

NARCOTICS LABORATORY ANALYSES IN ECUADOR

- An Evaluation Report -

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Summary

The narcotics problem in Ecuador centers around cocaine and marihuana used, transported and processed principally in the coastal and southern portions of this country. Narcotics law enforcement is the function of the National Civil Police, while the laboratory analyses of confiscated drugs are the responsibilities of the Ecuadorean National Department of Drug Control and Enforcement (DNCFE), of the Ministry of Public Health.

From the technical point of view, the adjudication of the current narcotics law in Ecuador calls for only the identification of illicit narcotics. However, a new law proposed and now under consideration will require the quantitation of the drugs, that is, the determination of percent content of the illicit substance in the confiscated materials.

Of the three Ecuadorean Government laboratories observed during this study, DNCFE/Guayaquil is the more capable, already performing adequate identification of marihuana and cocaine. DNCFE/Quito has trained technicians but no facilities and hence must depend on outside resources to effect any identification. The National Civil Police has no laboratory capability but employs the services of a consultant for whatever narcotics analyses might be requested.

It is recommended that all three laboratories equip themselves with at least the basic equipment and supplies necessary to suitably and definitively identify the common illicit drugs (marihuana, cocaine, heroin, morphine, amphetamines and barbiturates); that if the new law is enacted requiring quantitation, they add to their facilities either a gas chromatograph or ultra-violet spectrophotometer to conduct these examinations.

It is recommended that U.S. assistance totalling \$45,000 be provided to the DNCFE/Quito and DNCFE/Guayaquil laboratories for the necessary commodities but be granted contingent upon the implementation of self-help actions by the Ecuadorean Government; that any U.S. assistance to the National Police be held in abeyance, until such time they take action to establish a fulltime narcotics analysis or criminalistics laboratory.

I. Introduction

The Department of Drug Control and Enforcement (DNCFE) of the Ecuadorean National Institute of Hygiene in Quito submitted a list of laboratory equipment and supplies to the USAID Public Safety Division, in hopes that a U.S. grant might be made available for the purchase of these items for the development of their narcotics analysis capabilities^{a/}. This list was in turn submitted to A.I.D. for review. In light of the technical nature of the questions which subsequently arose, the USAID Mission chose to request TDY assistance to evaluate Ecuador's overall laboratory capabilities in drug control efforts (Ref: Quito 5770).

The assistance was provided by Mr. Arlen W. Jee, Public Safety Advisor, A.I.D./Washington, commencing on January 15, 1974, and ending on January 25. It entailed observation/study visits to the National Institutes of Hygiene in Quito and Guayaquil, the Provincial Headquarters of the National Civil Police and a commercial pharmaceutical laboratory both in Quito. Meetings were held with a number

^{a/} A translation of the list of requested materials was forwarded per Memorandum from USAID/PSD to AID/OPS Technical Services Division; dated July 19, 1973; subject: Narcotics Control -- Proposal for Laboratory Equipment and Reagents -- Ecuadorean Ministry of Public Health.

of the officials of the above agencies and with the USAID Public Safety staff in Quito. Prior to the departure of the Advisor, briefings on his findings and recommendations were held for the AMEMBassy's Narcotics Control Coordinator; the USAID Director, Deputy Director and Program Officer; the Senior Agent in charge of the U.S. Drug Enforcement Administration's office in Quito. (Ref. Annex A: Ecuadorean and U.S. Officials Contacted).

The areas of concern for this study were (1) the capabilities of the GOE forensic scientific facilities to respond adequately to Ecuador's narcotics law enforcement requirements; and (2) the staffing, training and equipment needs to permit these facilities to handle current and future caseloads in narcotics control.

II. Observations and Findings

General Narcotics Problem. While no data were available during this study to more empirically identify the extent of narcotics abuse in Ecuador, both Ecuadorean and U.S. officials generally agree that this Latin American country does have its own problem and that a major portion of it (one Ecuadorean estimated 90-95%) is

concentrated in the Guayas Province and others to the south and along the coast.

However, the types of narcotics related arrests made during the two-year period 1972 and 1973 is generally descriptive of the drug abuse in Ecuador. About 45% of the arrests were for consumption of illicit narcotics, principally marihuana and to a lesser extent, cocaine. Another 44% were for trafficking and the remaining 11% for possession of the illicit substances.

Ecuador is also considered to be a significant producer and transshipment point of the narcotics. Cocaine paste is reportedly being shipped from Peru and Chile into Ecuador where the substance is then refined to its hydrochloride derivative. In just the last two years 19 clandestine laboratories have been discovered. Moreover, fields of marihuana and coca have been uncovered and recent estimates suggest that other fields can very likely be found in areas not accessible by the Police.

With respect to the opiates, large fields of the opium poppy plant were found in 1972 (none in 1973) and it is strongly suspected that other fields are also present - but in inaccessible areas. At this time there is no evidence of a problem dealing with the consumption of processing of opium.

Narcotics Law Enforcement. The investigations of narcotics law violations are handled almost exclusively by the Narcotics Service/Interpol Division of the National Police. This Division - a unit independent of the Criminal Investigations Service - has fulltime investigators in 9 provinces; in addition, narcotics law enforcement responsibilities have been added as a part of the normal functions of key National Police officials assigned to the other 11 provinces.

The DNCFE of the Ministry of Public Health performs the monitoring and enforcing of laws related to the legitimate prescribing/dispensing of controlled substances by the pharmacies and medical profession.

Other agencies that have exercised narcotics investigative responsibilities include the armed forces and the Ecuadorean Customs Service, the latter of which has already taken steps to establish their own investigative team.

Ecuadorean Narcotics Law. The narcotics law presently enforced in Ecuador requires that the DNCFE maintain control as well as perform the analyses of seized drugs. Further interpretation

of this law indicates that the identity of the illicit substance only be established (i. e., qualitative analysis) and, as a consequence, the determination of its concentration in a mixture is not necessary (a procedure often referred to as quantitative analysis).

However, another law has been proposed and is now under discussion. It will require more extensive handling and analyses of seized drugs. (1) All confiscated narcotics will be turned over to National Police's drug control units (as opposed to the present law which requires the Ministry of Public Health to maintain control of the seized materials). (2) The packages of the entire seizure will be weighed and two samples from each will be taken. (3) These specimens will be submitted to the laboratories of the National Police and DNCFE where they are to carry out both qualitative and quantitative tests.

Upon completion of the judicial proceedings and upon receipt of a court order, the confiscated drugs will again be weighed; two samples from each package will be extracted and subjected to the same analysis by the same two laboratories, as described above; in the presence of witnesses, the entire seizure will then be destroyed.

It was reasoned that there is strong suspicion some of the confiscated drugs are being reintroduced into the illicit market; the proposed law and procedural requirements thereof would provide a cross check and hence eliminate, or most certainly make more difficult, the resale of seized narcotics.

Narcotics Analysis Laboratories, DNCFE. The National Institute of Hygiene, under the Ministry of Public Health, has a number of offices throughout the country and maintains laboratories to perform diagnostic/biological tests. Additionally, some three years ago DNCFE facilities were established in Quito and Guayaquil.

a. DNCFE/Quito

This regional office is staffed with two university-trained chemists who have the specific responsibility for analyzing suspect drug materials. Their cases come from within the Quito metropolitan area and in 1973 amounted to 68 examinations (almost 81% related to marihuana and the remaining to cocaine).

The DNCFE/Quito facilities do not have their own laboratory and any examinations which they do perform require the use of the limited array of instruments available at the Institute's medical laboratories. It was related during the study that rooms

can be made available to house a narcotics analysis laboratory but U.S. assistance would be needed to equip it.

Upon receipt of suspect substances, the chemists conduct what amount to be only preliminary examinations. Marihuana is tentatively identified through microscopic examinations; cocaine is presumptively identified by the use of a color reaction test.

If these test results indicate the possible presence of the respective illicit drug, the specimen is sent to a private pharmaceutical laboratory for further examinations and positive identification. This arrangement was established and continues more as a personal favor (than an official inter-agency contract) between one DNCFE chemist and the chief of the private firm's chemistry control laboratory.

b. DNCFE/Guayaquil

The operations at Guayaquil present a considerably different picture than those found in Quito. The Institute of Hygiene at the port city consists of a complex of buildings housing a much greater number of offices and different diagnostic/biological laboratories. The DNCFE offices occupy one floor of a building

and will include one room for the laboratory. In the meantime, a smaller room is designated for narcotics analyses but has been supplied with equipment and materials more suited for general chemical work than for narcotics testing.

The laboratory receives its cases from all parts of Ecuador outside of the Quito area. One university graduate in chemistry performs all analyses and during the calendar year 1973 handled 370 examinations (51% related to marihuana and 49% to cocaine).

Accepted microscopic/chemical examinations are conducted to adequately identify marihuana; appropriate chemical examinations are likewise employed to identify cocaine. And, when advanced techniques (gas chromatography, infra-red and ultra-violet spectrophotometry) are required, instruments are available in another building.

Narcotics Analysis Laboratory, National Civil Police. The Police do not have their own facilities to examine drugs nor any other types of physical evidence. A very small room at the Provincial Headquarters in Quito had been set aside to display what scientific

instruments they have (e. g., a stereomicroscope and a comparison microscope) and is no way equipped or designed to perform police laboratory tests. It was indicated during this visit, however, that facilities will be made available to house a laboratory at the general headquarters building of the National Police.

A part-time consultant (a chemistry professor with the Central University) has been employed by the Police for the last 14 years to conduct whatever criminalistics analyses that are required. For the most part, if not entirely, the examinations are conducted at the University. While the Police indicated they do perform narcotics analyses, they do not have statistics on their caseload.

Other Laboratory Resources. The private pharmaceutical laboratory referred to earlier is the Laboratorios Industriales Farmaceuticos Ecuatorianos, S. A., (more widely known as "LIFE"). Its principal operation is the manufacture of some pharmaceuticals and hence includes a chemistry control laboratory. It is well staffed with qualified technicians and equipped with a complete array of basic and advanced instruments, including ultra-violet and infra-red spectrophotometers (but not the gas chromatograph).

Another laboratory resource in Ecuador is the Central University which is reportedly to have all scientific instruments; as indicated previously. The National Police's consultant does employ these facilities.

Past U.S. Contributions. As yet, no commodity input nor in-country technical advice has been provided by the U.S. Government to the National Civil Police, DNCFE in Quito or in Guayaquil to develop their narcotics analytical skills.

U.S. technical specialty training has been recently provided, however. An analyst from DNCFE/Quito and the one from DNCFE in Guayaquil completed a forensic chemist seminar in February-March 1974. This course held in Washington, D.C., by the U.S. Drug Enforcement Administration encompassed studies in advanced narcotics analyses (including the utilization of gas chromatography and ultra-violet spectrophotometry). The training concluded with observation/study visits of a number of U.S. facilities that deal with narcotics analyses and forensic sciences.

III. Conclusions and Recommendations

Current concern relative to narcotics control efforts in Ecuador centers around strongly suspected reintroduction of

confiscated drugs into the illicit market. And, to minimize, if not eliminate, this situation, a new narcotics law has been proposed and is presently under consideration by the Ecuadorean Government.

To the forensic laboratories, the proposed legislation - if enacted - would not only require the identification but the quantitation of illicit narcotics. It would furthermore necessitate duplication of analyses by two independent laboratories as well as by the individual facilities b/.

Hence, any consideration of Ecuadorean laboratory capabilities to be responsive to the current and future needs in narcotics control is obliged to address three elements of drug examinations: qualitative/quantitative analytical objectives; control/accountability of seized drugs; and technical accuracy/precision of the examinations themselves.

Qualitative/Quantitative Analyses. To identify the more common illicit drugs (namely, marihuana, cocaine, morphine, heroin, amphetamines and barbiturates), the forensic analyst would need a

b/ In comparison, narcotics laws encountered elsewhere call for only the identification of drugs. While quantitation is useful as an investigative aid and hence performed at times, it is not required by law and is not indispensable to the adjudication of narcotics violation. Moreover, routine duplication of analyses by independent laboratories is not normally required nor requested.

small number of basic scientific instruments, plus a selected array of chemicals and laboratory supplies. (Suggested items noted in the Annexes C through G).

However, to quantitate drugs, more advanced instruments are imperative and must be added. The better known of these are the gas chromatograph and the ultra-violet spectrophotometer, both of which provide the additional versatility of identifying other types of controlled substances (such as the hallucinogenics) (Annex H).

a.. DNCFE/Quito

This organization is staffed with two trained analysts but nevertheless remains ineffective in narcotics examinations. It has neither the physical facilities nor the minimum equipment to carry out examinations leading to positive identifications of drugs. Presumptive tests which they do perform on cocaine and marihuana require the use of the already limited equipment and materials of other medical/biological laboratories of the Institute.

The Quito office should establish its own independent laboratory with facilities to conduct complete analyses of drugs. It should make one or two rooms available to house this laboratory.

Initially, it should be equipped with those instruments and materials to permit the definitive qualitative analyses of common drugs and, in particular, marihuana and cocaine.

However, if the proposed legislation is enacted, it will become imperative that they also have at least one of the aforementioned advanced instruments.

b. DNCFE/Guayaquil

This laboratory performs the narcotics examinations for all areas outside of Quito. Its technical staff of one analyst handled over five times the workload the Quito staff accomplished in 1973. While identifications of marihuana and cocaine are adequately conducted, there is no capability to quantitate the drugs without employing the instruments of other medical/biological laboratories of the Institute.

In the very near future the narcotics analysis laboratory will be relocated and will share the same floor as the other DNCFE offices, adding continuity to their operations and providing for more suitable space. The Ecuadorians should take this opportunity to improve and expand their laboratory capabilities to identify a wider

range of drugs by including those instruments and materials appropriate for chemical color/crystal testing.

If the proposed law is enacted, they too will require the addition of either a gas chromatograph or an ultra-violet spectrophotometer.

c. National Civil Police

Very little priority has seemingly been given by this organization to develop their own full-time criminalistics or narcotics analysis laboratory. It is felt that, until the warranted priority is given and some self-help action has been taken to establish such facilities, the Police should continue to employ the services of the part-time consultant and the Central University.

Control/Accountability. The handling of any form of physical evidence and, in particular, confiscated drugs must be controlled and all who have had custody of the evidence must be held accountable. If not to stop the actual loss of all or a portion of the evidence or the adulteration of the seized drugs, strict control and accountability would serve as an effective preventive measure. (See Annex B: Narcotics Evidence: Control/Accountability, for suggested points of consideration).

None of the laboratories observed has a permanent record in which confiscated evidence is logged in or out and hence can be accounted for. Each of the forensic laboratories should take steps to adopt appropriate measures to document the receipt and release of physical evidence. In addition, to maintain the continuity of control and accountability, all analyses should be performed entirely within the confine of the individual facilities. Examinations by outside institutions that can not be held accountable should be discontinued or at least minimized to only emergency situations.

Technical Accuracy/Precision. It is axiomatic that one laboratory should conduct the analyses of evidence from beginning to end. It develops its own analytical scheme, based on the technicians' experiences and the equipment they possess, and the continuity of the procedures results in a logically deduced opinion relative to the examinations. Moreover, the continued practice and testing of the scheme familiar to the technicians provide for consistent results. The dependence on outside laboratories to supplement their own tests would only invite errors, uncertainty or even differences of opinions and hence should be avoided.

Moreover, it is not out of the realm of possibility that two laboratories are in collusion with each other and consequently "fabricate" results; or they are in competition and attempt to undermine the efforts of the other. While these situations are not expected to arise in Ecuador, it is nevertheless pertinent to note them, for they - at the least - negate the technical objectivity and accuracy one originally strived for.

It would behoove the Ecuadorean Government to equip their laboratories with sufficient and adequate materials to conduct whatever tests necessary to definitively identify and, if required in the future, to quantitate controlled drugs.

Recommendations. Given the situation in Ecuador as described above and the possible availability of U.S. resources to aid the Ecuadoreans in their narcotics control efforts, it is recommended that the DNCFE/Quito and DNCFE/Guayaquil laboratories be each equipped with the basic equipment and supplies to identify illicit drugs and, if the new law is in fact enacted requiring quantitative analyses, the same facilities be additionally equipped with the needed chromatograph or spectrophotometer; that U.S. grants (\$22,500 for each of the two laboratories) be authorized to

procure the equipment and supplies, but contingent on the implementation of self-help actions by the Ecuadorean Government; that, however, U.S. assistance to the National Civil Police facilities in narcotics analysis be held in abeyance, until such time after the Ecuadoreans manifest sufficient priority and self-help action towards the development of these capabilities.

a. U.S. Contributions

More specifically, it is recommended that U.S. funds be made available for the granting of the basic instruments, supplies, reference texts and chemicals as listed in Annexes B through F, respectively to each of the laboratories - DNCFE/Quito and DNCFE/Guayaquil (total input per laboratory: \$5,500);

that, when the new legislation is enacted, the same laboratories be provided with a gas chromatograph or ultra-violet spectrophotometer, the selection being that of the Ecuadorean forensic chemists (total input per laboratory: \$17,000).

b. Ecuadorean Contributions

However, it is recommended that in receiving the aforementioned U.S. assistance, the Ecuadorean Government will

agree (1) to provide for separate quarters to house the narcotics analysis laboratories and to remodel them providing for adequate chemical work benches and utilities; (2) to house the advanced instrument within the confine of the narcotics analysis laboratory, if they are so equipped, and to properly condition these quarters relative to temperature and humidity in order to minimize the deterioration of the instruments and optimize their operations; (3) to allow for adequate budgetary support for the replacement of exhausted laboratory supplies and chemicals, the procurement of others which will be needed, the installation/maintenance/repair of the chromatograph or the spectrophotometer^{c/}, and (4) to initiate and maintain proper measures for logging in and out of all physical evidence and for securing them;

that, if the Ecuadorean Government desires to develop narcotics analytical or criminalistics skills within the National Civil Police, they seriously consider the relocation of the facilities to the

^{c/} Replacements of laboratory supplies and chemicals can be purchased by the GOE from local companies. Technical services are available in Ecuador for the maintenance and repair of Beckman instruments; for Perkin-Elmer apparatuses the sales representative in Ecuador (Joseuth Gonzalez Ltda, Apartado 297, Quito) can arrange for the services of factory-trained technicians located in Colombia, Peru and Chile.

central headquarters building, the provision of adequate room(s) to house the operations, the remodeling of the area to provide for adequate chemical work benches and utilities, the employment of a fulltime university-trained technician^{d/} and the transfer of all instruments (including the bullet comparison microscope and the stereomicroscope now at the regional headquarters) to the new facilities.

(NOTE: No recommendations are called for at this time relative to in-country technical advice or to training. The incumbent technicians at the DNCFE/Quito and DNCFE/Guayaquil have received U.S. training and are adequately qualified. Any future requirements should be handled on a case-by-case basis.)

^{d/} Options available to the National Police in the employment of a fulltime laboratory technician include (1) the hiring of an experienced university-trained analyst, (2) the employment of a recent university graduate who can then be trained and (3) the development of a person from within their own rank and file. Option #1 is the preferred, while option #2 would be an adequate alternative. In both instances, however, the GOE should provide salaries competitive with those of other analysts of the DNCFE and/or private industry and, if necessary, enact a special salary scale through special legislation. Option #3 has proven to be entirely inadequate and should be avoided; even if a university graduate in a physical science is available, the individual's desire to advance through the police ranks precludes his lengthy employment in the laboratory.

The resource implications of the proposals for U.S. contributions are reflected in the following table and are considered to be one-time expenditures:

ESTIMATED RESOURCES

Commodities: Grand Total \$45,000		
	<u>DNCFE</u> <u>Quito</u>	<u>DNCFE</u> <u>Guayaquil</u>
Scientific Instruments (Annex C)	\$ 2718	\$ 2718
General Laboratory Supplies (Annex D)	336	336
Reference Texts (Annex E)	82	82
Thin-Layer Chromatography Pkg (Annex F)	1242	1242
Estimated GSA Surcharge, Shipping Costs	<u>722</u>	<u>722</u>
	5100	5100
Laboratory Chemicals (Annex G)	<u>400**</u>	<u>400**</u>
Sub-Total	\$ 5500	\$ 5500
Ultra-Violet Spectrophotometry Pkg (Annex H)	\$14850*	\$14850*
Estimated GSA Surcharge, Shipping Costs	<u>2150</u>	<u>2150</u>
Sub-Total	\$17000	\$17000
TOTAL	<u>\$22500</u>	<u>\$22500</u>

** Estimated cost for recommended chemicals purchased in host country.

* Gas Chromatography Package (Annex H) would cost approximately the same.

ECUADOREAN AND UNITED STATES OFFICIALS CONTACTED

1. Department of Drug Control and Enforcement, National Institute of Hygiene, Ministry of Public Health

Quito Office

Dr. Vinicio Moreno, Deputy National Director of DNCFE
Dra. Gloria de Munoz, Senior Chemist, DNCFE
Dr. Jose Castillo, Chemist, DNCFE

Guayaquil Office

Dr. Roberto Navarez, Regional Director, National Institute of Hygiene
Dr. Joffe Garcia, Acting Regional Chief of DNCFE
Lic. Francisco Phillips, Legal Assistant, DNCFE
Dra. Mercedes de Bohorquez, Chemist

2. National Civil Police

Col. Ernesto Montalvo, Director General, Criminal Investigations Service
Dr. Gonzalo Grijalva, Consultant in Forensic Chemistry

3. Laboratorios Industriales Farmaceuticos Ecuatorianos, S.A.

Dr. Plutarco Naranjo, Chief Medical Consultant
Dra. Judith Valarezo, Chief, Chemistry Control Laboratory

4. United States Mission

Mr. Brewster Hemmenway, DCM & Narcotics Control Coordinator
Mr. Peter Cody, USAID Mission Director
Mr. Remo Garufi, Deputy USAID Director
Mr. Weston Emery, USAID Program Officer
Mr. Walter White, SAIC, U.S. Drug Enforcement Administration
Mr. Fred Zumwalt, Public Safety Officer, USAID
Mr. Howard Groom, Narcotics Investigation Advisor, USAID

NARCOTICS EVIDENCE: CONTROL/ACCOUNTABILITY

For physical evidence to have any probative value in an investigation or the adjudication of narcotics law violations (or any other types of offense), the identity and individuality of the recovered materials must be preserved and subsequently re-established; the possibility of their loss or adulteration must be precluded. To achieve these ends, standardized procedures in handling physical evidence should be developed, initiated and continuously employed; they would also take the following into consideration.

- 1.- Identification. Whenever possible, each item of physical evidence should be distinctly marked by each person who has had custody of it or at least by the individual who recovered it. Suitable identifying marks would include the person's initials and the date when he assumed custody.
- 2.- Chain of Custody. The custody of each item of physical evidence should be documented from the time it is acquired to the time it is disposed or destroyed. Each item should be labeled with tags or preserved in envelopes which have been pre-printed with a form to record all pertinent data identifying the case, content of the package and the chain of custody.

Hence, it would consist of the following information: the nature of the offense; the case number assigned by the investigating agency; the name of the investigating agency; names of the suspect(s); a full description of the content and its quantity or, where applicable, the gross weight; the name and signature of the officer who acquired the evidence; the date, time and location of acquisition.

The printed form would also be designed to permit the chronological listing of transfers of custody, the names of those who had custody, the date and time when he accepted the evidence.

- 3.- Packaging. When possible, each item of evidence should be individually packaged either wrapped/boxed and tagged with the aforementioned label or preserved in the pre-printed

envelope. It should then be sealed with tape, sealing wax, or adhesive and marked in such a manner that the opening of the package will cause clearly visible, irreparable damage to the seal.

- 4.- Transporting. Physical evidence should be delivered in person or, if impossible, by certified mail.
- 5.- Storage. The area in which narcotics evidence is to be stored should have only one point of access - the entry. All others should be permanently closed off. The entry door should be secured with a combination lock, the combination being known to only two persons (the senior laboratory technician and the immediate supervisor). The combination should be changed each year or when one of the two persons is transferred. An annual inventory in addition to periodic spot checks should be made of the stored evidence.
- 6.- Receipt/Release. The receipt and release of narcotics evidence should be further documented by each office. Furthermore, reasons for release should always be requested and verified.

A permanently bound register is employed and would consist of columns to enter in data pertinent to the transfer: the date and time of transfer; the names of the receiver and releaser, their organizations; the case number and any other reference codings.

Collecting, Preserving, Transporting Physical Evidence, Arlen W. Jee, October 1967.

"DEA Calls for Nationwide Review of Drug-Handling Procedures," Drug Enforcement Bulletin, Fall 1973.

SCIENTIFIC INSTRUMENTS

TOTAL: \$2718

<u>Qty</u>	<u>Unit Price</u>	<u>Description</u>
1	\$1440 ea	MICROSCOPE, LABORATORY, B&L Model PB-352, with photobinocular body, graduated mechanical stage, 4x-10x-100x objectives, 10x widefield eyepieces, 1.30 NA Abbe condenser, high intensity illuminator with adjustable transformer, 100v, 60Hz, VWR #40983-252
1	\$590 ea	STEREOMICROSCOPE, B&L Model BVB-73, 10x wide-field eyepieces, total magnification variable 7x-30x, large stage with clear glass plate and removable base, VWR #41434-089
1	\$55 ea	MICROSCOPE ILLUMINATOR, FLUORESCENT, B&L Model 31-33-36, with two 4-watt tubes and opalescent diffusor, 110v, 60Hz, VWR #41446-000
1	\$264 ea	BALANCE, TORSION, Model DWL-2, 120-gm overall capacity, macro dialing to 1-gm, fine dialing to 0.01-gm, VWR #11990-006
1	\$52 ea	BALANCE WEIGHTS, Class P, stainless steel, Ohaus "Sto-A-Weigh," metric, 1-mg to 100-gm, VWR #12665-022
1	\$317 ea	CENTRIFUGE, General Purpose, Adams Dynac, with horizontal head and stainless steel shields, for eight 15-ml tubes, speed range 620-2460 rpm, VWR #20173-067

Source: Van Waters & Rogers
P. O. Box 5195
Baltimore, Maryland 21224

GENERAL LABORATORY SUPPLIES

TOTAL: \$336

<u>Qty</u>	<u>Unit Price</u>	<u>Description</u>
2	\$19 cs	CULTURE TUBE, glass, disposable, Van-Lab brand, 10x75mm, cs of 1000, VWR #60825-301
2	\$3 ea	TEST TUBE RACK, semi-micro, aluminum, Fisher brand, 12 holes (9/16" dia.), VWR #60925-022
3	\$5 bx	MICROSCOPE SLIDE, plain, VWR brand, 25x75mm, approx. 1-mm thick, bx of 144, VWR #48300-025
6	\$3 ea	MICROSCOPE SLIDE, culture, single depression, standard 25x75mm, with 3x16mm cylindrical depression, VWR #48330-004
6	\$5 bx	MICRO COVER GLASS, circular, non-corrosive, Van-Lab brand, No. 1 thickness (0.13-0.17mm), 22mm diam., bx of 1-oz., VWR #48380-068
1	\$26 bx	CENTRIFUGE TUBE, Pyrex brand glass, conical, beaded rim, 5-ml capacity, bx of 60, VWR #20905-121
1	\$12 cs	BOTTLE, narrow mouth, glass, 30-ml capacity, with flat ground glass stopper, cs of 12, VWR #16270-026
1	\$9 bx	BEAKER, GRIFFIN, Pyrex brand glass, graduated, low form, with spout, 20-ml capacity, cs of 12, VWR #13912-105
6	\$7 ea	CYLINDER, GRADUATED, Pyrex brand glass, metric, "Accu-Red," 100-ml capacity, 1-ml subdivision, VWR #24707-265
2	\$10 cs	PIPET, Pasteur capillary, disposable, glass, overall length 5-3/4", cs of 2.5 gross, VWR #14672-029
6	\$5 ea	MORTAR, Mullite, Coors 5230 series, 35-mm diam., Size #1, VWR #50412-021
6	\$3 ea	PESTLE, Mullite, Size #1, to match above mortar, VWR #50412-189

<u>Qty</u>	<u>Unit Price</u>	<u>Description</u>
6	.\$3 ea	PLATE, COLOR, porcelain, Coors, Size 000, 109 x 89 x 12mm, with 12 concavities, VWR #53636-069
6	\$5 pk	SPATULA, micro, stainless steel, with spoon on other end, pk of 3, VWR #57949-022
6	\$4 bx	PAPER, WEIGHING, S&S, 4x4-inch, bx of 500, VWR #52853-028

Source: Van Waters & Rogers
P. O. Box 5195
Baltimore, Maryland 21224

REFERENCE TEXTS

TOTAL: \$82

Modern Microcrystal Tests for Drugs, Fulton, C.F., Wiley
Interscience, New York, \$30

Isolation and Identification of Drugs, Clarke, E.G.C.,
Pharmaceutical Press, London, \$40

Merck's Index, 11th or latest edition, \$12

Source: Technical Guide Publications
5241 NE 2nd Street
Miami, Florida 33137

THIN-LAYER CHROMATOGRAPHY PACKAGE

TOTAL: \$1242

<u>Qty</u>	<u>Unit Price</u>	<u>Description</u>
1	\$222 ea	THIN-LAYER SPREADER, adjustable, with fixed aperture gates, one adjustable thickness gate and 2 sets of spacer gauges, VWR #21432-229
1	\$50 ea	MOUNTING BOARD, plastic, approx 9-3/8" x 48-3/8" x 1/8", VWR #21432-364
2	\$17 ea	GLASS PLATES, TLC, STANDARD, 20x20-cm, pkg of 10, VWR #21432-284
4	\$20 ea	(do.), 5x20-cm, pkg of 20, VWR #21432-320
1	\$42 ea	DRYING RACK, removable handle, VWR #21432-422
1	\$90 ea	DESICCATING CABINET, stainless steel, to hold above rack, VWR #21432-488
2	\$66 ea	DEVELOPING TANK, multi-plate, with stainless steel rack and lid, VWR #21432-740
2	\$18 ea	TLC TEMPLATE, 8" x 8", acrylic plastic, VWR #21432-524
2	\$22 ea	SILICA GEL G, E-M Analytical TLC Sorbent, pkg of 1-kg, VWR #21434-870
1	\$390 ea	OVEN, LABORATORY, gravity convection, Thelco Model 16, 19x18-26-in., 750 watts, 110v, 50-60 Hz, VWR #52352-022
12	\$3 ea	PIPET, ULTRAMICRO, Kirk-type, 1 microliter, VWR #53445-005
12	\$3 ea	(do.), 5 microliter, VWR #53445-082
2	\$25 ea	CHROMATOGRAPHY SPRAYER, 125-ml capacity, with Standard Taper ground joint, Fisher #5-719-5C

Sources: Van Waters & Rogers
P. O. Box 5195
Baltimore, Maryland 21224

Fisher Scientific Co.
7722 Fenton Street
Silver Spring, Md. 20910

LABORATORY CHEMICALS

EST. TOTAL: \$400 **

ACETALDEHYDE, Highest Purity Grade, #A-468, 100-gm
ACETIC ACID, GLACIAL, Reagent Grade, #A-38, 1-pt
AMMONIUM HYDROXIDE, Reagent Grade, #A-669, 1-pt
AMMONIUM m-VANADATE, Purified Grade, #A-714, 1/4-lb
CADMIUM IODIDE, Reagent Grade, #C-12, 1/4-lb
CHLOROFORM, Certified Grade, #C-298, 1-pt
COBALTOUS ACETATE, Certified Grade, #C-364, 1/4-lb
CUPRIC SULFATE, Certified Grade, #C-493, 1-lb
p-DIMETHYLAMINO BENZALDEHYDE, Certified Grade, #D-71, 100-gm
ETHYL ALCOHOL, Denatured, #A-407, 1-pt
ETHYLENEDIAMINE, Certified Grade, #E-479, 1-pt
FORMALDEHYDE, Certified Grade, #F-79, 1-pt
GOLD CHLORIDE, Reagent Grade, #G-54, 1/8-oz
HYDROBROMIC ACID, Certified Grade, #A-140, 1-pt
HYDROCHLORIC ACID, Reagent Grade, #A-144, 1-pt
IODINE, Certified Grade, #I-37, 1-oz
MERCURIC CHLORIDE, Certified Grade, #M-155, 1/4-lb
METHYL ALCOHOL, Certified Grade, #A-936, 1-qt
MOLYBDIC ACID, Certified Grade, #A-173, 1-lb
NITRIC ACID, Reagent Grade, #A-200, 1-pt
PETROLEUM ETHER, Certified Grade, #E-139, 1-pt
PHOSPHORIC ACID, Certified Grade, #A-242, 1-pt
PICRIC ACID, Reagent Grade, #A-253, 1/4-lb
PLATINIC CHLORIDE, Reagent Grade, #P-154, 1/8-oz
POTASSIUM IODIDE, Certified Grade, #P-410, 1-lb
POTASSIUM THIOCYANATE, Certified Grade, #P-317, 1/4-lb
iso-PROPYLAMINE, Highest Purity Grade, #875, 500-gm
PYRIDINE, Certified Grade, #P-368, 1-pt
SODIUM CARBONATE, Certified Grade, #S-263, 1-lb
SULFURIC ACID, Reagent Grade, #A-300, 1-pt
VANILLIN, Laboratory Grade, #V-9, 1/4-lb

Ref: Fisher Chemical Index 71C Catalog

Fisher Scientific Company
711 Forbes Avenue
Pittsburgh, Pennsylvania 15219

** Estimated total for in-country purchase of chemicals

ANNEX H

SPECTROPHOTOMETRY PACKAGE

TOTAL: \$14,850

SPECTROPHOTOMETER, Ultraviolet-Visible-NIR (190-3000mm), \$13,500
Model ACTA M-IV, with automatic switching tungsten and
deuterium sources, integral 10-inch recorder, 110v, 60Hz,
Beckman #133400

Accessories (sampling cells, chart paper, etc.) 1,350

GAS CHROMATOGRAPHY PACKAGE

TOTAL: \$14,630

GAS CHROMATOGRAPH, Model 900, with flame ionization, hot \$11,400
wire and electron capture detectors, 117v, 60Hz, Perkin-
Elmer #009-0976

RECORDER, Model 56, for above chromatograph, dual channel,
multi-range, multi-speed, 117v, 60Hz, Perkin-Elmer #056-3002 1,900

Accessories (syringes, columns, chart paper, etc.) 1,330