 2898		14,490		
2. Excess baggage @ 162		810		
3. Air freight		2,800		
C. Field Staff Return				
1. 5 @ 1449				7,245
2. Excess baggage (5 @ 81)				405
3. Air freight				3,000
4. Surface freight & auto				5,000
D. Administrative Travel				
1. International trips for investigators & coordinators to visit various aspects of program in S. America, Kenya & U.S.A.	6,000	6,000	6,000	6,000
E. Local Travel (E. Africa)				
1. Field trips & administrative travel	3,000	3,000	3,000	3,000
F. Conferences and International Meetings				
	<u>3,000</u>	<u>3,000</u>	<u>3,000</u>	<u>3,000</u>
	23,950	31,600	13,500	29,150

	<u>1st year</u>	<u>2nd year</u>	<u>3rd year</u>	<u>4th year</u>
<b>VI. <u>Other Direct Costs</u></b>				
A. Workman's compensation, @ 12% of field staff salaries	6,294	6,921	7,613	8,373
B. Out of Pocket	3,000	3,000	3,000	3,000
C. Support of field staff	2,000	2,000	2,000	2,000
D. Reports & publications	1,500	1,500	1,500	1,500
E. Supplemental furnishings	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
	13,794	14,421	15,113	15,873
<b>VII. <u>Commodities</u></b>				
1. Equipment, including lab reagents and materials for research	40,000	40,000	40,000	40,000
2. Laboratory animals including care of such animals	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>
	45,000	45,000	45,000	45,000
<b>VIII. <u>Participant Costs</u></b>				
1. Travel to U.S.A. for graduate study and return	4,500	4,500		
2. Stipend - 3 students	14,400	14,400		
3. Tuition (3 semesters X 3 @ 1131.50/semester)	11,184	11,184		
4. Typing	500	500	500	500
5. Thesis preparation			2,000	2,000
6. Travel & tuition to the Pan American Zoonosis Lab	4,000	4,000	4,000	4,000
	<u>34,584</u>	<u>34,584</u>	<u>6,500</u>	<u>6,500</u>
<b>TOTALS</b>	<u>324,641</u>	<u>352,035</u>	<u>328,003</u>	<u>369,604</u>

## INFORMATION CONCERNING INSTITUTION SUBMITTING PROPOSAL

- A. *This proposal is submitted by COLORADO STATE UNIVERSITY. Contracts and grants that result from this proposal should be made in the name of COLORADO STATE UNIVERSITY.*
- B. *The officials authorized to sign and submit proposals and to negotiate contracts and grants are the following: (1) Dorothy J. Russell, (2) Galen E. Frantz, (3) M.J. Price, Contracts and Grants Administrators; and James F. Brown, Director, Office of Sponsored Research.*
- C. *Correspondence should be addressed to: COLORADO STATE UNIVERSITY, Fort Collins, Colorado 80523; Attention: Director, Office of Sponsored Research; Telephone: 491-6355; Area Code: 303.*
- D. *The officials authorized to sign contracts or to acknowledge grants are: (1) George G. Olson, Vice President for Research and (2) James F. Brown, Director, Office of Sponsored Research.*
- E. *Colorado State University is an agency of the STATE OF COLORADO and enjoys exemption from tort liability.*

## STATEMENT ON SOLICITING

*We hereby certify that we have not employed or retained a company or person (other than a full-time employee) to solicit or secure this contract (grant) and agree to furnish information relating thereto as requested by the Sponsor's cognizant officer.*

*We certify that the distribution of costs between the direct and indirect categories as shown in the proposal conforms to the usual accounting practices of the institution and to the distribution used by the cognizant federal audit agency.*

REPORT TO THE UNIVERSITY OF NAIROBI

Faculty of Veterinary Medicine

University of Nairobi

Nairobi, Kenya

EXAMINATIONS IN VETERINARY PATHOLOGY -- 1975

A. F. Alexander, D.V.M., Ph.D.

Professor and Head

Department of Pathology

Colorado State University

Fort Collins, Colorado

REPORT TO THE UNIVERSITY OF NAIROBI

Faculty of Veterinary Medicine  
University of Nairobi  
Nairobi, Kenya

EXAMINATIONS IN VETERINARY PATHOLOGY -- 1975

A. F. Alexander, D.V.M., Ph.D.  
Professor and Head  
Department of Pathology  
Colorado State University  
Fort Collins, Colorado

The examinations of July 1975 constituted my second year of service as an external examiner in veterinary pathology for the Faculty of Veterinary Medicine of the University of Nairobi. Due to the closure of the university during the academic year, the examinations occurred at a time much later in the calendar year than is usual. Also shortly before the examinations were given the possibility of an additional closure at examination time existed but the problems were resolved and this fortunately did not occur. As with the similar problem in 1974, it is difficult to evaluate the effect of the postponements and new schedule on the performance of either the students or the examiners in their ability to evaluate the students. Although these conditions probably work to the detriment of both groups, adverse effects were nowhere as apparent as in 1974. I doubt that these factors had a significant effect on student performance in 1975.

I received for review the questions for the written examinations for both the second and third year students well ahead of the examination dates. Again this year the questions were extremely comprehensive but I believe quite fair. They did request significant detail from the students but not beyond that of the professionally qualified veterinarian. I made some minor suggestions in the construction of some specific questions and these suggestions were incorporated where appropriate.

I again wish to commend and express my thanks to the faculty of the Department of Pathology for their corporation and efforts in orienting me to the material to be covered in the examinations and the testing procedures being used. This being my second year as an external examiner I found that by being moderately familiar with the curriculum and testing procedures it was much easier for me to participate in the examinations and to render evaluation upon the students which were commensurate with the system being utilized. There is no question but that successive years of service in this capacity improve one's ability to participate and evaluate.

A. Third Year Class: 68 students

1. Written Examinations:

I thoroughly reviewed all written examinations inasmuch as they were not arranged in order of performance. There was good correlation in the grading of the individual instructors whereby the grades for the questions for which the instructor was responsible appeared uniformly obtained. This indicated that the instructor was indeed looking for specific points in the answers to the question and graded accordingly. There was less uniformity between questions and hence between instructors grading the questions. Some tended to mark liberally while others were quite strict. I would imagine however, that these differences averaged out in the end.

2. Oral Examinations:

I participated in the oral examination of all 68 students of the third year class. I was a member of all examining panels for the students in special pathology although the internal examiner membership varied. The quality of the oral examination did not vary significantly from one panel to the other. The written and cumulative test scores made by the examinees were unknown to the panel and therefore the grades determined at the oral examination were unbiased by these factors.

The oral examination remains a very difficult ordeal for the majority of the students and the material covered was at times extremely detailed in nature. As in the previous years I was generally impressed that the students had a basic theoretical knowledge of the subject but that application of this theory was difficult for many.

### 3. Final Grade Determination:

For the sixty-eight students there were no failures and 19 credits given in Special Pathology. However, there had been eight failures given in the oral examination portion of the Special Pathology testing. All of these individuals were able to compensate these marks by their grades in the written examination. There had been no failures given in the written examination. Much better correlation was present at the high end of the scale where 12 of the 19 who received a grade of credit for the course received a credit level score in both the oral and written examination. Only three of those who received a grade of credit in Special Pathology had received less than a passing grade in the other courses for the third year and in no instance was the student in academic trouble in more than one course. In general this seems to indicate that there was good correlation between the written and oral examination on the high end of the scale but less so with the poorer students. One explanation might be that the poor performance of some students in the oral examinations may be strictly related to the emotional strain of the ordeal. In general I was satisfied with the final grade determination in Special Pathology for the third year students and I am in concurrence with those derived.

The third year students graded in Special Pathology were the same students which I examined in second year in 1974. At that time there were seven credits and one failure in general pathology with the failure successfully resiting his examination in June 1974. Thus, there seems to be some correlation in class

quality and I believe that the students sitting the third year examination this year were indeed superior in their performance to those who sat in March 1974.

B. Second Year Class: 86 students

1. Practical Examinations:

I was able to observe the preparation of the material for the practical examination and to review the examination papers upon their completion. The examination material for the most part was of good quality and the questions were fair and comprehensive. I did discuss with Dr. Wandera the need that the specimens chosen for the microscopic portion of the examination be of the highest quality so as to be fair to the students. With this thought in mind Dr. Wandera and myself screened some of the slides and removed those of inferior quality and replaced them with those that were of a satisfactory nature. Strict attention should be given to this problem in the future. In reviewing the examination papers for the practical test I found that the grading was consistent and fair and that in general the students made good grades in this section.

2. Written Examinations:

The questions were comprehensive and fair and the grading varied as one might expect on this type of examination. Again the grading uniformity was quite high by any one instructor but between instructors showed less uniformity. This of course may be due to the nature of the questions involved and the general outlook of the instructor on a particular question.

3. Oral Examinations:

I was a member of the examining panel for all 86 students and believe that although the membership of the panel's internal examiners varied there was good uniformity between the examining panels.

The panel did not know the grades of the student on their written and practical examinations nor on their semester coursework and thus, the oral examinations were not biased by these facts. However, there were instances where this knowledge might have been helpful in arriving at a more equitable evaluation.

As with the third year the oral examination is a very trying ordeal for the student but for the most part the faculty appear to go out of their way to make the student feel at ease and at home and hopefully relieve some of the tension. The questioning was quite detailed for the time allotted and one was again impressed with the fact that the students knew quite a bit of theoretical knowledge but had difficulty in applying the knowledge to practical situations.

#### 4. Final Grade Determination:

From the group of 86 students 8 credits, 67 passes and 11 failures were given. Of the 11 failures 10 had failed three or more of the component scores that make up their final grade, i.e. oral, written, practical and coursework portions. In addition, nine of the 11 with final failure also failed their oral examination and 10 of the 11 had failed the written examination. Nine of the 11 had failed the practical examination and six of the 11 were failing in their coursework average. This indicates that those who failed were indeed deserving of the grade that was given. In like manner those who had received credit for the most part had received credit value grades on the majority of the component scores for their grade. I thus believe that the grades determined for the special pathology section were appropriate and those earned.

Of the 11 who received failure grade in pathology three were students repeating from the previous year, which is another indication that the system of grading is weeding out those students who are not able to perform. Likewise seven of the 11 who failed in pathology had low passes in either parasitology,

microbiology or both. In Contrast, all individuals who received a grade of credit in pathology also received a grade of credit in parasitology and microbiology and one student had received a distinction in microbiology. These figures therefore show a pleasing uniformity in the high and low end of the scale.

C. Resit Examination Questions:

At the time of the review of the questions for both the general pathology and special pathology courses I also reviewed the questions to be used for the resit examinations. I found the questions to be both fair and comprehensive and I believe the resit examinations will serve the purpose for which they are intended.

D. Conclusions:

The examinations conducted were clear, comprehensive and fairly administered. The grades awarded appeared commensurate with the students' ability and knowledge. It is noted that the general performance of the second year class was not as good as that of the third year class. The reason for this is, as in all cases of this nature, not clear. In 1974 it was the third year that did poorly and the second year class that did well. I would assume that some of the variance is the result of a different general achievement level of the two classes. It will be interesting to note how the second year class does in the third year examinations during the coming year. Another factor accounting for this variability might be that with the larger size of classes there is less selection at the lower end of the scale and hence some poor performers are admitted.

In general there was good correlation between the student performance on the oral, written and practical part of the examination along with similar good correlation between these grades and the accumulative coursework grades.

In general the grades from the written examination were higher than those on the oral examination or the accumulative course grade. A couple of factors may account for this. First, specific instructors may have a tendency to grade high upon written examination. Secondly, the psychological trauma associated with the oral examination undoubtedly causes some students to do very poorly in that method of measurement of their knowledge.

As in 1974 I come away with the impression the students in general were well schooled in the theoretical aspect of pathology and indeed in some instances in the minutia of specific disease processes. On the other hand I have the general belief that they appear short on the application of these theories to practical situations and on the interpretative skills in applying their knowledge. This is not a problem that is unique to the students at the University of Nairobi but is one seen in veterinary schools throughout the world. However, certain curricular re-emphasis might help alleviate the situation to some degree.

The faculty is to be commended on the efficiency with which the oral examination was run. The oral exam panels were allowed fifteen minutes per student and the schedule was tightly adhered to. In some instances it would have been extremely desirable to have had approximately five minutes to discuss the students performance among the panel. I believe that in this way certain inequities, if they did occur, could be avoided and special time on the oral examination could be utilized for those students who are on the borderline between either pass or fail or pass and credit.

#### E. Recommendations

1. That the examinations be continued to be administered in the same general manner with portions of the final grade coming from the final written, final practical examination, the final oral and the accumulative class average. More weight for the cumulative average might be considered.

2. In the administration of the second year practical examination great care should be taken to assure that the test material is of the highest quality and thus equal for all students.
3. That external examiners be provided with complete course outlines and hours committed on all facets of the subjects on which they are examining. This would provide for better understanding by the external examiner of the exact material that has been covered and the manner in which it has been presented. This would undoubtedly allow for more thorough and fair questioning of the students and interpretations of the test results.
4. That serious consideration be given to some modification in the second and third year curriculum whereby the second year students would be exposed to a large variety of gross pathological specimens and the third year students allowed to participate in the necropsy laboratory. This would overcome the apparent difficulty of the course relying heavily on colored photographs for exposing the students to the specific disease processes being studied. Gross specimen exposure is particularly pertinent for the second year students. The third year students, by being able to participate in the gross necropsy laboratory would be able to begin to apply on a practical basis their knowledge of the disease processes and to learn the basics of conducting a post mortem examination and arriving at a diagnosis. The procedure would of course be continued throughout the fourth year so that when these students graduated they would have good practical experience in this most important facet of veterinary medicine not only in East Africa but world-wide.

I look forward with personal commitment to serving as external examiner in the coming year. I believe that in so doing I will be able to make valid comparisons between classes performance and have, in that third and final year as external examiner, a good grasp of the program and its goals.

  
A. F. Alexander

Report to University of Nairobi  
Examinations in Medicine  
Faculty of Veterinary Medicine - Kabete

Donald G. Low, D. V. M., Ph. D.  
Head, Department of Clinical Sciences  
Colorado State University  
Fort Collins, Colorado

Nineteen seventy three was my second year of service as an external examiner in veterinary medicine for the University of Nairobi, Faculty of Veterinary Medicine. A comparison can be made between the performance in the examinations of third and fourth year students in the area of medicine between 1972 and 1973.

The questions for the written examinations were received and reviewed well ahead of the examination dates. The questions were reviewed and approved. The examinations were comprehensive and the questions seemed fair. A few minor suggestions, mainly to clarify several questions, were offered and the suggested changes were incorporated in the examination questions.

Six third year students failed to pass their examination in medicine this year as compared to three in 1972 and six in 1971. Little significance is attached to this rather minor variation. The majority of students were knowledgeable and well trained in medicine. In general, I was more favorably impressed by their theoretical knowledge than by their ability to apply this knowledge. Much of the deficiency is obviously related to inexperience and is characteristic of veterinary students everywhere. The students appeared

to be more knowledgeable in general in the diseases of large animals than in the diseases of horses and pets. I believe this reflects the emphasis in the curriculum and I agree with the concept of heavier emphasis on animals of economic importance. While there was an improved understanding of physical diagnosis, the technics involved and the interpretation of the results obtained by physical examination as compared to last year's third year class, there is still a noticeable deficiency in the students' knowledge in this area. Too many students are still not familiar with the signs, detectable by physical examination technics, that the clinician can elicit and must understand. Three third year students received credits in medicine. There were no distinctions.

In the fourth year class, two students failed their examinations in medicine, the same number as in 1972 and as compared to four in 1971. There were five credits and no distinctions. The fourth year students performed well and clearly showed the advantage of more hospital training and greater practical orientation. As in the case of third year students, the examination questions were fair and comprehensive.

The oral examinations continue to be a real ordeal and cause of emotional trauma to the students. While there has been some change to increase emphasis of other facets in the evaluation of a student's performance, the final oral examination continues to occupy an exceedingly dominant position in determining whether a student passes or fails.

As reported last year, the practical examination in medicine provided the best single evaluation of fourth year students. Each of seven examiners

spent 20 minutes with each student evaluating his ability to effectively examine several different species of animals. This provided the examiners an opportunity to evaluate the effectiveness and efficiency of each student in performing a physical examination and in evaluating the significance of his findings. It provided an opportunity for questioning the student relative to his approach for conducting a physical examination, evaluating the findings and discussing the disease present in the animal being examined.

Both third and fourth year students continue to demonstrate good knowledge of laboratory medicine, both with respect to indications for various tests and interpretation of the results of the tests. Additional use of the laboratory by clinicians should be encouraged to continue to develop this valuable teaching facility.

Fourth year students were infinitely more adept at orienting themselves with a radiograph this year than was true of the fourth year students in 1972. Only radiographs of normal structures were used during the practical examination so the ability of the students to interpret abnormalities in a radiograph was not evaluated. Fourth year students were also much more proficient in the use of a stethoscope than was true of the fourth year students in 1972. There was still a serious deficiency in the students' ability to perform an efficient, effective physical examination and then to concisely summarize the results of that examination.

## Conclusions and Recommendations

1. The examinations were clear, comprehensive and fairly administered and graded.
2. The Faculty of Veterinary Medicine is again to be commended on the quality of education provided.
3. Morale among students and faculty remains high and both faculty and students seem highly motivated.
4. As was mentioned in my report last year, I believe there is an excessive reliance on the lecture system of teaching with perhaps less than adequate coordination between departments and lecturers with respect to course content and material presented in the various courses. I strongly recommend reduced lecture time and increased time in the teaching hospital. The lectures that are given should be coordinated to a much greater degree. At the present time there may be much repetition, but the repetition may be confusing equally as often as re-enforcing. The coordination must cross departmental lines.
5. It would be desirable to have third year students involved in hospital type teaching to a greater extent. Case oriented teaching increases both motivation and retention of information.
6. The recommendation is again made to introduce a course in physical diagnosis consisting of both lectures and laboratories. If this is not possible, a specific section of existing medicine courses should be reserved for teaching physical diagnosis.

7. The expanded herd health program, introduced by Dr. Kimberling and continued and enlarged by Drs. Burrows and Johnson, continues to be a strong feature of the teaching program in medicine. Every effort should be made to continue the program and expand it if possible.

REPORT TO THE UNIVERSITY OF NAIROBI  
EXAMINATIONS IN SURGERY  
FACULTY OF VETERINARY MEDICINE - KABETE

William V. Lumb, D.V.M., M.S., Ph.D.

Director, Surgical Laboratory

Colorado State University

Fort Collins, Colorado

This was my first year as an external examiner of junior and senior students in Veterinary Surgery. A total of 79 juniors and 52 seniors were examined. Because the system of examination is somewhat different than the one to which I am accustomed, my first year impressions are probably not as cogent as those of more experienced examiners.

The examinations this year were marred by the student strike which occurred immediately prior, and the effects of the strike were undoubtedly reflected in the abilities of students to perform on the examinations. Furthermore, the foreshortened time allotted to the examinations probably compromised to some extent the ability of the examiners to devote adequate time to each student. I was disappointed in the number of students who did not do well on the examinations, but this may have been a reflection of the strike.

The examinations in surgery for juniors were oral. They covered a wide range of surgical procedures in both large and small animals. In addition, surgically-related questions were asked in bacteriology, physiology, pharmacology, anatomy and radiology, since the surgical correction of disease processes requires the application of these

disciplines. In general, the students answered strictly theoretical questions fairly well.

The major criticism of junior students is their lack of ability to relate their theoretical knowledge to practical situations. This stems, of course, from their very limited exposure to clinical cases. It is suggested that every attempt be made to draw their attentions to animals with surgical conditions hospitalized in the clinic and that consideration be given to allotting time in the junior year to clinical practice. Considerable benefit could probably be obtained by pairing juniors with seniors in the clinic.

Senior students were given both oral and practical examinations. In general, a few students were excellent in both; however, the general level of knowledge was not as good as that expected. In the practical examination many students appeared to lack the ability to perform a quick, thorough physical examination and to apply knowledge to which they had been exposed in the basic sciences. They often could describe what to do, but not why it should be done. It is recommended that particular stress be placed on teaching the application of basic sciences in the clinic.

Senior students appeared to be deficient in surgical anatomy and radiographic interpretation and technique. In the latter instance some were unable to point out the salient normal organs on radiographs. Regular film reading sessions with small groups of students will  
deficiency.

Effort should be made to increase the exposure of senior students to clinical cases, both large and small animals. This involves both an increase in the time assigned to clinical duties, plus

an increase in the number of animals which they can observe and follow in the hospital.

In conclusion, I was disappointed in the negative attitude with which the students approached the examination. Many complained they didn't feel well. Very few took the examination in a cheerful, positive fashion. There is no question that examinations are a stressing situation; however, it is suggested that the students be advised of the fact that a positive approach makes points with the examiners.

## SUMMARY OF COMMODITY SITUATION

as of  
January 18, 1978

Budgeted C.Y. 1977 to July 1978 -----	\$30,000.00
Plus 15% additional allowable -----	<u>4,500.00</u>
Total possible budget, C.Y. 1977 to July 1978 --	\$34,500.00
Total spent C.Y. 1977 (Commodities & Air Freight	<u>23,171.04</u>
Remainder for spending -----	\$11,328.96
Present commodity orders -----	5,258.06
Plus estimated air freight 35% -----	<u>1,840.32</u>
Total -----	7,098.38

Commodities for order:

Medarco Corporation - 30-01 Brookhaven Ave., Far Rockaway, N. Y. 11691

1000-0-145	Str. 5/B Op. Scissors (6 @ \$5.00) -----	\$ 30.00
1002-0-170	Curved Mayo Scissors, 6 3/4" (6 @ \$4.00) -----	24.00
	Scalpel Handles #3 (6 @ \$3.50) -----	21.00
	Scalpel Handles #4 (6 @ \$3.50) -----	21.00
1211-2-120	Str. Mosquito Forceps (12 @ \$5.00) -----	60.00
1211-3-120	Curved Mosquito Forceps (12 @ \$5.00) -----	60.00
1210-0-160	Str. Crile Forceps, 6 1/4" (12 @ \$4.00) -----	48.00
1210-1-160	Curved Crile Forceps, 6 1/4" (12 @ \$4.00) -----	48.00
1102-0-145	Thumb Forceps, 1 X 2 teeth, 5 1/2" (6 @ \$2.00) -----	12.00
1102-3-300	Thumb Forceps, 4 X 5 teeth, 5 3/4" (6 @ \$5.00) -----	<u>30.00</u> <sup>#</sup> 35!

Haver-Lockhart

4032 00	Instrument tray (6 @ \$13.85) -----	83.10
3413 00	Stainless Bowl, 1 1/2 qt capacity (6 @ \$2.50) -----	15.00
1360 00	Mayo-Hegar Needle Holders (6 @ \$29.00) -----	174.00

Full curved 3/8 circle needles:

1413 02	Size 2, Reverse cutting (6 pkg of 6 @ 2.25)	
1413 08	Size 8, Reverse Cutting (6 pkg of 6 @ 2.25)	
1413 14	Size 14, Reverse Cutting (6 pkg of 6 @ 2.25)	
1413 18	Size 18, Reverse Cutting (6 pkg of 6 @ 2.25) -----	54.00

Ferguson Suture Needles:

1422 03	Size 3 (6 pkg of 6 @ 2.10)	
1422 02	Size 2 (6 pkg of 6 @ 2.10)	
1422 01	Size 1 (6 pkg of 6 @ 2.10) -----	37.80

Martin Suture Needles:

1423 02	Size 2 (6 pkg of 6 @ 2.50)	
1423 04	Size 4 (6 pkg of 6 @ 2.50) -----	30.00
1425 01	Heavy Suture Needle, Size 1 (6 pkg of 6 @ 3.15) -----	18.90
1432 01	4 1/2" half curved spaying needles (12 @ .50) -----	6.00
1430 02	Medium Double curved Spaying Needle (12 @ .70) -----	8.40

Haver-Lockhart (cont.)

1190 00	Allis Tissue Forceps (12 @ \$14.10) -----	\$169.20
1169 00	Backhaus-Roeder Towel Forceps (36 @ 10.50) -----	378.00
1240 00	Ferguson Forceps Curved, 6 1/2" (6 @ \$25.00) -----	150.00
1270 01	Dayen Compression Forceps, Straight (12 @ \$26.50) -	318.00
3175 00	Snook Hook (6 @ \$7.20) -----	43.20
3112 00	Catheters, asstd sizes (3 sets @ 5.85) -----	17.55
39214	Female Bovine Catheter (2 @ \$5.25) -----	10.50
3139 00	Tom Cat Catheters (40 @ .40) -----	16.00

\$ 1579.63Harleco - 480 Democrat Rd., Gibbstown, N. J. 28027

SPECIAL HANDLING BY KENYA PROJ OFFICE

64887	CO <sub>2</sub> Apparatus (3 @ 52.38) -----	157.14
64887 A	CO <sub>2</sub> Reagent Sets (3 @ 9.18) -----	27.54
64887 B	CO <sub>2</sub> Reaction Vessel Sets (3 @ 23.76) -----	71.28

255.96Gelman: Electrophoresis

SPECIAL HANDLING BY KENYA PROJ OFFICE

Kit 51155	Complete Seprotek System Fischer Cat #9-528-20 -----	325.00
-----------	---	--------

325.00

(Tele 800-325-4370)

Jones Vet Supply

Dynaprobe Model DV-260 including 4 tips as follows:

6602-77-30 (2 mm)	
6602-79-50 (6.6 mm)	
6602-76-20 (4.7 mm)	
6602-80-60 (18 mm flat) -----	750.00

Extra Tips:

6602-68-35 (2 mm extended) -----	105.00
6602-69-25 (5 mm extended) -----	105.00

Accessories:

7845 Adapter to CGA-320 -----	30.00
7846 Adapter to CBA-320 -----	50.00
Dynaspray Model DV-270 -----	295.00

Jones Vet (cont.)

Azium, 2 mg./ml., 100 ml. (50 vials @ 6.00) ----- \$300.00  
 CMT Paddles (6 @ 6.00) ----- 36.00

\$1671.

Poor Richards Calculators, Fort Collins:

✓ Calculator #TI 5050 M ----- 109.95

4 109.95

( Photo and cassette copying of approximately 50 auto-tutorial  
 ( carousels in veterinary ophthalmology -- approx ----- 700.00  
 ( (ALREADY ORDERED FROM DR. SEVERIN; DELIVERY BY APRIL 1)  
 (

3 700.00

BOOKS FOR ORDER:

✓ Diagnostic Procedures in Veterinary Microbiology, 2d Ed, Carter ---- 12.00

Microbiology, 2nd Ed., Davis, Dulbecco, Eiseu, Ginsberg, Wood,  
 McCarty. Pub. Harper & Row ----- 30.00

Parasitic Protozoa. Ed. by Kreier. 4 Volumes: 1, 2, 3 & 4  
 Academic Press, N. Y. ----- 135.00

Reproduction in Domestic Animals, 3rd Ed., Cole & Cupps, Academic  
 Press ----- 40.00

Pathophysiology of Parasitic Infection, Soulsby, Academic Press ---- 33.00

The Evaluation of Feeds Through Digestibility Experiments.  
 Schneider & Flatt, Academic Press ----- 19.50

Wound Repair, Peacock & Van Winkle, latest edition ----- 35.00

✓ Veterinary Ophthalmology Notes, Severin, 2nd Ed (2 @ 4.00) ----- 8.00

4 \$317.00

Total order \$ 5258.05

Mr. Dalmas O. Were,  
Pan American World Airways,  
Box 19130 (Tel. 822111)  
NAIROBI.

June 28, 1978

Dear Mr. Were,

A box of Air Freight from Colorado State University addressed to me at the University of Nairobi will be arriving shortly. The A.W.B. No. is 026-17921396, I have enclosed a copy of the packing list with total value of the shipment.

Since I am returning to the U.S. very soon, probably before this shipment can be cleared, I have asked Dr. Paul Sayer Faculty of Veterinary Medicine, Box 29053, Kabete, University of Nairobi, to receive this shipment on behalf of the University. By this letter, I authorize Dr. Sayer as my agent for this shipment. His telephone numbers are 592248 (office) and 592288 (home).

Please assist Dr. Sayer as you have done so ably for me in the past.

Yours sincerely,

William A. Wolff, D.V.M.  
CSU/USAID Chief of Party

c.c. Dr. P.D. Sayer  
Faculty of Vet. Medicine  
Kabete.

Encl:

Items sent to Dr. Wolff via Cowan:

Vijay's slides -----	
3 ea CO <sub>2</sub> Apparatus -----	164.64
3 ea CO <sub>2</sub> Reagent Sets -----	34.10
3 ea CO <sub>2</sub> Reaction Vessel Sets -----	70.56
100 ea Offprints, J. Small Animals Practice, paper 481, Ndiritu -----	42.00
1 ea Calculator -----	93.46
1 ea Gelman Electrophoresis Complete Seprotek ----- <i>clim.</i>	355.78

Received February 18, 1978  
W. A. Wolff

\$ 760.54

No air freight charges



College of Veterinary Medicine  
and Biomedical Sciences  
Kenya Project

Colorado State University  
Fort Collins, Colorado  
80523

June 7, 1978

Mr. James Samaras, Pres.  
Samaras International  
6753 E. 47th Ave., Suite A  
Denver, Colorado 80216

Dear Mr. Samaras:

We are forwarding to you one (1) box, via Trans-Western Express, for documentation and arrangement for shipment via air freight to Nairobi, Kenya, East Africa. This shipment is to go via U.S. flag carrier with arrangements for uninterrupted transit of shipment to degree possible.

The contents of the box, TEACHING AID EQUIPMENT, has a total value of \$3,567.53. Please insure the box for this amount and bill us by separate invoices for the charges of insurance, documentation and shipping.

The shipment of these boxes is consigned as follows:

Dr. William A. Wolff  
Faculty of Veterinary Medicine  
University of Nairobi  
P. O. Box 29053  
KABETE, Kenya                      TELE: 60914

Your invoices for each of above services and a copy of the air freight waybill should be sent to the CSU Kenya Project Office, 33 Vet Med Bldg, Colorado State University, Fort Collins, Colorado 80523. Thanks for your services.

Sincerely,

Cleon V. Kimberling, D.V.M.  
CSU Coordinator, Kenya Project

jk  
Encl: Listing of items and value  
cc: Dr. William A. Wolff ✓

026-17921396

026-17921396

Airport of departure (address of first carrier) and requested routing <b>DENVER COLO</b>		Airport of Destination <b>NAIROBI</b>		Flight/Day <b>UA/164</b> <b>6-15</b>	Flight/Day <b>PA/188</b> <b>6-16</b>
---	--	--	--	--	--

To <b>JFK</b>	by first carrier <b>UA</b>	to <b>NBO</b>	by <b>PA</b>
Consignee's account number		Consignee's name and address <b>DR. WILLIAM A. WOLFF</b> <b>FACULTY OF VETERINARY MEDICINE</b> <b>UNIVERSITY OF NAIROBI</b> <b>P O BOX 29053</b> <b>KABETE, KENYA</b>	

Not negotiable  
**Air Waybill**  
(Air Consignment note)  
ISSUED BY  
**Pan American World Airways, Inc.**  
NEW YORK, N.Y., U.S.A.

**PAN AM**  
**Clipper Cargo**

Member of International Air Transport Association

If the carriage involves an ultimate destination or stop in a country other than the country of departure, the Warsaw Convention may be applicable and the Convention governs and in no case limits the liability of carriers in respect of loss of or damage to cargo. Agreed stopping places are those places (other than the places of departure and destination) shown under requested routing and/or those places shown in carriers' timetables as scheduled stopping places for the route. Address of first carrier is the airport of departure  
SEE CONDITIONS ON REVERSE HEREOF

Shipper's account number	Shipper's name and address <b>CLEON V. KIMBERLING, D.V.M.</b> <b>CSU COORDINATOR, KENYA PROJECT</b> <b>33 VET MED BLDG</b> <b>COLORADO STATE UNIVERSITY</b> <b>FORT COLLINS, CO 80523</b>
--------------------------	--

The shipper certifies that the particulars on the face hereof are correct, agrees to the CONDITIONS ON REVERSE HEREOF, accepts that carrier's liability is limited as stated in 4(c) on the reverse hereof and accepts such value unless a higher value for carriage is declared on the face hereof subject to an additional charge and that insofar as any part of the consignment contains restricted articles, such part is properly described by name and is in proper condition for carriage by air according to the International Air Transport Association's Restricted Articles Regulations.

**S/C. KIMBERLING**  
SIGNATURE OF SHIPPER OR HIS AGENT

Issuing carrier's agent, account no <b>06-60229</b>	Issuing carrier's agent, name and city <b>SAMARAS INT'L CORP., DENVER CO</b> <b>80238</b>
--	---

Carrier certifies goods described below were received for carriage subject to the Conditions on reverse hereof, the goods then being in apparent good order and condition except as noted hereon.

**JUNE 14, 1978**      **DENVER COLO**  
EXECUTED ON (Date) at (Place)  
*Kathy Reed*  
SIGNATURE OF ISSUING CARRIER OR ITS AGENT

Copies 1, 2 and 3 of this Air Waybill are originals and have the same validity

Currenty <b>US\$</b>	Declared value for carriage <b>MAX FREE</b>	Declared value for customs <b>\$3567.53</b>	Amount of insurance <b>\$3567.53</b>	INSURANCE: If shipper requests insurance in accordance with conditions on reverse hereof, indicate amount to be insured in figures in box marked amount of insurance.
-------------------------	--	--	---	---

WEIGHT CHANGE AND VALUATION CHARGE		ALL OTHER CHARGES AT ORIGIN		Accounting information			Nature and quantity of goods (incl. dimensions or volume)
PREPAID	COLLECT	PREPAID	COLLECT	Rate/Charge	Total		
<b>XX</b>		<b>XX</b>					<b>TEACHING AID EQUIPMENT</b>
No. of packages <b>1</b>	Actual gross weight <b>166# 16</b>	Rate class <b>Q</b>	Chargeable weight <b>166#</b>	<b>2.98</b>	<b>494.68</b>		

pre-paid	Prepaid weight charge <b>494.68</b>	Prepaid valuation charge	Due carrier <b>18.00</b>	Total other prepaid charges <b>14.00</b>	Due agent	Total prepaid <b>\$508.68</b> <b>526.68</b>	For carrier's use only at destination
----------	--	--------------------------	-----------------------------	---	-----------	---	---------------------------------------

Other charges (except weight charge and valuation charge) <b>INSURANCE CHARGE 18.00 U.S. TAX</b>	<b>AWB 4.00; TSF 7.00 XMKX</b>	Collect charges in destination currency
	<b>A. TRANS. 3.00</b>	COD amount
<b>C. O. D. FEE</b>		Total charges

collect	Collect weight charge	Collect valuation charge	Due carrier	Total other collect charges	Due agent	COD amount	Total collect

These commodities licensed by the United States for ultimate destination **KENYA**. Diversion contrary to United States law prohibited.

026-17921396

SHIPMENT - JUNE 1978

Box 1:

*clinic*  
P.O.

*Path ->*  
*complete*

01263	1 ea	Clay-Adams Centrifuge	102.35
01797	3 ea	Cornell Teat Curette @ 3.10/ea	9.30
01803	1 pl	Rumen Compound Powder	43.50
"	1 ea	Clay-Adams Centrifuge	249.26
02051	2 doz	Needles, Stainless, Hypodermic, 18 g x 3" @ 3.00/doz	6.00
"	12 doz	Needles, Stainless, Hypodermic, 14 g x 2½" @ 3.10/doz	37.20
02130	48 ea	Needles, Stainless, Hypodermic, 16 x 4½" @ .42/ea	20.16
"	10 ea	Needle Holders, 8" @ 5.20/ea	52.00
"	6 ea	O.B. Chain Handles @ 2.60/ea	15.60
"	12 ea	Needles, Stainless, Hypodermic, 12 x 4" @ .42/ea	5.04
"	11 ea	#15 Glass Barrels @ 2.00/ea	22.00
"	4 ea	Inner Rod @ 1.70	6.80
"	4 ea	Outer Rod @ 3.00	12.00
"	4 ea	Ratchet @ 1.80/ea	7.20
14493	6 ea	Scalpel Handles #3 @ 2.20/ea	13.20
"	6 ea	Scalpel Handles #4 @ 2.20/ea	13.20
"	6 pkg	Full Curved 3/8 circle Needle, Size 2 @ 1.98/pkg	11.88
"	6 pkg	Reverse Cutting Needle, Size 7 @ 1.98/pkg	11.88
"	6 pkg	Reverse Cutting Needles, Size 11 @ 1.98/pkg	11.88
"	6 pkg	Reverse Cutting Needles, Size 14 @ 1.98/pkg	11.88
14494	12 ea	Allis Tissue Forceps @ 12.38	148.56
"	6 ea	Ferguson Forceps Curved, 6½" @ 21.25/ea	127.50
"	12 ea	Dayen Compression Forceps, Straight @ 25.00/ea	300.00
"	6 ea	Snook Hook @ 6.25/ea	37.50
"	2 ea	Female Bovine Catheter @ 5.15/ea	10.30
"	40 ea	Tom Cat Catheters @ .32/ea	11.80
"	12 ea	Med. Double curved Spaying Needle @ .40/ea	4.80
"	6 ea	Thumb Forceps 4 x 5 Teeth @ 5.99/ea	35.94
"	12 ea	Half-curved Spaying Needle, 4½" @ .30/ea	3.60
14495	1 ea	Cynaprobe Model DV-260 With Tips	605.00
"	50 vls	Azlum, 2 mg/ml @ 5.75	287.50
"	6 ea	CMT Paddles @ 3.15/ea	18.90
"	6 ea	Stainless Bowls, 1½ qt. cap. @ 2.00/ea	12.00
"	6 ea	Mayo Needle Holders @ 26.00/ea	156.00
"	6 pkg	Ferguson Needles, Size 3 @ 1.25/pkg	7.50
"	6 pkg	Ferguson Needles, Size 2 @ 1.25/pkg	7.50
"	6 pkg	Ferguson Needles, Size 1 @ 1.25/pkg	7.50
"	6 pkg	Martin Suture Needles, Size 2 @ 1.65/pkg	9.90
"	6 pkg	Martin Suture Needles, Size 4 @ 1.65/pkg	9.90
"	6 pkg	Heavy Suture Needles, Size 1 @ 3.15/pkg	18.90
"	12 ea	Straight Mosquito Forceps @ 4.30/ea	51.60
"	12 ea	Curved Mosquito Forceps @ 4.40/ea	52.80
"	6 ea	Straight 5/8 Op. Scissors @ 2.75/ea	16.50
"	6 ea	Curved Mayo Scissors, 6 3/4" @ 3.75/ea	22.50
"	3 sets	Catheters, Assorted sizes @ 4.05/set	12.15
"	36 ea	Backhaus-Roeder Towel Forceps @ 10.46/ea	376.56
14863	12 ea	Straight Crile Forceps, 6½" @ 4.00/ea	48.00
"	12 ea	Curved Crile Forceps, 6½" @ 4.00/ea	48.00
"	6 ea	Thumb Forceps, 1 x 2 Teeth, 5½" @ 2.00/ea	12.00
"	6 ea	Thumb Forceps, 4 x 5 Teeth, 5 3/4" @ 5.00/ea	30.00
86465	20 mg	Lipopolysaccharide B @ 12.50	192.50

*Path -* 86465  
*Agya*

Box 1 (Continued):

Wuruguri	1	each/book	Diagnostic Procedures in Veterinary Microbiology -----	16.99
Ayuga	1	each/book	Pathophysiology of Parasitic Infection -----	14.75
	1	each/book	The Evaluation of Feeds Through Digestibility Experiments -----	19.50
VANUA	1	each/book	Wound Repair -----	31.25
	4	each/books	Reproduction in Domestic Animals and Parasitic Protozoa -----	139.50

(2 Path)

(2 Clinic)

Total Value of Shipment ----- \$3,567.53

Colorado State University  
Work Plan 1972-1976  
AID/afr-790

Undergraduate training of the veterinary medicine students in the Faculty of Veterinary Medicine at the University of Nairobi is being progressively improved in both scope and quality. This is the consensus expressed in all previous reports and speaks highly of the abilities of the current staff. With an anticipated change in two of the three CSU staff by July 1, 1972, the emphasis on improvement of the undergraduate program will predominate early in the 1972-1976 period with a gradual shift to increased graduate student training.

Objective A-1: Improvement of Clinical Studies.

The initiation of a Clinical Diagnostic Laboratory has been one of the most rewarding of recent improvements by the current contract team. This laboratory conducts various examinations of blood, urine, fecal material, et cetera. The staff member in charge consults with clinicians, and teaches veterinary students the value and techniques of these examinations so that upon graduation he will be able to perform them. This skill is essential if he is to function competently in the field. The staff member primarily responsible for the development of the area of Clinical Laboratory Medicine is Dr. LaRue Johnson. Dr. Johnson will remain until July 1973, and he, and subsequently his replacement, will continue to improve this important part of the clinical studies area. Because of the recent establishment of this position, it is expected that it will be continued throughout the contract period.

The Large Animal Medicine position has been filled by Dr. Cleon Kimberling for the past three years. A major improvement initiated and developed by Dr. Kimberling has been a herd health program which provides the undergraduate student with "on-the-farm" training in prevention and treatment of animal diseases. This is where the student has a chance to "put it all together", and to use all of his undergraduate training in practical application. This program is at present limited because of its recent initiation and must continue to be expanded and improved for the duration of the contract period. Dr. Kimberling will leave July 1, 1972, and the herd health program will be a major responsibility of his replacement.

The Large Animal Surgery position is filled by Dr. Gail Gilbert who has made remarkable progress in development of surgery courses. These courses have been well received by the students and praised by Dr. Muger, Dean of the faculty. Dr. Gilbert will leave by July 1, 1972, and will be replaced by a senior staff member with expertise in surgery as well as other clinical skills. The surgery courses will be carefully evaluated and directed toward the practical application of needed surgical skills for the African veterinarian. This will take into account the limited but nonetheless required need to perform surgery by the graduate veterinarian in Africa.

In addition to his responsibilities in developing surgery, the new staff member will also assume the initiative for further development of the area of radiology in the Department of Clinical Studies.

Because of the shortage of competent personnel in the Department of Clinical Studies, and the need for continuing improvement in the undergraduate curriculum, CSU will continue these three staff positions

for the duration of the contract. In addition, CSU plans to assist this department by transferring any of the other three authorized positions that can be Africanized during the contract period. These other positions now authorized and staffed by CSU are in Microbiology, Pharmacology and Parasitology, and when an African counterpart is capable of assuming responsibility for any of these three disciplines, that position can be transferred to the support of clinical studies. The exact timing of these transfers is difficult to determine, but it seems that none will be possible before 1974.

The present head of the Department of Clinical Studies is Dr. Gehring, a member of the German donor group. If the German group does not continue its participation to 1976, and if there is not a qualified African, the CSU group will have at least one man qualified to assume the headship of the department.

Continued development of the clinical program will require expanding the present clinical case load to provide adequate student training material, but due to the location of the Kabete clinic, it is not expected that this case load can be adequately expanded from the livestock population in the local area. Most of the clinical cases now available to the clinic are from the Kikuyu reserve and the area does not have a large or diversified livestock industry. An outpatient clinic established in one of the larger livestock raising areas of Kenya and staffed by one senior faculty member and one or two junior staff members would provide additional cases for student training. Such an outpatient clinic might be incorporated into the Veterinary Diagnostic Laboratories proposed for establishment in various sections of the country.

Objective A-2: Initiate and Develop Post Graduate Training and Research.

From initial participation in the Faculty of Veterinary Science the CSU staff has of necessity emphasized the development of the undergraduate curriculum. Although substantial improvement has been achieved, the task is far from complete and must be continued throughout the contract period. While continuing this effort, the Colorado staff must develop a greater involvement in the training of graduate students. The initial step in this gradual transition will begin with the recruitment of personnel with demonstrated ability to teach and do research at the graduate level. Such personnel will be members of the graduate faculty at CSU and qualify for membership on the graduate faculty at the University of Nairobi. The curriculum of the Faculty of Veterinary Medicine is presently better developed in microbiology, pharmacology and parasitology than it is in clinical studies, so individuals filling positions in these three areas will be able to make a more rapid transfer of emphasis from undergraduate curriculum toward graduate training and research. The new staff members will require an interval of three to six months following their arrival in July 1972 to assess the research needs and opportunities in their respective specialties and, to the best of their ability, to direct their research to animal disease problems important to Kenya and East Africa. The active participation of members of the African faculty as well as graduate and undergraduate students will be encouraged so that a nucleus of African participants will have the opportunity to become proficient in planning, executing and interpreting research projects. The current plan for graduate training for some of the potential African staff counterparts is to provide them with

the opportunity to obtain prescribed course work at foreign universities and then to return to the faculty to do their research, to prepare their thesis or dissertation and to stand the examination for the advanced degree. The participation by these graduate students in research projects developed by the Colorado staff can be used to fulfill the research requirement.

The CSU staff will need to adapt to whatever system of graduate student training is used by the Faculty of Veterinary Medicine and the University of Nairobi. The CSU Chief of Party and staff will seek and encourage assistance in graduate teaching and research from research scientists in the Nairobi area in organizations such as EAVRO, Veterinary Laboratories, Veterinary Service Organization, the International Atomic Energy Agency laboratory and medical school. If participation of scientists from these areas can be obtained in providing seminars or courses in the graduate program, the scope of expertise will be greatly increased and the African graduate students and faculty members would benefit from a broader exposure to the scientific community. The opportunity for African graduate students to conduct research under the direction of these individuals will be encouraged.

Objective B: Cooperate with other donor groups and make the most efficient use of available resources.

CSU has, throughout its previous contract period, cooperated with other donor groups and will continue to do so during the new contract period. Evidence of past cooperation is readily obtainable. The best example perhaps has been in the Department of Clinical Studies.

The department is headed by Dr. Gehring, a member of the German donor group, and to date four members of the CSU staff have served under him in a cooperative and productive manner which has been mutually beneficial. Cooperation between the Norwegian staff and the CSU staff and others has resulted in the recommended creation of a new Department of Public Health, Pharmacology and Toxicology. All of Colorado staff members have cooperated fully with other expatriates and African staff in developing the training program in the faculty. It is difficult to project definitive long-range plans for cooperation with other donor groups as their future commitment to the Faculty of Veterinary Medicine is not clear. Every effort will be made to support other donor groups in matters pertaining to curriculum development, graduate student selection and training, and collaborative research.

Objective C: Training of East Africans for Academic and Professional Positions by Assisting in Identifying, Selecting and Training Outstanding Students.

Dr. John Cheney, Chief of Party from 1969 to July 1972, initiated a system of academic ranking of undergraduate veterinary medicine students which is currently in use, and this along with the employment of certain select students during vacation periods served to identify those students who are academically competent as well as seriously motivated toward an academic application of veterinary medicine. These procedures will be followed in the future to assure a continuing source of supply of potential African faculty members. This process of selection and subsequent training is now in progress and a number of African counterparts are partly through their training periods.

a. Pharmacology

Mr. Kiptoon, a 1971 graduate of the faculty, had been selected as a Participant Trainee in pharmacology. Mr. Kiptoon, however, did not accept his appointment in the faculty as a result of the better terms of service given him by the Kenya Veterinary Services Organization. Mr. Mbadi, a third year student from Kenya, has been working for the past two years in the pharmacology section. It is anticipated that Mr. Mbadi will join the faculty following his graduation in March 1973, and proceed as a Participant Trainee to the United States. Upon his return to the faculty at the beginning of the 1976-1977 academic year, he should be capable of assuming major responsibility in pharmacology. It will, however, be necessary to select one other counterpart trainee in pharmacology or toxicology, depending upon which area Mr. Mbadi chooses. It is anticipated that such an individual can be selected to begin Participant Training by the 1975-1976 academic year.

b. Microbiology

Dr. Muhammed has served as a staff member in the microbiology section for three years following his return as a Participant Trainee from the United States and has assumed a part of the undergraduate and graduate teaching responsibilities in the department.

Mr. Nyaga, a third year student, has been working for the past two years in the Department of Biochemistry and in the microbiology section. It is anticipated he will go as a Participant Trainee in microbiology and biochemistry to the United States following his graduation in March 1973. At the completion of his training, the USAID contract will have provided post graduate training to two individuals for the microbiology section.

### c.. Parasitology

Africanization of the parasitology position has changed markedly with the departure of Dr. Bitakaramire from the parasitology section in December 1971 to join the new veterinary faculty in Uganda. Had Dr. Bitakaramire stayed in the section, it was anticipated that the parasitology position could have been phased out by 1974. Dr. Bitakaramire's departure leaves only one other African staff member, Mr. Munyua, in the section. Mr. Munyua's progress as a developing staff member during the past two years has not been as satisfactory as anticipated, and USAID support in the parasitology section will be necessary until such time as an additional staff member is located and trained. In October of 1971 Mr. Omusa joined the pathology section, and although his field of study for advanced degree training has not been published, it is expected he will work in pathology and protozoology. The possibility therefore exists that he can become a future staff member in the parasitology section.

### d. Clinical Studies

In September of 1971 Mr. S. Varma was sent to the United States as a Participant Trainee in surgery but will also receive training in radiology. Mr. Varma is expected to return to the faculty upon completion of the Master of Science degree in late summer of 1973.

There are two African staff members, Mr. Shatry and Mr. Maribei, both Kenyans, who are being considered as Participant Trainees in clinical medicine. Mr. Shatry joined the faculty in December of last year and has been working in the large animal surgery section. Mr. Maribei, a 1971 graduate, is scheduled to join the faculty in November or December 1971. It is anticipated that one, and possibly both of these individuals, will be sent to the United States in

September 1972 for graduate training in large animal medicine.

Mr. Wamukoya, a Kenyan and a 1969 graduate from the faculty who is working as a District Veterinary Officer but has expressed an interest in joining the faculty, is also being considered for a staff position in large animal medicine. Mr. Wamukoya's academic standing was in the upper half of his class. He has shown exceptional ability during his past three years as a Veterinary Field Officer. It is possible that one additional student will be selected as a Participant Trainee at a future date for a position in surgery or clinical radiobiology.

At the present time, there are four students working in the clinical studies section who are being evaluated as future staff members. Two of these students, Miss Price and Miss Mbogwa, are being considered for Participant Training in clinical laboratory medicine. Miss Price, a final year student from Kenya, worked during the 1971 long vacation period in large animal surgery. Miss Mbogwa, a second year student, will be working during the forthcoming vacation period in the clinical laboratory medicine section. Both of these students have expressed an interest to do graduate training in clinical laboratory medicine. Miss Price has applied for a position in the clinical studies department following her graduation next year. It is anticipated that she will remain as a staff member in the faculty here for one year prior to going on to the United States as a Participant Trainee. Miss Mbogwa will be graduating in March 1974, and if she continues to work in the clinical laboratory medicine section, should be ready for advanced degree training in September of the year she graduates.

Objective D: Plan and Execute Research of East African Significance.

This objective has already been discussed in part under objective A-2. All current and new CSU staff will be expected to place highest priority on research that is directly applicable to animal diseases in Kenya and East Africa. Whether such research is conducted on an individual or collaborative basis is dependent on the nature of the research and the interests of the staff. In all instances, however, active participation by African counterpart trainees, undergraduate and graduate students will be strongly encouraged.

COLORADO STATE UNIVERSITY  
Agency for International Development  
Program for 1974-1976

## INTRODUCTION:

With the acceptance of the new contract in July 1971, the emphasis of the Colorado State University team at the Faculty of Veterinary Medicine, University of Nairobi has increased in the graduate training and research programs and support to the undergraduate curriculum has shifted to the Department of Clinical Studies. In accord with the increased interest in graduate training the CSU team has stressed the identification and recruitment of Kenyan graduate students for training both at the University of Nairobi and in U. S. colleges and universities.

In the initial contract (1966-1971) the CSU team was charged with the development of the undergraduate curriculum in veterinary medicine. Assigned throughout the Faculty, the team was in a strategic position to maximize its influence on the overall curriculum development. At the close of the first contract it was apparent that the link in the undergraduate training that would need additional assistance was the Department of Clinical Studies. As a result, the staff began a move to improve the students' case exposure and to orient such exposure to the future needs of the African Student. A herd-health-ambulatory program was initiated and expanded under the direction of Dr. Cleon Kimberling. Using the larger cattle operation initially within 150 miles of Nairobi, Dr. Kimberling gradually incorporated various cooperatives and settlement schemes into the students' visits. Dr. Kimberling's replacement in Kenya, Dr. George Burrows, has continued to develop the latter components and now calls on three settlement schemes, a pork cooperative, a feed-lot cooperative and two

major dairy operations. On each call, six to ten students accompany the clinician and all actively participate in the examination, diagnosis, and therapy prescriptions for the individual cases and herds that are under study. As executed, this program is probably superior to any similar effort in the United States and is particularly applicable to the present and future livestock disease conditions of Kenya and East Africa.

Complementing the herd-health-ambulatory training has been the activation of a clinical diagnostic laboratory under the direction of Dr. LaRue Johnson. The function of the laboratory is typical of the kind of back-up facility used by the Kenya Veterinary Service to support the field veterinarian. Students provide the principal labor force and because of their previous exposure to the ranches, settlement schemes and cooperatives have a chance to follow in the laboratory the disease problems that they encountered in their herd-health field work. The combined program of herd-health and clinical laboratory has received praise from students, staff and administration.

Recent additional changes that the CSU staff has been instrumental in bringing about have included the development of an operative surgery course and Instruction in Diagnostic Radiology. The latter is taught by members of the Faculty of Veterinary Medicine. The CSU staff were active supporters and successfully influenced the development of preceptorships in the Kenya Veterinary Service. Students entering the preceptorship are assigned to either veterinary field officers, veterinary laboratory installations or veterinary practitioners for the 4th term of the 2nd year. Assignments during the 4th term of the 1st year include microbiology, statistics and animal production. During the 4th term of the

3rd year the students participate in meat hygiene and toxicology laboratory practicums. The use of the 4th term of each of the first three undergraduate years was introduced in lieu of adding a 5th year to the professional program and follows closely the use of similar mechanisms to increase the efficiency of professional training in the U. S.

The Colorado State University team has made material contributions to undergraduate instructional aids by the development of strong audiovisual resources. The present team brought some 2000 35 mm slides to the Faculty to assist in teaching basic principles in the various disciplines of veterinary science. Over 400 slides and more recently motion pictures of indigenous animal disease problems have been added in the last 18 months. The staff has added 17 films of general interest to the Faculty film library and about 200 books have been acquired at their recommendation. Dr. Johnson has prepared 4 auto-tutorial programs in clinical pathology, and Dr. Davis is in the process of producing 10 auto-tutorial programs in Pharmacology. The collection of indigenous parasites and records of parasitic diseases that was initiated by Dr. Kramer and Cheney has been continued by Dr. Rubin and a set of some 100 slides is presently available for instruction in parasitology. Several sets of slides on medical mycology and immunology have been contributed by Drs. Lauerman and Grant and an auto-tutorial unit on Rinderpest and East Coast Fever has been prepared by Drs. Cheney, Lauerman and Kimberling.

The CSU involvement with the graduate program received high priority with the advent of the new contract in 1971. The charge was to develop a program of graduate training to include the identification and recruitment of graduate students, development of graduate courses

and initiation of research that would contribute to graduate and undergraduate training, and to the solution of animal disease problems in Kenya and East Africa.

The present status of students training for positions in the Faculty of Veterinary Medicine is summarized in Table 1. Particular attention should be drawn to the 3 departments in which CSU faculty members have been participants, i.e. Pathology and Microbiology, Clinical Studies, Pharmacology, Public Health and Toxicology.

Of the 21 Kenyan students in graduate training 17 have come from these three departments and 12 are training in the U. S. Of the students in the U. S. 5 of these are at CSU. Each are receiving support from the United States Agency for International Development. The present CSU team and its predecessor exerted significant influence in the recruitment of all 21 graduate students. This achievement is of considerable merit when one realizes that only 8 Kenyan students graduated in 1970, 12 in 1971 and 8 in 1972 and that the Kenya Veterinary Service offers both salaries and fringe benefits (housing, transportation and practice options) in excess of those offered by the University. Now that more Kenyans are being admitted to the curriculum in Veterinary Medicine (61 in 1973) the recruiting base and the number of trainees can be expected to increase dramatically.

In the development of the graduate program first priority was given to recruiting qualified students and getting them placed in over-seas training programs: 15 of the 21 graduate students are studying outside of Kenya. Subsequently, graduate courses were initiated in Pharmacology and Toxicology, Parasitology and Microbiology. There are three students presently enrolled in Dr. Rubin's course in advanced parasitology. It is

expected that the demand for and the enrollment in graduate courses will increase over the next two to three years due to several factors: First, the commitment of the University to a curricular graduate system (as opposed to the tutorial system); second, the increased number of Kenya students coming through the system; and third, the return of the students presently training outside Kenya. These factors will be taken into account as CSU proceeds to recruit staff for July 1974.

The research efforts by the CSU team have been designed to support graduate training, to provide information for undergraduate instruction and to increase the information base concerning animal disease problems of Kenya and East Africa. The first team of the present contract continued the research projects that they had developed during the latter years of the original contract. Dr. Cleon Kimberling completed evaluation of a tranquilizing drug used in domestic and wild animals and his East Coast Fever (ECF) project in conjunction with Dr. Gale Wagner (EAVRO-Muguga) is being continued by Dr. Wagner and Dr. S. I. Mohammed of the Faculty of Veterinary Medicine. Dr. Gail Gilbert's interest in squamous cell carcinoma in Ayershire cattle has been continued by Dr. George Burrows of the present team. Dr. Burrows is also conducting a survey on the helminths of swine for use in teaching and as an assessment of the need for further research.

Dr. Lowell Parsons initiated investigations of the toxic and pharmacologic principles in a number of native plants. His graduate student, Mr. C. K. Maitai, has continued these studies and is currently publishing the results of his investigations of the pharmacology and toxicology of an indigenous plant Miraa.

Dr. LaRue Johnson has participated in several projects both on and off campus in his position of Director of the Clinical Laboratory. These outside interests have involved investigations of trypanosomiasis in dogs and East Coast Fever in cattle. Dr. Johnson has his own project on experimental Theileriosis and is training a graduate student in the laboratory procedures needed for this investigation.

Dr. Lloyd Lauerman initiated several research projects concerned with disease-causing microorganisms in Kenya. Projects that involved Brucella ovis included the initial isolation and identification of B. ovis in Kenya, a field study to determine its importance in the sheep flocks; a study of the disease in rams; investigation of the duration of persistence in the ewe; and development of a hemagglutination test for B. ovis. These studies were performed in cooperation with Drs. Carles and Cameron of the Department of Animal Production, University of Nairobi, and except for the last listed project were completed prior to Dr. Lauerman's departure. During the long vacation (now the 4th term) at least four students participated in the B. ovis research studies under Dr. Lauerman's supervision. A project on East Coast Fever was initiated for the Faculty of Veterinary Medicine by Dr. Lauerman and is presently being continued by several members of the staff. Drs. Lauerman and Muhammed performed studies on humoral and cellular immunity of cattle to the East Coast Fever agent (Theileria parva) cooperating with scientists at EAVRO, Veterinary Services and Wellcome Research Laboratory. Dr. Lauerman also had projects concerned with the immune response of cattle to Rhipicephalis appendiculatus, the incidence of bovine mastitis in Kenya over a five-year period, isolation and identification and

serological survey of a chlamydial agent. Disease agents were investigated as cases were presented to the diagnostic bacteriologic laboratory. Dr. Lauerman's replacement, Dr. Dale Grant, initiated two studies of indigenous mycotoxins but these were discontinued at Dr. Grant's untimely return to the States. A survey of Histoplasmosis in Kenya is being completed by Dr. Mohammed.

In parasitology, Dr. Cheney increased the collection of indigenous parasites in the museum and developed an extensive collection of teaching slides and Kodachromes. Dr. Rubin has continued to increase both collections and has conducted an investigation of a treatment for bovine cysticercosis. He has also begun a survey of helminth parasites in ruminants. Both of these projects employed a local staff member as co-principal investigator.

Dr. Ed Usenik has been collaborating with investigations both on and off campus that require experimental surgical techniques.

Research is a very personal activity and although there is a tendency to lose continuity when faculty positions turn over, the problem has been recognized and wherever possible the studies have been sustained either by a local staff member or by an expatriot replacement. Also, as part of the research program there is concerted effort to involve local graduate students in the research as part of their masters or doctoral training.

In summary, CSU through its contracts with A.I.D. has made a significant impact on the development of the undergraduate curriculum in the Faculty of Veterinary Medicine. Its most recent efforts have been concentrated on the identification and recruitment of Kenyan graduate students, the development of graduate courses and the expansion

of research programs that will complement the undergraduate and graduate training programs. CSU plans to continue this thrust in the remaining four years of the present contract.

TABLE I

DISTRIBUTION OF STAFF AND TRAINEES  
IN FACULTY OF VETERINARY MEDICINE  
UNIVERSITY OF NAIROBI, KENYA (1)

Departments	Permanent Positions	Local Staff Perm. Pos.	Local Trainees Nairobi	Local Trainees U.S.	Local Trainees Other Countries	TOTAL TRAINEES
Anat-Hist	6	1	1	1	1	2
Animal Prod.	13	4	1	1	-	2
Vet. Biochem	4	1	-	-	-	0
Clin. Studies (2)	15	3	2	5	-	7
Vet. Physiology	5	2	-	-	-	0
Path & Micro.	14	7	2	3	1	6
Public Health & Pharm. (2)	5	1	-	4	-	4
	62	19	6	13	2	21

- 1) Data from 1973-74 Calendar University of Nairobi and letter from Dean G. Mugeru to Mr. Harold Jones, AID Nairobi, 14 June, 1973.
- 2) Departments in which CSU has had staff members since the new contract.

Plans - January 1, 1974 to June 30, 1976

It is the intention of the College of Veterinary Medicine and Biomedical Sciences, Colorado State University to meet the conditions set forth in the CSU/AID contract dated July 1, 1971 and the companion Work Plan. The College through its field party and in full cooperation with A.I.D. and the University of Nairobi intends to work toward achievement of the following goals:

- 1) In conjunction with the Faculty of Veterinary Medicine to identify, recruit and train Kenyan veterinarians for teaching and research positions in the University of Nairobi;
- 2) to work with the local staff to continue to develop the problem-solving capability of the Faculty of Veterinary Medicine;
- 3) to work toward an environment of inter- and intra-institutional cooperation within the Faculty of Veterinary Medicine, the University of Nairobi and the universities that represent the donor countries;
- 4) to assist the Faculty of Veterinary Medicine to develop an integrated research program.

Project Personnel:

A. Recruitment

Replacements for the CSU team are being recruited at the present time and it is anticipated that the final selection will be completed shortly after the first of the year. Particular attention is being paid to the staff members' families, the age of the children, their recreational orientation and their attitude toward foreign assignments in general, and East Africa specifically. In all cases it is being

stressed that we are seeking people that are willing to make a four-year commitment.

Pharmacology:

In discussions with Dean Mugeru it was mutually agreed that we would seek a Clinical Pharmacologist to replace Dr. Lloyd Davis. Such a selection is compatible with our stated emphasis on the clinics and the individual recruited for this position will be responsible for the continued training of Mr. Mbadi, at present training at CSU in Clinical Pharmacology. Dean Mugeru and Mr. C. K. Maitai of the Department of Pharmacology, Public Health and Toxicology indicate that Mr. Maitai is fully capable of teaching basic Pharmacology and Toxicology, but not being a veterinarian they noted the need for applied pharmacology as it relates to the clinics. It is our intention to fill that void. The individual selected will very likely be assigned to the Department of Clinical Studies in a position that provides the maximum flexibility and impact.

Microbiology and Parasitology:

Advertisement for these positions has already been carried out and the respondents are of unusually high quality. It will be these two positions that CSU will depend upon to organize and coordinate our research and graduate programs in the Faculty and to coordinate the training being received by students in the U. S. with projects and programs in Kabete. Further, persons filling these two positions will need to work closely with the Diagnostic pathologists and microbiologists in support of the Clinics, particularly the herd health and ambulatory projects. It is essential that the individuals in these two positions have the full confidence of the Dean and other

administrative officials of the Faculty and of the University of Nairobi.

Clinical Studies:

Contract positions in the Department of Clinical Studies that will be open this year will be in Surgery and in Medicine (Herd Health). In addition, it is likely that the Clinical Pharmacology appointment will occur in this department.

Our recruiting program is oriented to selecting veterinarians who understand the needs of a veterinary service that must provide surveillance over large numbers of animals in diverse and often remote areas. A surgeon will be recruited that while teaching the basic principles and techniques of operative surgery keeps foremost in his mind that the vast majority of graduates will be employed by the Kenya Veterinary Service. Their specific surgical needs will therefore be those of a rural, preventive medicine type of practice. The individual recruited for the Medicine position will necessarily be similarly oriented.

In combination with Dr. LaRue Johnson these three faculty members will be charged with reorganizing and optimizing the ambulatory and herd health services of the department. With a relatively low hospital case load and with future employment in the veterinary service almost a certainty, the students will get maximum benefit by combining the resources of the ambulatory and herd health services to form the principle case contract arm of the Faculty. The case contact provided by this service would be in the context of Kenya animal agriculture.

It should be noted that at the end of June Professor Wilhelm Gehring will return to West Germany and Dr. William Luke will retire,

thereby leaving vacant the chairs of professor and of associate professor. Dean Mugeru intends to advertise the positions internationally and one or more of our replacements in the Department of Clinical Studies will be qualified to stand for either one of the vacancies.

B. Orientation

Extensive efforts will be made to increase the information possessed by the CSU team and their families prior to their departure for Kenya. The information will concern CSU and its purposes and resources, AID and U. S. foreign policy; Kenya and East Africa; the Faculty of Veterinary Medicine and the University of Nairobi. At CSU the contract will be reviewed historically and in its present form. The history and philosophy of the University of Nairobi and the Faculty of Veterinary Medicine will be presented in the context of present day Kenya. Also, included in the orientation at CSU will be our perception of veterinary medicine and animal agriculture in East Africa and Kenya. All participants and their families will be required to go through the orientation at CSU and through the AID orientation program in Washington, D. C. prior to leaving for Nairobi. Further orientation will be conducted in Nairobi by the CSU Chief of Party and by the administration of the Faculty of Veterinary Medicine.

C. Project Administration

At Colorado State University the campus coordinator will be Dr. Cleon Kimberling, Department of Clinical Sciences, beginning January 1, 1974. Dr. Kimberling will continue to work closely with our Kenya Advisory Committee <sup>1/</sup> and with the Office of the Dean of

---

<sup>1/</sup> The Kenya Advisory Committee is composed of past Chief of Party, the Dean of the College, the campus coordinator and 2 faculty members, who have served a full 2-year assignment on the project. When appropriate Kenyan trainees are included as resource people.

the College of Veterinary Medicine and Biomedical Sciences.

In the Faculty, Dr. LaRue Johnson will become Chief of Party on March 1st. He is presently Assistant Chief of Party under Dr. Robert Rubin.

With the new fiscal year we are requesting that the Chief of Party be given assistance in the administration of the project. Such assistance is consonant with maximum utilization of the talent provided to the project and with the present AID policy of having the project management increasingly self-sufficient. We would anticipate that maximum effectiveness for such assistance would be realized if the person employed were a native Kenyan, familiar with local practices.

The project will be monitored periodically by the external examiners and on alternate years by visits of the campus coordinator or representatives of the Office of the Dean. This schedule of visits is in accord with the terms of the present contract.

D. Travel for Scientific Staff

The College of Veterinary Medicine and Biomedical Sciences will provide each of the staff members on the team with travel resources equivalent to those received by their counterparts on the faculty in Fort Collins.

PROGRAMS

A. Undergraduate Instruction

The CSU program in undergraduate instruction will continue along the lines set forth in the Work Plan 1972-74. This will bring additional contributions to the collection of teaching aids, to the

museums and to the library. All will form a part of the permanent instructional resources available to the Faculty. Excellence will be the goal in the classroom with more and more of the actual instruction being assumed by the local staff, particularly in Pharmacology, Microbiology and Parasitology. In the Department of Clinical Studies, a combination of ambulatory and herd health resources will increase the efficiency of operation and will increase the exposure of undergraduate students to case material in an environment that is consonant with their future role in the Kenya Veterinary Service. To enhance this experience, the contact with dairies, feedlots and settlement schemes will be expanded over the next two years. Strong support will be given to the clinical diagnostic laboratory and it will continue to work closely with the herd health-ambulatory group.

Having endorsed the use of the Kenya Veterinary Service in training undergraduate students between their 2nd and 3rd years in the professional curriculum, the CSU team will encourage similar experience with the research teams at EAVRO, Muguga, in the new Clinical-Diagnostic Centers of the Veterinary Service and in the Trypanosome Research Laboratories at Kabete. Although the International Laboratory for Research on Animal Disease is not due for activation for 18 to 24 months contact will be established and maintained in order that complementary relationships may be developed at a future date.

#### B. Graduate program

1) Course development for the graduate program will continue according to the plans of the Graduate Faculty of the University of Nairobi and in a direction that matches the needs of the graduate

trainees both in the Faculty and in participating nations. Three courses have been offered by the present team and new courses will be added by the incoming team. Particular emphasis will be placed on those disciplines and specialties that have particular relevance to Kenya. The establishment of graduate courses is very timely in that the majority of trainees are involved in overseas training and will be returning to Kabete in 1975. This provides an appropriate interval for the initiation of graduate courses that will provide experiences that have not been possible at the over-seas universities.

2) The present team has been charged with recruiting another series of trainees to receive AID scholarship assistance. In 1974, Dean Mugeru has pledged 15 trainees of which 7 will be eligible for AID assistance. The students will be contacted by the CSU team members and when possible employed to work with staff engaged in teaching and research during off-hour time or vacation periods. The Chief of Party will consult closely with the Dean in developing the list of qualified candidates.

3) The training program in the U. S. will be oriented to granting the M. S. degree at the end of two calendar years. The M. S. degree will carry a research requirement and the candidates will be strongly urged to prepare a thesis based on their research. An assessment of the student as a potential faculty member in his discipline will be sent by his graduate committee to the Dean of the Faculty with copies to the Deputy Vice Chancellor, the AID Program Officer, the CSU Chief of Party, the trainees department head and the CSU staff member most likely to qualify as major professor.

Upon returning to the faculty, the present University of Nairobi policy is to appoint the trainee to a tutorial-fellowship. As such the trainee will have primary responsibility to pursue coursework and research for the doctorate. Close supervision by the CSU staff will assure that such is the case.

### RESEARCH

Research for the purposes of this project shall be taken to mean those activities that contribute to the knowledge base in the animal sciences of East Africa with particular emphasis on knowledge that is of practical benefit to the livestock industry and to the Faculty of Veterinary Medicine. In that context the CSU team will place the obligation to develop a coordinated research program in hands of the two staff positions in the Department of Pathology and Microbiology. The staff members will be recruited with this in mind and selection will depend heavily on the personal and professional compatibility of these two individuals. As the program is developed it will complement the training areas we have endorsed and will be geared to receive the trainees that are receiving assistance from AID.

Although the Department of Pathology and Microbiology possesses the staff and maturity to launch a major thrust into research, the faculty in Clinical Studies is thin and heavily burdened with undergraduate instruction. It will be the obligation of the research coordinator to provide opportunities for cooperation between the clinical staff and other research investigators. Further, it will be an obligation of the clinical staff to gather data from the field on disease problems, their epidemiology and their relative importance. Such information will contribute to the knowledge base for instructional purposes and will serve

as a guide for the development of relevant research projects.

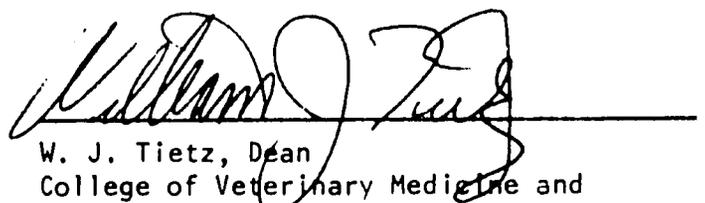
An avenue that will continue to be expanded will be cooperative projects with other veterinary medical installations in Kenya including the Kenya Veterinary Service, EAVRO, ILRAD, and the Trypanosome Research Laboratories. Programs of research participation as well as exchange seminars and exchange staff and students will be endorsed and wherever possible directly instituted. Cooperative programs with the Faculty of Medicine and of Agriculture will be further developed particularly as they relate to graduate training.

SUMMARY:

It is the intent of the College of Veterinary Medicine and Biomedical Sciences at Colorado State University to pursue the objectives of the project as originally stated.

- a) Maintain and improve the presently achieved level of undergraduate training.
- b) Expand research and graduate training.
- c) Assist in every way possible to develop the local academic staff.

It is our firm conviction that these objectives can best be met by the identification, recruitment and training of Kenyan students for positions in the Faculty of Veterinary Medicine and by providing the best possible environment in which the trainees can pursue their professional development. It is to these goals and objectives that the staff and administration of Colorado State University are dedicated.



W. J. Tietz, Dean  
College of Veterinary Medicine and  
Biomedical Sciences  
Colorado State University

University of Nairobi Veterinary Educational Program

An Evaluation of CSU/AID Participation

Dr. Charles J. York  
Associate Professor  
School of Medicine  
University of California  
San Diego

Dr. Niels Konnerup  
Livestock Disease Specialist  
Technical Assistance Bureau  
Agency for International Development

December 1973

University of Nairobi Veterinary Education Program  
An Evaluation of USAID/CSU Participation

Introduction

In accordance with an established Africa Bureau policy and a special Mission request, an AID/Washington evaluation of the AID/afir 790 Project for assistance to the Faculty of Veterinary Medicine, University of Nairobi has been arranged and carried out.

With concurrence by USAID/Nairobi and Dean Mugeru, Faculty of Veterinary Medicine, University of Nairobi, Dr. Charles J. York, Associate Professor of Comparative Pathology, University of California at San Diego and Dr. Nels Konnerup, Livestock Diseases Specialist, Technical Assistance Bureau, Agency for International Development, Washington, D.C. were appointed to conduct and evaluate the project designated above. It has been agreed that the review and evaluation team would be assisted by staff officers of USAID/Nairobi and REDSO/EA.

Terms of reference for the review and evaluation, including Objectives and Scope of Work, have been prepared by AID/W and submitted to USAID/Nairobi prior to the assignment of the team and concurrence by USAID and the Dean of the Faculty of Veterinary Medicine has been obtained.

Review of Development of Veterinary Educational Program

While veterinary education and research in Europe, the Americas and parts of Asia have a long history of development, similar academic enterprises in Africa are for the most part relatively recent. Kenya, with a large livestock industry more or less centrally located in East Africa and with a rapidly developing general educational system, was a logical area to assume the initiative for development of a veterinary medical program including undergraduate and graduate training, as well as the promotion of research in animal sciences.

Under the aegis of the University of East Africa, the Government of Kenya assumed this responsibility shortly after independence and a Faculty of Veterinary Medicine within the University structure was launched in 1962. With the assistance of outside donors, including USAID, the Faculty of Veterinary Medicine, University of Nairobi has progressed in its undergraduate program to the point that, in 1971, it became feasible to place more emphasis on developing a research and post-graduate program that would eventually make this veterinary college fully comparable to that of well established institutions elsewhere in the world. The ultimate aim of this program as far as outside donors are concerned, in addition to having a well-rounded veterinary educational system, is to "africanize" the academic teaching and research faculty by 1978, or as soon thereafter as is possible.

Since the inception of collaborative assistance, the internal support in terms of resources and manpower has been fairly consistent and progressive, both in resources and planning. External support has varied but generally has expanded to meet the needs of a growing college.

Sources of support include the East African Community (EAC), The Rockefeller Foundation, Wildlife Societies, the United Kingdom, West Germany, Norway, Sweden, Denmark, Switzerland, Canada, and the United States of America.

The capital improvement outlay by the Rockefeller Foundation, United States, West Germany, Norway and various other governments has been substantial and is well documented elsewhere. In addition, equipment and supply purchases by the various donors as part of their veterinary educational assistance has been sizeable of the past several years. These combined support efforts are consistent with a normal expected institutional growth pattern.

The exact amounts of monies spent and the specific projects supported are not important for the main thrust of this evaluation. However, it is important to recognize that the end result of this combined assistance has the development of a well rounded, fairly well equipped physical educational plant. While new building additions or remodeling and the purchase of

equipment of various types will be required from time to time, the veterinary college in its present status is adequate for the training of both undergraduate and graduate veterinary students.

The growth of the veterinary college in terms of undergraduate training has also shown steady gains over the short period of the school's existence. The number of students has grown each year from a few in each class to groups of 60 to 80. The curriculum has also undergone revisions and improvements until at the present time it is a successful blend of the European and US methods of training; even though the over-all complexion is European as might be expected. Improvements in certain areas are necessary, as is again to be expected in any veterinary college trying to meet the needs of times. Some of these requirements will be mentioned later in this report.

The makeup of the student body over the past several years has gradually shifted. Initially, a high percentage were from East African countries other than Kenya. With the founding of a veterinary college in Uganda and the increased availability of Kenyan students, the current newer classes contain a high percent of Kenyans. In spite of this shift, the veterinary college at the University of Nairobi still serves as a regional school with students from a number of East African countries in attendance. However, in terms of one of the ultimate goals of replacing expatriate faculty with Kenyans having advanced training the increasing availability of graduate Kenya veterinarians qualified to carry out post-graduate studies will serve to accelerate this process.

The number of students who have qualified for advanced training, and are now occupying faculty positions in the Veterinary College is another measuring stick for evaluating the growth and maturity of the school. Starting initially with almost no African instructors, the current status of the faculty is as follows:

Africans	22
Norwegians	8
Americans	6
Germans	5
Swedes	1
Swiss	1
United Kingdom	4

It can be noted then that the makeup of the faculty has shifted from almost all expatriotes to almost 50% Africans, in a space of only 10 years. (8 years of AID involvement). Even though this phase of the task is basically 50% completed, the availability of larger numbers of graduate students is expected to accelerate this process.

The training of graduate veterinarians who will eventually assume teaching positions must at the present time rest heavily on post-graduate scholarships allowing study abroad.

Currently, scholarships, in addition of those provided by the Government of Kenya, include as follows:

West Germany	5
Norway	5
Sweden	5
Switzerland	5
United States	8
Canada	1
Australia	1
Rockefeller Foundation	3

It is considered that the training of undergraduates by CSU, other donors and the University of Nairobi were satisfactorily accomplished as indicated by successful matriculation of students under a procedure using the external examiner system, and the fact that selected graduated individuals have been nominated for post-graduate training at both the Masters and Ph. D. level.

The assimilation of University of Nairobi graduates into the faculty has enabled the donor group teachers and scientists to shift emphasis in part from specific undergraduate teaching

responsibilities to supervision of post-graduate training programs and research, along with the African members of the faculty.

The transition in emphasis to post-graduate education from what might be called a phase I to phase II program called for the acceleration of research, development of suitable curricula and programs geared to the post-graduate level.

The development of research and post-graduate training has as its basis the requirement that it be relevant to East Africa conditions, with emphasis on projects providing data that can rapidly be applied for use at the local level. These areas, plus undergraduate training, comprise the three areas of activity for the CSU veterinary team. Each of these are reviewed as follows:

a) Post-graduate Training. Current advanced training is being carried out in three ways: (1) studies at the University of Nairobi leading to either an M.S. or Ph.D. degree; (2) selection of students for scholarships in the USA (leading to a M.S. degree); (3) students returning from abroad qualifying for a tutorial fellowship generally registering for a Ph.D. degree. In this manner the Ph.D. thesis can be carried out on African problems in Kenya. The degree could be granted from either University of Nairobi or CSU depending on the situation.

In addition to support of graduate students in the USA by means of scholarships curricula for graduate courses have been prepared by CSU in the fields of pharmacology, toxicology, parasitology and microbiology. These courses supplement those being offered in pathology and anatomy. Eventually, it is anticipated that all veterinary college departments will have developed one or more graduate level courses. It must

be recognized that even though these courses are offered, it does not mean that students are enrolled in them currently. However, preparing a course outline is the first essential step in developing a graduate program at the university that can eventually be self-sustaining without the need for continued overseas scholarships. The fact that even a limited number of courses are currently being offered is a significant step forward. In the meantime, the tutorial system in many instances will serve as the primary means of graduate training. Indeed, in the view of the evaluation team, a tutorial system combined with selected course work is superior under Kenya conditions to the U.S. system which relies heavily on a formalized curriculum. The tutorial system is especially valuable for the Ph. D. degree where close relationship between student and instructor is necessary.

The meaning of the phrase - graduate program - has several interpretations. It does not mean necessarily a full-blown complete curriculum at the University of Nairobi. For a relatively new university to develop a self-sustaining graduate program takes many years. In the meantime, the availability of scholarships for studies in the USA or elsewhere must remain the core of the graduate program. If a student can earn an M. S. degree, he is then capable and qualified to enroll for a Ph. D. degree at the University of Nairobi. At that point he can then be assigned to a CSU/Nairobi or some other faculty member for the advanced degree. At that time obviously some, if not all of the formal graduate courses that have been proposed, will undoubtedly be utilized.

In terms of successful administration of the scholarship program even though the visiting student from Africa may not always have the same background in terms of course work as the U.S. counterpart, the evaluators were pleased to note that CSU was making

every effort to complete the students' masters' degree work in the two-year time frame allowed by the scholarship program and as expected by the University of Nairobi. It is anticipated that this cooperative effort will continue.

b) Research. Research is tied in closely with graduate training especially at the Ph.D. level and serves three major purposes: (a) conducting research in collaboration with one or more students provides experience for them through demonstration (tutorial) and provides a means of screening and encouraging qualified students to go on for more advanced degrees; (b) research conducted by a faculty member gives the graduate student assigned to him the opportunity to work on a portion of the project independently for his thesis work. Equipment and supplies are also generally readily available by doing this; (c) research at the University of Nairobi as at any university is an essential component of the academic life and when applied to East African problems provides new data of value to the animal industry of the countries of this region, in addition to the usual contributions to the scientific literature.

It is recognized that these general research aims may at times be difficult to apply to the individual faculty member, especially in the clinical field with a time-consuming undergraduate teaching load. However, even here, by collaboration with men in the basic departments, various types of research projects of varying degrees of depth could and should be developed. In fact, in view of the fact that research emphasis must be placed on East Africa problems, in many instances the best and main source of material or data is via a vigorous clinic program.

In evaluating the current scope of research efforts by the present CSU team, it was with some regret that the evaluators found that the projects to date have been

minimal in number and limited in scope. Demands on one's time for undergraduate instruction, especially in the clinical sciences, the lack of certain pieces of equipment, lack of research funds and administrative problems have all been contributing factors as to why research efforts have been slow in developing. Another factor which dampened research is the fact that most men on the team are only on a two-year assignment. It is expected for the next team filling the CSU contract starting in the summer of 1974 that the research lag will be corrected. The overall impact of a low research rate on the educational process was fortunately not great, primarily because the number of African students returning from abroad is very small. However, in another year the flow of students back to the University of Nairobi for enrollment for a Ph.D. degree will be considerably larger. Hence development of a vigorous research program from 1974 on will successfully serve to train graduate students and complete the process of Africanization of the faculty.

c) Undergraduate Training. The evaluation team, while finding a need to expedite graduate training and expand research efforts, could find no significant fault with the undergraduate program leading to the veterinary degree. In fact, although some areas, such as clinical sciences, need to be strengthened, as a whole undergraduate curriculum is certainly comparable to that of any modern veterinary college. The input by CSU into undergraduate training is and always has been significant. Improvement in teaching aids, the development of auto-tutorial systems, and expansion of the scope of herd health programs to the small farmer are cited as examples of the accomplishments by CSU team. With a history of successful undergraduate training by CSU it is anticipated that this portion of the program will continue without major problems for the balance of the contract period.

### General Comments.

Africa is a continent with vast areas suited for an expanded animal industry, and East Africa is one area of major potential in the rearing of cattle and other animals. To realize this potential requires the solution to many intricate economic, social, agricultural and animal health problems, each demanding attention by different groups of specialist. Yet the solution to these problems that inhibit maximal animal production must be found to meet the rising demand from both an expanding human population and increased buying power.

For an animal industry to keep pace with demand requires vigorous efforts and continual advancement in technology of animal production and in animal health. Of all the factors concerned with developing an animal industry, none is more important than the prevention and control of animal diseases. Improved pastures, advances in animal genetics, the introduction of new breeds or superior blood lines mean little if health problems prevent large areas of land from being utilized, or if endemic disease reduces reproduction or growth efficiency. A prerequisite then to successful cattle or other livestock production in East Africa is to be able to maintain sustained vigilance against disease epidemics originating both within and outside the country, and to combat endemic conditions that are equally important in terms of their influence on a viable animal program. To satisfy the need for animal health control requires a corps of well-trained veterinarians who can carry out the numerous responsibilities on which a successful animal industry depends.

In East Africa, the activities of a veterinary profession cover the same wide range of specific responsibilities as found elsewhere in the world and in addition a wide assortment of illnesses not found in temperate zones. Specifically, microbial or

parasitic diseases both of an epidemic and endemic type, the application of animal hygiene on a herd basis, the understanding of reproductive disorders, the interrelation of animal nutritional requirements and health, and the conduct of diagnostic laboratories for disease differentiation are examples of immediate pressing needs demanding trained veterinarians. Veterinarians also assume important roles in food hygiene, meat inspection, toxicology and veterinary public health. As specialists become available in allied fields of the animal industry, veterinary collaboration will be necessary on such subjects as animal genetics, nutrition, and breeding, to mention only a few.

The key to supplying the needed veterinary manpower is of course a viable self-sustaining veterinary college. The Veterinary College, University of Nairobi, has had tremendous studies in the relatively short period of its existence. However, at this point in time it cannot be considered a self-sustaining organization and it will have to depend on donor assistance for a number of years to come with the solution to "independence" dependent on the degree of Africanization of the faculty. As stated earlier in this report, many areas in the college have a sizeable group of native faculty. In other areas much needs to be done. One of the areas lagging behind in this regard are the clinic sciences. Therefore, in terms of maximum benefit to the college it is recommended that CSU place major emphasis in this area.

Accordingly for the six positions allotted to the faculty in the CSU contract four of them should be for clinical subjects. These should encompass the diagnostic laboratory, herd health, and general medicine. The latter subject would be covered by two positions, one man with greater skills in medicine, another with a broader background in surgery. The faculty involved in herd health and general medicine

could pool their time and resources to develop an effective ambulatory clinic program, one of the weaker areas as the school curriculum presently stands.

The two other positions should include microbiology and parasitology. It is recognized that in each of these two areas there is a trained African faculty member present. But these two subjects are among the most important in the African environment. Therefore, greater support is needed and will be needed for some time to come.

This reorganization of the CSU faculty would then eliminate support in the areas of pharmacology and full-time surgery.

In order to facilitate research by CSU/Nairobi (as a key to successful graduate training) it is recommended that the budget be re-examined to allow for a large sum to be attached to so-called commodities fund. This fund should be divided up so each faculty member can have a few thousand dollars for research support. Larger pieces of equipment could be had by individual faculty members pooling their share of the fund if they desire. This method of support for faculty research has been used successfully by other donor groups. It is the opinion of the evaluators that to obtain maximal benefit from the CSU team, this type support should be allowed.

The subject of phasing out the CSU program in 1978 should be reexamined. To arbitrarily plan to eliminate positions prior to that time may not be to the best benefit of all concerned. The key to phasing out will be the number of graduate students under training for a Ph. D. degree under a CSU faculty member. Since the survival of the college depends on a trained African faculty, nothing should be done to jeopardize graduate training.

## Conclusions and Recommendations.

1. The Veterinary College in Kenya is a vital support element in the development of a strong, economically sound animal industry.
2. The Veterinary College, although advanced in development, cannot survive without additional donor assistance from several sources, one of these being AID. Therefore, it is strongly recommended that AID continue support through at least 1978 as had been previously planned.
3. Colorado State University through the AID contract has been an invaluable member of a group of donors which has successfully developed, along with the University of Nairobi, a good undergraduate veterinary program.
4. In some ways the graduate training program and research by CSU has lagged behind the undergraduate program. The exception to this has been the successful scholarship program allowing for studies in the USA.
5. The scholarship program should be continued and even expanded when possible.
6. Due to the long period of experience by CSU at the University of Nairobi and because of the presence of a relatively new dean at CSU/Fort Collins, it is strongly recommended that CSU continue to supply veterinary education support through the USAID contract.
7. Emphasis should be in the Clinical Sciences area in addition to Microbiology and Parasitology.
8. Some form of a research support fund should be provided for each of the CSU faculty members as an important means of graduate training and accelerating the Africanization process.

9. The precise time table for phasing out the CSU program should be re-examined and keyed to the status of essential graduate training leading to development of an African faculty.

Individuals Interviewed

Harold Kugler	AID/ Washington
Dean Tietz	
R. Jensen	
John Cheney	
Cleo Kimberling	CSU/Fort Collins
Bob Udall	
L. Lauerman	
D. Grout	
Varma	Kenya Students/CSU Fort Collins
E.C. Mbadi	
F. Corey	EAVRO
Gale Wagner	
G. Burrows	
L. Davies	CSU/N
R. Robin	
E. Usenik	
L. Johnson	
Dean J. Mugeru	Vet. College, Univ. of Nairobi
Dean Musangi	School of Agriculture/ Univ. of Nairobi
Dr. Mungi, Dep. Vice Chancellor	University of Nairobi
Dr. Gomba	Vet. College/N
Dr. Wandera	" " "
Dr. Mboya	
Dr. W. Gervig	Germany, U of N
S. Muhammed	U of N
Dr. Wycoff	Walter Reed
S.E. Rastod	Rockefeller/Norway
Dr. Njoroge	Vet. Services Lab.
Mr. Sorensen	NORAD
Mr. Carr	ODA
Mr. Bannecker	Swiss Tech. Assistance
Dr. Bergstrand	Sieda
Mr. Hahn	German Tech. Assistance
Harold Jones	AID/Nairobi
Dale Pfeiffer	" "
John Gunning	" "
David Schoer	

## DEPARTMENT OF CLINICAL STUDIES

Faculty of Veterinary Medicine  
University of Nairobi

Report to the Vice-Chancellor of the University from Professor Ian McIntyre,  
Professor of Veterinary Medicine in the University of Glasgow.

This report has been prepared at the request of the Vice-Chancellor of the University of Nairobi and the Dean of the Faculty of Veterinary Medicine. It is based on a two-week visit in November 1977 to the Department of Clinical Studies. During this time all members of staff were interviewed individually and three group meetings were held with members of staff including one under the Chairmanship of the Head of Department. The facilities offered by the Department were examined and various teaching stations were visited including a short period on the ambulatory clinic. Before making general comments I would like to record with appreciation the complete cooperation which I received from all members of the clinical staff and in particular the frankness with which they discussed future opportunities and problems.

I must begin this report by recording how many changes and improvements have taken place within the Department since I left it a decade ago. The facilities have expanded beyond all recognition and the recruitment of local staff has been most encouraging. My lasting impression is one of future opportunities for the Department rather than one of problems.

I should say that these general impressions are formed against the background of a very busy year in which I have visited formally the clinical departments of ten other veterinary schools, six in the United Kingdom, three in Canada and one in the United States. It would be true to say that none of these schools have solved the problem of adequate clinical teaching material in relation to staff and students and Nairobi need not feel it is in any way unique in this respect.

It is proposed to discuss the main problems and opportunities under major

headings and to end the report with a list of recommendations based on the arguments produced in the report.

### Student Numbers

As one who was involved in the early struggles within the University of East Africa to increase the student intake to the Faculty of Veterinary Medicine from twenty to fifty to serve the needs of the three countries of East Africa it seems to me that the present intake of eighty to ninety students per annum is far too great for the building facilities and clinical teaching staffs available. Also it seems impossible to provide adequate clinical teaching material for such a number of students in their senior year despite the optimism with which I believe I discuss the problem of clinical material in the next section.

It may well be that for a short period the veterinary manpower requirements of Kenya demanded these numbers but it now seems urgent that discussions should take place between the University and several Government Departments including the Ministry of Agriculture concerning this matter. During my visit it has been put to me that there are more students in the Veterinary Faculty at the moment than there are veterinarians in the Government service of Kenya. This is an urgent matter and I place it at the head of the report because I believe that with the best will in the world the clinical staffs cannot produce enough teaching material for such numbers of students.

### Clinical Material

It seems clear to me and to the large majority of clinical staff that the main emphasis in clinical teaching must be directed towards the problems of the small livestock farmer in Kenya, thousands of whom are within easy geographical reach of the Faculty of Veterinary Medicine. An ambulatory clinic has been a long established traditional part of the clinical service to the community and a means of providing teaching material both on the farm and

within the hospital. Traditionally the ambulatory clinic has provided a service in response to telephone requests or other messages from livestock owners to come to treat their sick animals. Farmers have been charged for this service under headings of professional services, mileage costs and drug costs with profits. This is a reasonable procedure for the successful farmer milking more than thirty cows or owning more than fifty beef breeding cows, but this is the exception within the areas adjacent to Kabete.

It seems to me that much more appreciation must be given to the fact that these farmers are allowing groups of six students to come on to their farms along with a professional veterinarian and that the farmer is expected to allow these students to examine his sick animal despite the fact that this is not necessary for the purposes of the diagnosis or treatment. Therefore, this exercise must be looked on as an educational cost similar to that involved in transporting students elsewhere for field studies of various kinds. The charges have now become so high that there is little doubt in my mind that they are limiting the number of requests for aid from the small farmers. In particular second visits to farms to see whether or not an animal has recovered from its illness or responded to treatment is an essential educational feature of an ambulatory clinic but is virtually prohibited in the present running of the ambulatory clinic because of costs.

Furthermore the concepts of long term preventive medicine and disease control cannot be looked after properly by a telephone service based on the occasional individual animal becoming sick. Continuous advice and encouragement to such farmers can only be given on a basis of regular visits by members of staff to an area or groups of farmers who are interested in developing and improving their methods of production. I realize that under the animal health programme students are taken on a regular basis to see and to participate in certain activities involving production. However, this particular class tends to concentrate on larger farms and a substantial part

of its routine work is based on pregnancy diagnosis of cattle. This is a valuable part of the total clinical programme but is in no way a substitute for the need to become involved with the development of the small farmer.

Apart from the immediate teaching requirements for students and personal clinical experience for the staff, it is important for the public image of the Veterinary Faculty that it should be seen to be involved with the problems of the majority of livestock farmers in its vicinity.

As these farmers also have access to the services of the Government Veterinary Department it seems to me that much could be gained by closer collaboration with the staff of the Chief Veterinary Officer and in particular to benefit from the experience which he has gained in building up clinical services in different parts of the country and a national artificial insemination service.

Finally it should be said that all members of the staff involved in the teaching of conditions concerning farm animals expressed the strong desire that they would like to participate in the work of the ambulatory clinic both on routine tasks and also in the development of specialist preventive medicine programmes. As there are some eight or ten people in this category the Department could obviously develop some major programmes in agriculture provided that the transport and back-up facilities were available which they are not at present.

By far, the weakest area within the Department is the small number of land-rovers on the road. This is always a costly exercise but there is no alternative and it is a cost which must be faced up to as part of the training of veterinarians. If the present overall earning of the various clinics were made available for the use of the Department the problem of land-rovers could be solved very easily.

Having decided that the main effort of the Clinical Department should go

towards developments in agriculture it must not be forgotten that the present small animal clinic has also got an excellent educational part to play.

Not only does it serve a public which has acquired an increasing number of guard dogs and pet animals but it provides the student with an opportunity to take case histories directly from owners and, to participate in first diagnosis and to see a variety of disease conditions which do not exist in farm animal species. Also the small animal clinic provides by far the best opportunity for giving the appropriate amount of surgical training for students in Nairobi and for introducing them to specialist techniques such as anaesthesia and radiology.

The small animal clinic has an excellent facility and could handle more cases given sufficient staff to keep the clinic open all day or at least to re-open it again in the early evening hours. It seems to me that limiting the clinic hours to two per day is an unnecessary limitation on the amount of material available. To provide adequate material for even fifty students the small animal clinic would need to double its present out-patient numbers.

The amount of time which the student should spend learning about the horse must vary from veterinary school to veterinary school throughout the world. In some parts of Africa such as Uganda practically no horses exist. In countries such as Senegal which has its own veterinary school the horse is a major source of traction. In Kenya, so far, it tends to be a pleasure animal and of course there is a limited thoroughbred industry. The Veterinary School must be involved in these activities but care must always be taken to see that under the title of the large animal the horse does not squeeze out the importance of the cow.

Likewise, provision must be made for the care of wild animals which for one reason or another require individual veterinary care. The wildlife resource is of major importance to Kenya and the Faculty should continue and

even develop its interests in this area keeping in mind that it will always be a relatively minor interest for the average student.

### The Administrative Structure of the Department of Clinical Studies

This subject was discussed at length with members of staff and it would appear that the present divisions of opinion within the department may be summarized roughly as follows.

There are those traditionalists who would like to compare Nairobi either to its own medical school or to European veterinary schools and subdivide the clinical department into departments such as medicine, surgery, and gynaecology and obstetrics. Such arrangements exist in Germany but not in the U.K. and only very occasionally in the United States.

Others believe that the department should retain one Chairman of Clinical Studies and be sub-divided on a species basis. In other words, the small animal clinic should continue as it is, doing its own medicine cases and surgery cases and that the farm animal teachers should equally combine their experience in ambulatory diagnosis and treatment of medicine cases with the occasional surgery required in farm animal work. Some would combine the horse with the farm animal work under the general heading of large animals while others would combine the horse with small animals and wildlife as a non-agricultural group, while I am sure the horse specialists would wish to keep the horse separate and on its own. It would be fair to say that those who visualize such a division would want to see specialties such as anaesthesia and radiology develop in the areas it seems most appropriate.

There is little doubt in my mind that any system can be made to work given the goodwill of all concerned. Whatever organization develops in the future I would wish only to see that the dominant influence is given within the department to the development of farm animal work and to further involvement in Kenya's agriculture without in anyway negating the relative importance

of other branches of veterinary work.

For the present it seems to me that far too much concern and discussion takes place within the Department concerning future reorganization and subdivision. For me, the most important developments for the next four or five years are the clinical academic careers of the individuals on the staff, and a shift of emphasis to the development of agricultural programmes. Any hasty reorganization might well work against these long term aims and young staff in particular might well suffer in their academic growth.

### The Curriculum

While it was not a specific part of my remit to examine the curriculum in any detail it was inevitable that certain major items of the curriculum do affect the clinical department and its teaching and service programmes. Therefore, the following comments are offered keeping in mind that no detailed study has been made. However, I think that some of the points are so obvious that there will not be much argument about them within the clinical department. Like so many professional schools and perhaps in particular veterinary schools too much emphasis is still being made on the use of the lecture as a means of communication. In particular there would appear to be a large duplication of factual material concerning disease between the departments of pathology and clinical studies. There would also appear to be a considerable amount of time spent on conditions which do not commonly occur in Kenya. I certainly would not expect my Glasgow students to know all about Rinderpest.

With regard to the clinical training, it seems to me that inadequate use is being made of the additional term between the end of third year and between the beginning of fourth year. This would appear to be the ideal time to concentrate on the formal training on how to examine a cow and a dog and to have it done within the hospital so that students are able to examine an animal thoroughly before they start to visit farms.

In the final year itself it is obvious that the postponement of clinical work until 10 a.m. is ruinous on the day's programme and indeed the animal health instructor ignores the lectures between 8 and 10 a.m. and takes his students to the country as early as he likes. The delay has a marked effect on the ambulatory clinic and the day's work involved.

Furthermore, the advent of a lengthy laboratory bacteriological class in the Public Health Department impinges excessively on the distribution of groups during the clinical year. In order to provide this department with large classes at a time, the veterinary staff on ambulatory clinic have even got to return at lunchtime to change students and the concept of students being on ambulatory clinic for even a week continuously is not in any way possible at present.

While this may appear to be a detail that could be remedied with some careful thought I believe the present clinical curriculum in the fourth year reflects the lack of emphasis on farm animal work and the involvement of staff in it.

### Physical Facilities

Physical facilities in general at Kabete must be the envy of many veterinary schools and particularly British Veterinary Schools. Both the large animal clinic and the small animal clinic have been built on a generous scale. In the context of the above it does seem a pity however that there is little or no accommodation available for housing horses in safety and despite what may have been said about the horse in earlier pages I believe it is important that to match its other excellent facilities the department should have approximately twenty horse loose-boxes which might for financial reasons be built in two stages. In addition, some of the cattle accommodation requires to be modernized and there is little or no suitable accommodation for the smaller species of farm animals within the department and this should

be corrected.

### Clinical Earnings

The use of money earned by veterinary clinical staff varies from University to University across the world. At the one extreme some Universities expect their clinical departments to earn almost enough to pay for the whole operation of the department and at the other extreme any clinical earnings simply disappear into the general budget of the University. The happiest compromise seems to exist where clinical earnings are reinvested in improvements to the clinical departments and to solving some of the immediate problems particularly concerning transport.

Clinical staff could easily argue that they would obtain clinical material much more easily if no charges were made at all to the clients and therefore there would be no income available to the University. It does seem to me that the Nairobi Veterinary School desperately requires a re-thinking of this subject by the central administration, keeping in mind that present practices have grown up by accident rather than by specific design.

For me, it was a salutary experience, if brief, to be back in the land-rover again at Kabete in the mud of a very wet November morning. I believe it is important that central administrative staff should have a special sympathy for clinicians who work under these conditions over long hours and who need to keep this activity going for the whole of their professional and academic lives. To solve the administrative problems concerned with a farm animal operation in the clinical department should assume the greatest of importance within the administration. Naturally this requires communication on both sides and an understanding of each others problems but once again one can only say that this particular problem is not confined to Nairobi.

### Clinical Laboratories

It is essential that the clinical department should retain control over its diagnostic laboratories for two main reasons. They are the only group of staff who feel the urgency of an immediate blood examination because the animal under their care is sick but still alive. These laboratories are available at the time for clinicians to do their own microscopic examination when necessary. They are also an essential facility to enable clinicians to initiate new epidemiological programmes.

However, as far as the students are concerned and once again from a brief examination of the curriculum, it does seem that final year students are being taught to do too many laboratory operations which they will never have the opportunity to carry out in the field. The ability to make a good blood film or a lymph node smear and the loving care of a good microscope should surely be the main themes for veterinarians who are going to spend their lives in the field in Africa.

### General Impressions

After two weeks with the clinical staff I left Nairobi tremendously encouraged at what has taken place and excited about the opportunities which lie ahead. The staff gave me the impression that they are eager to go ahead to work hard to develop their academic and professional interests and to look after their students to the maximum of their ability. I believe that over the next four or five years they deserve the special interest and help of the administration in their rather difficult task, a task without comparison in any other part of the University. They certainly have mine.

### RECOMMENDATIONS

1. That consultations should take place urgently with the Government of Kenya, about the Country's veterinary manpower requirements for the future with a view to reducing the numbers of students in the Veterinary Faculty. The

Faculty was built for fifty students per class and in my opinion there is little chance of providing adequate clinical material no matter how many improvements are made for more than this number of students.

2. Greater emphasis on the development of farm animal programmes must be made by the clinical department. To enable the clinical department to do this the following are essential:

- a. A minimum of five land-rovers to be kept on the road at all times.
- b. To allow the clinical department to collect and account for fees which it earns.
- c. For these funds to be devoted to solving the problems of the clinical department such as adequate provision of land-rovers and future developments.
- d. To reduce charges to small farmers preferably charging only for the cost of drugs.
- e. To revise the final year curriculum to enable students to get away early to farms and to spend the maximum time each day in farm work.
- f. To appoint two junior members of clinical staff for a year at a time to be resident in the flat specially built at the Faculty for this purpose. At the moment there is no one in residence despite a considerable number of sick animals being in the care of the clinical department. These appointments would be for new graduates and ideally should change each year.

3. To postpone a major rigid sub-division of the department for several more years until individual members of staff have had more time to develop their own careers.

4. In addition to publications, research and teaching ability, clinical experience should be considered for promotion of individual staff members.

5. To enable staff in the farm area of work to develop such experience they must have access to a share of the ambulatory work and have the use of animal hospital accommodation to study some of their patients in depth. Epidemiology and disease evaluation within the area should become a recognized part of thesis work for clinicians whether for M.Sc., or Ph.D.
6. The clinical diagnostic laboratories should remain the responsibility of the clinical department.
7. Experienced clinical staff should continue to have the opportunity of spending short periods abroad working to extend their clinical experience and to exchange ideas with other clinical teachers. These periods can usefully be as short as a month or six weeks.
8. The University of Nairobi should give serious consideration to awarding a special clinical responsibility Financial Allowance to members of the staff of the Department of Clinical Studies on the basis that they carry out a large amount of routine clinical work for the benefit of the students which eats into their time for individual research. In other words, it is a responsibility which they carry over and above the usual ones within a University namely teaching and research. Also, they have a continuing responsibility for the care of sick animals once they have admitted them to the hospital and this responsibility continues regardless of the weekend and often has legal implications for the staff and the University. Such a financial responsibility could be paid from the earnings of the clinical department from the public thus keeping it separate from other salary monies.

