

RESEARCH PROJECT SUMMARY

Proj. No. 9310483-
PN PD-AAC-811 (4)

Project Title: "Lysine Enrichment of Wheat Flour" 4p.
Project Number: 931-17-560-483
Contract Number: AID/csd-1805
Project Investigator: Professor George S. Graham, M.D.

This project was activated July 1, 1967. One report has been submitted for the period July 1, 1967 to March 31, 1968.

1. Objectives

CSD-1805 Rev

This contract seeks to establish the optimum amount of lysine to be added to wheat flours to make them effective as the main or only main source of protein in the diets of growing infants and preschool children, including some who have been rehabilitated for a previous serious condition of malnutrition of the marasmic-kwashiorkor type. This project will be conducted under sensitive clinical supervision at several levels of lysine-supplementation using high protein wheat flour as the major source of protein.

Since the major grain exported to underdeveloped regions as part of our Food for Peace Programs is wheat and since wheat flour is a major portion of Title II shipments, this particular investigation has immediate bearing on procedures which would not only eliminate famine due to insufficient amount of food but also malnutrition due to inadequacy of the protein intake. It has direct and immediate relevance to projects being undertaken in various parts of the world to fortify wheat products with lysine. It has immediate relevance to determining the impact of fortification of Modern Bread in India upon the protein quality of the bread.

2. Methodology

The study is being conducted with a specially prepared wheat flour that has 21% protein so as to be able to compare this material directly to milk protein. Professor Graham, however, has reported his results on the basis of normal wheat flour containing 10% protein. He uses human infants who have recovered from serious protein deficiency and he uses the protein at a level which introduces a strain on its usefulness and therefore allows very sensitive comparisons with the protein quality of milk.

3. Accomplishments

The first report deals with the results of short term studies at three different levels of lysine supplementation of the wheat flour. Although previously published data have indicated that lysine supplementation of wheat makes it possible to bring children into positive nitrogen balance, it was generally held that there was a second limiting amino acid which was threonine and that with lysine alone even though considerable improvement was achieved, the protein was not as good as milk protein. Moreover, it was held that if one added too much lysine there would occur an imbalance which would reduce the protein value of the wheat.

Professor Graham's findings as put in this first report show that even when he went to lysine levels of .36% on the basis of 10% protein wheat flour, there was no imbalance. This level represented an improvement over half as much. And at this level the wheat flour was equal or superior to milk protein. There is no next limiting amino acid to lysine in wheat flour and there is no point to thinking of supplementation beyond the lysine supplementation.

Professor Graham was impressed with the high absorption of the wheat in children and the fact that it was good or better than casein even at levels of less than 8% protein calories; ordinarily vegetable mixtures fed at less than 8% protein calories, even if weight gain is supported, show a drop in the level of serum albumin.

Professor Graham has put his finger on the cheapest and quickest way of increasing protein supplies: by improving the protein quality of the wheat. Our calculations have shown that it costs 1/10 as much to provide the equivalent of protein gained from fortification of wheat with lysine if instead the protein were obtained from nonfat dry milk. And it costs twenty times as much to get the same amount of protein from liquid milk.

4. Budget and Contractual Aspects

RAC approval: 6/27/67 - 6/26/70

Contract AID/csd-180, : 6/27/67 - 6/26/70: \$125,933.00

(a) For period of 6/27/67-12/31/68 - Obligated \$63,000;
Expenditures \$29,365

(b) For period of 12/31/68-3/31/70 - Obligated \$38,000;
Estimated to be \$71,635

Personnel:

Principal Investigator - George G. Graham, M.D. - 10%

Chief Pediatrician - Angel Cordano, M.D. 10%

Pediatrician - Gladys Acevedo, M.D. - 100%

Biochemist - Robert Placko - 25%

Nurse - Convalescent Unit and Metabolic Unit - 50% each unit

Secretary - 12/31/67-12/31/68

Supported by NIH project until 12/31/67

FUNDING

Budget categories:	6/67 - 12/68		12/68-3/70	
	<u>Obligations</u>	<u>Expenditures</u>	<u>Obligations</u>	<u>Estimated Expenditures</u>
Salaries & Wages	\$36,800	(TO BE PROVIDED)		
Equipment & Supplies	20,200			
Travel	900			
Overhead	<u>5,100</u>			
Grand Total	\$63,000	\$29,365	\$38,000	\$71,635

5. Summaries Written

Professor Graham has submitted a paper embodying the results of this first investigation to a scientific journal. If published in this journal, this would attract wide attention. Professor Graham has been invited and is leaving for India to lecture on the results of his experiments. Every effort should be made to bring these to the attention of as many people within the government who have to make policy decisions. For example, any decision on aid to Biafra ought to be made in favor of providing fortified wheat as against the ordinary wheat.

RESEARCH

Technical Assistance Bureau

Major Types of Activity Development of Highly Nutritious Low-Cost Food Products ^{2p}

Project Title Lysine Enrichment of Wheat Flour

Project Number 931-17-550-183 RAC ~~XXXX~~ 2-20-67 Date ~~APR~~ Project Summary Approved 1-17-67

Name of Contractor British American Hospital, Lima, Peru Contract No. csd 1805

Starting Date Work 6-27-67 Obligation FY 1967 Termination Funding FY 1970 Date Work 5-31-71

Project Monitor I. Hornstein Extension 29771

Funding Data
 (in thousands)

	U.S. Contribution		
	Oblig.	Expend.	Unliquidated
Cumulative through 6/30/69	99	79	20
FY 1970	36	40	16
FY 1971	0		
FY 1972	0		

Project Target and Course of Action

To establish the optimum amount of lysine to be added to wheat flours to make them effective as the main source of protein in the diets of infants and pre-school children.

A specially prepared wheat flour that has 21% protein, so as to be directly comparable to milk protein, is supplemented at several levels with lysine. This product is fed to infants who have recovered from serious deficiency.

Accomplishments to Date

It has been shown that even at 0.36% added lysine to wheat flour, there is no amino acid imbalance. Further, at this level, the wheat flour is equal to or superior to milk protein. Apparently, there is no next limiting amino acid to lysine in wheat flour at least in human studies.

If wheat is to be enriched with lysine in those areas where it is the main source of protein for many infants and small children, and where dilution by non-protein calories is the rule, at least 0.2% enrichment is recommended.

FY 72 Program and Future Targets

To verify the initial findings by continuing these studies over a longer time span and on the basis of these results to persuade the Peruvian Government to enrich wheat flour with lysine on a commercial scale.

RESEARCH

9310483-6
PD-ARR-811

Project Title Lysine Enrichment of Wheat Flour

Project Number 931-17-560-483

Starting Date 6/27/67 Termination Date 6/27/70

Cumulative Obligations June 30, 1968 63
 (in thousand \$) FY 1969 Actual 36
 FY 1970 Estimate 15
 FY 1971 Proposed -

Name of Contractor(s) British American Hospital, Lima, Peru

Contract Number(s) csd 1505

Cooperating Sponsor(s) _____

Project Summary RAC

Date of Report 1/17/67 Date Approved (PAR) 2/20/67 Evaluation Date (PAR) 2/10/69

Purpose

To establish the optimum amount of lysine to be added to wheat flours to make them effective as the main source of protein in the diets of infants and preschool children.

Description of Activity

A specially prepared wheat flour that has 21% protein, so as to be directly comparable to milk protein, is supplemented at several levels with lysine. This product is fed to infants who have recovered from serious protein deficiency.

Accomplishments

It has been shown that even at 0.36% added lysine to wheat flour, there is no amino acid imbalance. Further, at this level, the wheat flour is equal to or superior to milk protein. Apparently, there is no next limiting amino acid to lysine in wheat flour at least in human studies.

Future Targets

To verify the initial findings by continuing these studies over a longer time span and on the basis of these results to persuade the Peruvian Government to enrich wheat flour with lysine on a commercial scale.