PN-ABQ-447

SUSTAIN

GUATEMALA

SEPTEMBER 7 - 10, 1992

INCAP ANNUAL SCIENTIFIC MEETING

S haring
U nited
S tates
T echnology to
A id in the
I mprovement of
N utrition

A U.S. Private Food Industry initiative
in collaboration with the U.S. Agency for International Development
through a Cooperative Agreement with the National Cooperative Business Association

Upgrading the Food Processing Industries in Developing Countries.

Why SUSTAIN?

SUSTAIN represents a successful collaborative effort between the U.S. food industry and the Agency for International Development (A.I.D.) to upgrade food processing in developing countries. It provides an excellent model for similar private-public sector joint ventures in health, agriculture and other areas of concern to developing countries.

Food processing is a major contributor to development. It serves multiple roles. Food processing can increase the available food supply by extending the life of perishable food products. It can improve the nutritional quality of the diet by making nutritious foods available the year round. It can lead to the growth of related enterprises in transportation, storage, distribution and marketing. And, it can produce much needed foreign exchange by creating value added products both for export and for internal substitution of imported processed foods.

The U.S. food industry has embraced the concept that freely sharing its expertise and knowledge is of mutual benefit to recipient and donor - to the recipient by improving current operations - to the donor by contributing to a healthier global future.

How SUSTAIN Works

A.I.D. missions and trade associations in developing countries publicize SUSTAIN's goals and activities. Executives of U.S. food companies with technical expertise and overall knowledge of the food industry serve as the SUSTAIN Steering Committee, providing guidance and overseeing activities.

Food related companies in developing countries submit their requests to SUSTAIN through the A.I.D. mission or a designated organization in their country. SUSTAIN screens all incoming requests and if necessary asks for additional information. Appropriate U.S. companies are then invited to respond.

Some problems can be readily resolved by providing information. Others require that consultants be sent. When a consultant is sent, the usual assignment is for one to three weeks. Upon completion of the assignment, the consultant prepares a report describing findings and making recommendations. Depending on need, some consultants may return for follow-up visits to ensure that recommendations have been appropriately implemented.

SUSTAIN Helps

Requests are diverse. Help may be needed to solve processing problems, to identify equipment needs and sources of new and used equipment, to train personnel in the use of new equipment and new technologies, to find new uses for indigenous commodities, to establish or improve quality assurance procedures, to control insects and rodents in food processing plants and to improve plant layouts and materials handling.

In the past, U.S. food companies, large and small, have provided technical assistance in the form of information, consultants and training to food processors in Africa, Asia, Latin American and the Caribbean.

SUSTAIN PROGRAM

INCAP ANNUAL SCIENTIFIC MEETING

Guatemala

September 7 - 10, 1992

Presentations Given by SUSTAIN Volunteers:

Dr. Norman Betz

University of Tennessee, Martin

Dr. Luis Mejia

Kellog's Latin America

Dr. Sanford Miller

University of Texas

Dr. John Nelson

McCormick & Company

This publication was made possible through support provided by the Office of Nutrition, Bureau for Research & Development, U.S. Agency for International Development, under Cooperative Agreement No. DAN-5120-A-00-1066-00.

NCBA/SUSTAIN Project 111.012

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INTRODUCTION

From September 7 to September 10, 1992, the Institute for Nutrition of Central America and Panama (INCAP) in Guatemala City, Guatemala held its Annual Scientific Meeting and celebrated its 40th anniversary. Included in the seminar were speakers representing U.S. and Latin American universities, companies, and scientific organizations, addressing related topics under the general heading of nutrition in Latin America. These topics included, among others, "The Role of Food Science and Technology in the Solution of Feeding and Nutrition Problems" and "Update in Knowledge, Surveillance, and Control of Micronutrient Deficiencies."

SUSTAIN participated by furnishing the following speakers from the U.S. food manufacturing sector:

- Dr. Sanford Miller, University of Texas
- Dr. John Nelson, McCormick & Company and Chairman of the SUSTAIN Steering Committee
- Dr. Norman Betz, University of Tennessee at Martin
- Dr. Luis Mejia, Kelloggs, Latin America Division

SUSTAIN has maintained a relationship with INCAP since 1991 and has sent various missions to Guatemala in that time.

INSTITUTE OF NUTRITION OF CENTRAL AMERICA AND PANAMA (INCAP/OPS)

Program of the Annual Scientific Meeting
September 7th through September 10, 1992

Monday, September 7th.

Moderator: Dr. Hernan L. Delgado

TIME	LECTURE	BY
08:00 - 08:15	Opening	Dr. Herman L. Delgado, INCAP
08:15 - 09:00	Consequences of hidden hunger in individuals and societies	Dr. Nevin Scrimshaw, Harvard University
09:00 - 09:45	Evaluation of complex interventions in food and nutrition: problems and improvements.	Dr. Ivan Beghin, Institute of Tropical Medicine Principe Leopoldo
09:45 - 10:00	Coffee Break	
10:00 - 10:45	Economic development policies as an attack against malnutrition and poverty.	Dr. David Franklin, Sigma One Corp.
10:45 - 11:30	Social communication in feeding and nutrition.	Ms. Marcia Griffiths, Mannoff Group
11:30 - 12:15	Nutritional Change in Latin America and the Caribbean: PAHO's future lines of action.	Dr. Carlos Hernan Daza, OPS/WASH
12:15 - 12:45	Video: INCAP, The New Opportunity	Dr. Hernan L. Delgado, INCAP

Tuesday, September 8th

Moderator: Dr. Luis G. Elias

Topic: The role of food science and technology in the solution of feeding and nutrition problems

TIME	LECTURE	BY
08:00 - 08:30	Food Fortification, History and Practice	Dr. Luis Mejia, Kellogg's Latin America
08:30 - 09:00	Food Safety, an International Opportunity	Dr. Sanford Miller, University of Texas
09:00 - 09:30	Investigation and Development and its Application to Food Science and Technology	Dr. John Nelson, McCormick & Company
09:30 - 10:00	Development of Food Technologies and Sciences in Relevant Nutrition Programs	Dr. Norman Betz, University of Tennessee, Martin
10:00 - 10:30	Plenary discussion	Dr. G. Luiz Elias, INCAP
10:30 - 10:45	Coffee break	

Topic: Food chain and food availability

10:45 - 11:15	Post-harvest Losses and Storage Conditions for Grains	Dr. Carl Reed, Kansas State University
11:15 - 11:45	Development and Implementation of an Integrated System of Farming Production	Dr. Jerome Maner, Winrock International
11:45 - 12:15	Plenary discussion	Dr. Luiz G. Elias, INCAP
12:15 - 12:45	Video: What's not Provided by Nature is Given by Technology	Dr. Luiz G. Elias, INCAP

Wednesday, September 9th.

Moderator: Dr. Juan Rivera

Topic: Update in knowledge, surveillance, and control of micronutrient deficiencies.

TIME	LECTURE	BY
08:15 - 08:45	Effects of Vitamin A supplementation on chld morbidity and mortality: preliminary results of a meta-analysis.	Dr. Reynaldo Martorell, Cornell University
08:45 - 09:15	Effects of infections on micronutrients status.	Dr. Kenneth Brown, University of California, Davis.
09:15 - 09:45	Micronutrient interactions	Dr. Bo Lonnerdal, University of California, Davis
09:45 - 10:00	Coffee break	
10:00 - 10:30	Current methods of surveillance of iodine, Vitamin A and iron deficiencies	Dr. Frederick Trowbridge, Centers for Disease Control.
10:30 - 11:00	Micronutrient status of breast-fed infants.	Dr. Katheryn Dewey, University of California, Davis
11:00 - 11:30	Long-term strategies for the prevention and control of Vitamin A and other micronutrient defieiencies.	Dr. Jose Obdulio Mora, VITAL/International Science and Technology Institute, Inc.
11:30 - 12:00	Plenary discussion	Dr. Juan Rivera, INCAP
12:00 - 12:30	Video: The surviving process	Dr. Juan Rivera

Thursday September 10

Moderator: Dr. Arnulfo Noguera

Topic: Household characteristics of small farmers working on commercial agriculture of non-traditional expfort products

TIME	LECTURE	BY
08:10 - 08:30	Commecial of non-traditional export in Latin America	Dr. Bradford Barham, University of Wisconsin
08:30 - 08:50	Adoption and accumulation standards in Guatemalan agronomical export	Dr. Bradford Barham, University of Wisconsin
08:50 - 09:10	Consequences of non-traditional agriculture on food expenses and diet in Guatemalan central highlands: a household perspective.	Dr. Elizabeth Katz, University of Wisconsin
09:10 - 09:30	The role of women in the produciton of non-traditional agriculture in Guatemalan central highland. Results in food consumption, child feeding, and child nutrition status.	Dr. Monica Woldt, University of Wisconsin
09:30 - 09:45	Coffee break	
09:45 - 10:05	Characteristics of food security and determinant factors in small farmers of non-traditional products in Costa Rica.	Dr. Manuel Rojas, Latin American Faculty of Social Sciences (FLASCO).
10:05 - 10:25	Characteristics of food security determinant factors in small farmers of non-traditional products in Honduras.	Dr. Alfredo Benitez, Studies Center and Development Promotion (CEPROD).
10:25 - 11:00	Discussion	Dr. Arnulfo Noguera, INCAP

Topic: Medium term consequences of commercial agriculture of non-traditional exports in household food security.

11:00: -11:20	Agricultural and socio-economic consequences of commercial agriculture of Guatamalan non-traditional products.	Dr. Maarten Immink, International Food Policy Reserach Institute (IFPRI).
11:20 - 11:40	Consequences of commercial agriculture of non-traditional products on household food security.	Dr. Ricardo Sibrian, INCAP
11:40 - 12:15	Plenary discussion	Dr. Arnulfo Noguera, INCAP
12:15 - 12:45	Video: 4 Pinos	Dr. Arnulfo Noguero, INCAP

SUMMARY PRESENTATIONS

Product Development in Marketing for Developing Countries

by Dr. John H. Nelson
Vice President
Science and Technology
McCormick & Company
September 8, 1992

My career as a food scientist and technologist and industrial manager devoted primarily to product development of consumer food products, food service products, industrial products and nutritional products for developing countries. My address is based on four hypotheses:

1) Consumer wants and need are critical in the choice of foods in developed and developing countries.
2) Consumer wants and need can be determined through effective consumer research.
3) Knowledge of consumer wants is essential to product efforts.
4) Product development requires coordination of team work between food scientists, including chemists, microbiologists, sensory specialist, culinary specialists, engineers, processors and marketing experts with a knowledge of sociology, anthropology as well as business.

Let me discuss the four hypotheses as I build a common terminology and level of understanding by reviewing the classic product development cycle. Each has an initiation phase, growth phase, maturity phase, and a decline phase. These subsets will include the idea stage, the concept stage, the prototype development stage, the pilot scale-up stage, and the test -marketing stage.

The idea stage sounds simple, but by actual practice in the United States it is well known that 100 initial ideas produce one viable commercial idea. It is essential that marketing and technical functions interface throughout each step of the initiation phase in order to assure success of the a new product launch.

Marketing has the responsibility for understanding the consumer wants and needs. In a developed country such as the U.S. a great deal of effort goes into studying market segments. The marketing people are also responsible for understanding how to position the new product in the marketplace, as well as consumer expectations and their lifestyles.

Marketers must also devise the methodology by which the product will be distributed and promoted to the ultimate consumers. For example, SUSTAIN participated in a project in Swaziland a number of years ago where a weaning food was being developed. The product was an enzyme-containing product that would liquefy very viscous white corn meal prepared daily for consumption in Swaziland. My original thought in promoting this product was that you could use point-of-sale information in the stores. However, many children are sent to the stores by their mother to buy specific objects at the store, therefore using point of sale material would not be effective. Also, an-enzyme darkened product which was on the market used for making beer would make it difficult to market a similar product as a baby food.

Another illustration of the development of a product in a developing country is the Vitamin A fortification of the tea for use in Pakistan. It was determined that mothers who had a heavy

demand for breast feeding would frequently give young infants a little bit of warm tea to satisfy their hunger pangs. By fortifying the tea with Vitamin A, babies would receive enough Vitamin A to minimize the incidence of xerophthalmia. Based on this very good idea, process was worked out to apply the vitamin A to the tea without effecting the over-all flavor and quality of the tea.

As you ponder and use social marketing in the development of new products for developed or developing countries, I sincerely hope that you are in agreement with my first three hypotheses, namely that consumer wants and need are critical in the choice of foods for developed and developing countries and that they can be determined through consumer research as well knowledge of product development efforts. As for the fourth hypothesis, that product hypothesis requires coordination of the team work between a multidisciplinary team, I propose that you consider food technologists as key members of the development team.

Development in Food Science and Technology
Impacting Nutritional Program
by Norman L. Betz
Gil Parker Chair of Excellence in
Food and Fiber Industries
The University of Tennessee at Martin
September 8, 1992

In 1985 I left the truly scientific and corporate world and walked into the less developed countries of Mexico and Latin America. Today I would like to discuss the key aspects of making a new product program successful in Mexico.

I am driven by the idea that "Hunger is 100% Curable." It drives me to seek the needy, recognize the many facets of reaching them and persevere to the point of personal and professional satisfaction. Ideas need programs that will test and evaluate, re-plan and re-program, review and re-structure in order to make a fair assessment of the idea's potentials. So, a program to reach the disadvantaged was assembled and the total involvement of key personnel in the State of Nuevo Leon, Mexico became a significantly lengthy list. The focal point of this activity was set for World Food Day, always on October 16th.
It was apparent that the program/idea combination was an effective way to get administrators and staff committed to and involved in the nutritional awareness business. Now we need to reach the children.

Here is your menu of specific topics that I plan to address with you: Target Audience, Ideal Product, Delivery Vehicle, Products Design, Observations and Medical Applications.

Target Audience and Social Marketing: I like to call the consumer data demographics. But yesterday I was introduced to a new term "social marketing." Social marketing is data with human feeling attached.

Although our target audience was early childhood malnutrition, we chose to work through the organized school system in the primary grades and added pre-schoolers that are in day-care centers and nurseries. It was obvious that by the time the children reached the first grade an irreversible amount of a lack of brain development had occurred, due to deficits in protein, and that correcting these voids was likely to be extremely difficult. We then looked at the normal dietary habits of these children, their choices and preferences. Initially we prepared products that were made with liked in the U.S. but that did not prove very effective. We then prepared breakfast bars made from local fruits-mangos, tamoringos, and chili powder. Because these children had consumed so much chili powder their taste and flavor perception were so altered that they required hyper-flavoring in the food products.

Having observed this, let us define the ideal product: it should be low-cost, have the desired nutrients, be convenient or easily accessible, should not require refrigeration, labor preparation, water or milk.

Vehicle: The vehicle would have these previous characteristics and be readily accepted by children. After a great deal of debate, we decided on a nutritious candy bar. The food technology was called into place: the product would contain 100% of a child's daily nutrition, animal protein and should not be heat processed so that heat labile vitamins are not destroyed. So, a process of cold extrusion was chosen. The bar was coated with a nigh melt chocolate. We decided that packaging would be attractive and yet low-cost.

(Some overheads in Spanish were presented at this point. See Index II.)

Observations: We noticed that less absenteeism as children chose to appear in the classroom. We were able to influence being-on-time behavior and less tardiness since they would be too late to receive the bar. Teachers also reported more attention in the class - or a longer interest span.

In order to reach more children, we feel that a plant in-country would make the bars more accessible less costly and possibly supply employment to some of the parents.

I would like to mention a brief comment or two about our successes with children that are malnourished and suffer from leukemia. This study took place in three hospitals and involved thirty-eight children. This is the first time that we have been able to save all of them. After a three-month period dietary supplementation, we found , in addition to significant increases in weight, height, levels of hemoglobin, serum albumin, and body fat deposition, a better tolerance of the "maintenance" chemotherapy.
In two previous studies we have had less success.

With resect to the use of supplemental vitamins and minerals during pregnancy there is substantial data which suggest the need for critical blood vitamins in the first trimester. Significant work has been done at Boston University by Dr. Milunsky. I would be happy to forward this information to Dr. Elias.

SUMMARY TRANSLATION

The Fortification of Foods
Luis Antonio Mejia, Ph.D. Kellogg's America Latina
Apartado Portal No. 78, Queretaro, Qro. 76200, Mexico

The addition of nutrients to foods is a far-reaching concept and can be effective for the following reasons: a) In order to restore lost nutrients during processing of foods (a process known historically as "Enrichment"); b) in order to add nutrients not originally in the food (Fortification); c) in order to standardize the concentration of nutrients in foods whose nutrient contents are variable (Standardization); and d) with modern technology (such as antioxidants or dyes). With reference to the previous points, and depending on the selected focus, the addition of nutrients to foods can have the following objectives: a) to preserve the nutritional quality of the foods in order to maintain adequate levels of nutrients contained in them; b) to correct and prevent any special nutritional deficiencies in the general population or in target groups or individuals (for example: the elderly, vegetarians, pregnant women etc.); c) to raise the total nutritional value of a product (from industry's point of view) and d) obtain certain technological functions in the processing of the food.

In practice, in different parts of the world, nutrients are added to foods such as cereals, flours, bread, salt, sugar, milk, margarine, baby formula, soy milk, orange juice, condiments such as MSG, diet beverages to help lose weight. The added nutrients are principally vitamins and minerals, and in some cases essential amino acids.

As existing examples of food fortification that have contributed to resolving problems in public health, one can cite, among many, the iodonizaiton of salt, the addition of vitamins B1, B2, Niacin, and iron to flour of wheat cereals, the fortification of milk, margarine, sugar with Vitamin A; the addition of iron to milk for infant formulas.

In order to guarantee the outcome of this type of intervention the following factors should be considered: a) the vehicle, or the means; it should consist of a food generally consumed by the targeted group; b) the nutrient or fortifying agent, it should be physio-chemically, organoleptically and biologically adequate. Its cost is also important, in such a manner that does not significantly raise the price of the final product. c) It should consist of a system for monitoring and controlling the process that guarantees the appropriate level of nutrients and completion of the program. d) The regulatory and legal aspects (obligatory and voluntary), costs/benefits of the intervention.

From a technological standpoint, there are also important considerations. First is the biological activity of the fortifying nutrient and its affects on the quality of the product, primarily its stability. The nutrient has to be biologically active, nevertheless, in raising the nutritional quality of the food and yet not compromise the quality of the food. The general quality of the product is of vital importance because it is that which determines its acceptability by the consumer. The combination of nutrients can affect, in terms of quality, the color, the taste and the texture of

the food; undesirable changes should be avoided.

As part of the fortification process it is also imperative to rely upon a permanent system of monitoring the levels of the (total) added nutrients, in such a manner that complies with established levels. Low levels and excessively high levels for some nutrients are undesirable, since there exists the potential risk for toxicity.

The legal aspects are also important in the sense that a harmony exists in the regulations between the countries that facilitate the implementations of the fortification program at the regional level.

In the future, the fortification of foods will continue being an important instrument, not only in order to combat and prevent specific nutritional deficiencies, but also in order to promote, in general, the good health of the population, including the potential prevention of some chronic diseases. One important challenge, the scientific and technological development of fortifying agents that guarantee the quality of the product and that at the same time be very biologically active.

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"Food Safety, an International Opportunity"

Dr. Sanford Miller
Professor & Dean, Graduate School of Biomedical Sciences
University of Texas Health Science Center

Abstract

In this lecture, the author discusses how several food issues have been affecting humankind through history. More specifically, the increasing food demand in urban settings which will require changes in food production, processing, distribution and safety. To cope with this need, new food formulations will be designed to be nutritionally ~~complete~~ SUPERIOR, along with the rational use of food additives and other chemical substances. For these purposes, modern biology is increasing the possibility of modifying traditional foods and developing new food sources to meet the health needs. The author states that in most of the world, food safety has not been a top priority health issue, but an economic and political issue. This attitude contrasts with the appalling figures of food-borne diseases in all the world. There are common scientific and technological problems to be addressed before developing a solution for food contamination and safety. The author urges the creation of an organization that brings together food safety officials and scientists in the hemisphere.

APPENDICES

SUSTAIN PROGRAM

The program **Sharing U.S. Technology to Aid in the Improvement of Nutrition (SUSTAIN)** provides access to U.S. expertise in food processing to help improve nutrition in the developing world. Technical assistance is provided by volunteer professionals from U.S. food companies, universities, and other organizations who donate their time and expertise.

SUSTAIN was granted a five-year renewal from the U.S. Agency for International Development (USAID) on September 30, 1991. The program is managed under a cooperative agreement with the National Cooperative Business Association (NCBA) and receives advice from a Steering Committee made up of private sector representatives.

NCBA was founded in 1916 and is a membership association representing America's 45,000 cooperative businesses. Known overseas as CLUSA, NCBA works overseas with its own member co-ops, USAID, World Bank, UNDP, and other donor agencies to promote development and joint ventures in the third world.

Many benefits can accrue to the developing world through improvements in food processing. From the standpoint of alleviating hunger and improving nutrition, food processing has much to offer. It helps meet food and nutritional requirements and reduce post-harvest food losses. From the economic standpoint, food processing provides a means for increasing foreign exchange earnings through exporting value-added processed foods rather than commodities. It helps generate employment and stimulates technological development and the growth of allied industries.

SUSTAIN helps improve food quality, expand production, and lower operating costs of locally grown and processed foods by providing technical assistance in post-harvest food systems, including: (a) food safety, quality, and sanitation (b) food preservation and storage (c) food processing (d) food fortification (e) packaging (f) marketing (g) weaning foods and (h) environmental technologies.

How the Program Works

SUSTAIN receives requests for assistance from individual food companies, research institutions, and USAID. Short-term technical assistance is provided by experienced U.S. professionals who donate their time and expertise to the project. Missions are typically one to three weeks in duration. SUSTAIN covers international travel costs. Companies or host organizations requesting SUSTAIN assistance are asked to contribute towards in-country expenses. Due to budget constraints, priority is given to requests that can demonstrate an ability to improve the nutritional quality, safety, and availability of food in the local community.

SUSTAIN is able to solve many problems by providing information that exists either in technical literature or in the "memory" of a company. If the problem cannot be solved through correspondence, then SUSTAIN volunteers may be sent to provide short-term technical assistance. Workshops and seminars can also be organized to help address food technology issues. The program does not fund product or equipment acquisitions.

The program publishes a quarterly newsletter (*SUSTAIN Notes*) on food technology issues. It is provided gratis to approximately 2300 recipients in more than 50 countries.

For more information, please write to:

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PRESENTATION AT INCAP
BY JOHN H. NELSON, Ph.D.
PRODUCT DEVELOPMENT IN MARKETING FOR DEVELOPING COUNTRIES
PRESENTED SEPTEMBER 8, 1992
AS PART OF A SYMPOSIUM ENTITLED
"THE ROLE OF FOOD SCIENCE AND TECHNOLOGY AND THE SOLUTION OF FEEDING AND NUTRITION PROBLEMS"

ANNUAL SCIENTIFIC MEETING/43RD ANNIVERSARY

Yesterday, we heard Dr. Scrimshaw set the stage for our subject today with a discussion of hidden hunger. Dr. Bejhnin indicated we are prisoners of specific schemes and, instead, we need to work with the people to construct a hypothesis and constantly reevaluate the hypothesis. Dr. Franklin made the point "Poor people are rational in their decisions". Marcia Griffiths introduced us to social marketing, and Dr. Hernán Daza emphasized that technology transfer must continue.

Little was said about food science and technology, but today we wish to emphasize that subject. My career has been as a food scientist and technologist and industrial manager devoted primarily to product development of consumer food products, food service products, industrial products, and nutritional consumer products for developing countries. My address is based on four hypotheses:

1. Consumer wants and needs are critical in the choice of foods in developed and developing countries.
2. Consumer wants and needs can be determined through effective consumer research.
3. Knowledge of consumer wants and needs is essential to product development efforts.
4. Product development requires coordination of team work between food scientists, including chemists, microbiologists, sensory

specialist, and culinary specialists, food process engineers, and food marketers with an understanding of sociology, anthropology as well as business.

Let me discuss the four hypotheses as I build a common terminology and level of understanding by reviewing the classic product development cycle. Scientific people will immediately recognize the similarity between a product development cycle and the bacterial growth cycle; namely, each has an initiation phase, a growth phase, a maturity phase, and a decline phase. Product development involves many subsets in the initiation phase. These subsets will include the idea stage, the concept stage, the prototype development stage, the pilot plant scale-up stage, and the test-marketing stage.

The idea stage sounds simple, but by actual practice in the United States, it is well known that it takes more than 100 initial ideas to produce one viable commercial idea. The second point as it relates to the initiation phase of a product development cycle is the need to understand the interrelationships of functions as we proceed through the idea stage through to the test-market stage. It is essential that marketing and the technical functions interface throughout each step of the initiation phase in order to assure success of a new product launch.

Marketing has the responsibility for understanding the consumer wants and needs. Marcia Griffiths discussed this in some detail in her presentation yesterday called "social marketing". She pointed out the concept of segmentation in the marketplace. In a developed country, such as the U.S., a great deal of effort goes

into studying market segments. The Stanford Research Institute developed a method for discussing market segments called "values and life styles," better known as VALS. In the U.S. scheme, we show as market segments, sustainers and survivors, which amount to about 20 percent of the U.S. population. The buying habits of sustainers and survivors are quite different than people higher on the socioeconomic scale. In developing countries, I am sure that the percent of market that would be included in categories comparable to sustainers and survivors would be a much higher percent of the population.

The marketing people on the team are also responsible for understanding how to position the new product in the marketplace. In addition to understanding the segment of the population that is targeted by the product, they must understand the consumer expectations for that product--the taste expectations, the appearance expectations, the nutritional expectations, the sociological and anthropological expectations. People buy the product because it will sustain them nutritionally, because it will keep them up with their neighbors, and because it is what some celebrity recommends they eat. These are all issues to be discussed as the product positioning is determined. The product positioning in turn relates to the responsibility of the food scientist and technologist who must devise the food product to satisfy the positioning established by the marketers.

Marketers must also devise the methodology by which the product will be distributed and promoted to the ultimate consumers. Project SUSTAIN participated in a weanling food project in

Swaziland a number of years ago. The product to be developed was an enzyme-containing product that would liquefy the very viscous white corn meal prepared for daily consumption in Swaziland. The product when utilized on the cooked white corn meal would partially liquefy it so that it could be diluted for use with babies without excessive dilution. My original thought in promoting this product was that you could use point-of-sale information in the stores. On further study, it was determined that in the country stores in Swaziland, the mothers who make the decision to buy such products rarely went to the store. They would send their children to the store with the specific objective of buying a known product. Therefore, point-of-sale material in the store would not be an effective way to sell a product to a homemaker. Another factor that spoke against the product they had proposed was that a dark-colored enzyme product, already available in the market, was purchased by the male members of the family to produce beer. This dark-colored enzyme product definitely had a poor image from the mothers' viewpoint. Because it was used for beer, how in the world could it be used for babies? This signaled a definite need for differentiation of a new product from the old enzyme product present in the marketplace. Price is also important in the consideration by marketing, and enough consumer work should be done to determine that the price-value equation for a product assures trial and repeat.

Another illustration of the development of a product for a developing country is the Vitamin A fortification of tea for use in Pakistan. Many people in the AID community have had to consider

fortification of food products. In Pakistan, it was determined that mothers who had a heavy demand for breast feeding would frequently give young infants a little bit of warm tea to satisfy their hunger pains. The market researchers looking at consumer wants and needs realized that if you fortify tea with Vitamin A, these very young babies would receive enough Vitamin A to minimize the incidence of xerophthalmia. The job of the product developers was to put the Vitamin A onto tea leaves so that when the tea was brewed, there would be no change in color, taste, and appearance, and that the tea traders in Pakistan could easily apply the Vitamin A to the tea. Based on this very good idea of Vitamin A fortified tea, product development proceeded to work out the formula, process development worked out a process for applying the material to the tea, marketing did acceptance research on the products in the U.S., and then carried this consumer research into Pakistan. The Pakistan tea traders were then taught how to apply the Vitamin A solution to tea. Once they saw how easy it was, that became no problem, and they served tea to consumers with and without the treatment and found there were no differences by actual consumer tests in Pakistan.

As you ponder and use social marketing in the development of new products for developed or developing countries, I sincerely hope that you are in agreement with my first three hypotheses; namely, that consumer wants and needs are critical in the choice of foods for developed and developing countries, that they can be determined through effective consumer research, and the knowledge of these is essential to the product development efforts.

As for the fourth hypothesis, that product development requires coordination of the team work between a multidiscipline team, you may have to experience that before you are a total believer. My proposal is that you consider food scientists and technologists as key members of development teams. Project SUSTAIN volunteers can fill in some of the gaps in those multidisciplined teams to provide those functions that are essential to INCAP'S very important, continuing mission.

10/22/92

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Development in Food Science and Technology Impacting Nutritional Program

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September 8, 1992

It was in the Spring of 1985 when I decided to depart the American industrial employment and do something totally different from the truly scientific lifestyle; I basically walked out of the corporate scene and into the less developed countries of Mexico and Latin America. Although my interests and activities have taken me to El Salvador, Honduras, Brazil and Peru, I will spend time today on the key aspects of making a program successful in Mexico.

You learn quickly as a Professor at The University of Tennessee at Martin that an effective teaching policy is to (1) tell the students what you will address, (2) address the topic just enumerated, and (3) then tell them what you told them. So I'll use this approach in addressing some aspects of the achievements in early childhood nutrition.

I have an idea! How good is an idea? An idea will get you attention, a few slaps on the back, and a good feeling of self-esteem. What's the idea? "Hunger is 100% Curable" drives me to seek the needy, recognize the many negative facets of reaching them and persevere to the point of personal and professional satisfaction. So that's the idea that has been thoroughly explained and reviewed for the past eight years. Ideas need programs that will test and evaluate, re-plan and re-program, review and re-structure in order to make a fair assessment of the idea's potentials. So a program to reach the disadvantaged was assembled and the total involvement of key personnel in the State of Nuevo Leon, Mexico became a significantly lengthy list. We involved the first lady of Nuevo Leon. the Directora of Desarrollo Integral De La Familia, the medical director, the Mayor's wife, several health care workers that included dietitians and nutritionists, etc. The focal point of this activity was set for World Food Day, always on October 16th.

It soon became apparent that the idea:program combination was an effective way to get administrators and staff committed to and involved in the nutritional awareness business. Now we need to reach the children.

What eventually transpired, after a few years of planning was the complete package of idea:program:product. In other words, having a tangible product that would be received and appreciated by the children became a visible (and subsequently vital) measure of the overall success.

Let's now turn to the task scheduled for today. Here is your menu of specific topics that I plan to address with you.

First, we'll look at the target audience. I like to call the data - demographics - but yesterday we were introduced to a similar collection of data that was termed "social marketing". I like that! Social marketing is data with human feeling attached and in our pursuit of the target audience, we need to be aware of these aspects.

Secondly, we shall evaluate some of the key elements of an ideal product. It matters not that our intentions are to reach the less-fortunate children if the product characteristics do not allow product reception with this target audience.

Thirdly, I have intentionally separated the delivery vehicle for this supplemental nutrition because of the data surrounding a developing country's profile. We'll address some of these aspects.

Fourthly, I have prepared some overhead documents (in Spanish) for us to look together at the product(s) designed for - and this is a new approach - both retail and governmental feeding. So please pay attention to this new business relationship that allows a product to appear in the retail market, make a profit and turn that profit into a supplemental, financial support for the school nutritional program.

Next (and number five), I'd like to share with you some of the observations that were a result of these activities to be followed by some unique medical applications that became an immediate spin-off application of the School Breakfast Bar.

Finally, I have some key excerpts from an earlier video that brings together the six topics just listed for our discussion.

1. Social Marketing:

Although our target audience was early childhood malnutrition, we chose to work through the organized school system in the primary grades. Additionally, we added pre-schoolers that are in day care centers and nurseries. It became increasingly obvious that by the time the children reached the first grade an irreversible amount of a lack of brain development had occurred and that correcting these voids was likely to be extremely difficult, at best. So we started backing up to the pre-schoolers with a long-range target of children as young or less than one year and even back to the pregnant and/or lactating females.

I want to pause for a moment to make sure that you get at least two significant observations from this presentation. First, and most importantly, with a lack of animal protein (complete protein) during early childhood development, in addition to

anthrometic deficits the brain does not develop normally and the child is forever deprived of an improved life style. Chances are that if we adequately provide complete protein during these development stages, these children will grow up to choose a better life-style and subsequently decrease the population of welfare dependent adults. So brain development is the ultimate objective of this program. Other clearly positive aspects of proper brain development should be obvious.

Secondly, a for-profit activity can function effectively, parallel to the government needs. It should be pointed out however that the needs of the deprived schools (those without a school breakfast meal, for example) must always be structured and funded without interruption. So some risk is a vital part of the product introduction phase.

Finally, lack of adequate brain development unfortunately allows these children to be content with the status-quo because they know nothing better exists. We will be successful in reaching this population early enough if we totally investigate the mother-child relationship.

Next, we looked at the normal dietary habits of these children, what they have to select from and what are their preferences. Initially, we prepared products that were apple, orange and strawberry flavored. These are U.S. preferences and the early acceptance of our food bars was not positive. Very quickly we formulated with mango, tamarindo and chili powder. As a matter of fact, we even ordered these flavors from Mexico City to put into bars made in the U.S You might be interested to note that the chili powder bars would make us physically perspire when consumed but the children didn't think they were hot at all! Since my professional specialty is taste and smell, it was apparent that these children did not have a normal taste system either. Upon further investigation we noticed that at home the children add jalapeno peppers to their tortillas to give them some flavor. This repeated dietary habit essentially modified the taste system (buds on tongue) so that taste thresholds were greatly enhanced for these children. This required the bars to be hyper-flavored so that they could taste the flavor component. We felt that this observation significantly affected the product profiles and eventually a food technology challenge.

2. Based on these observations, let us now turn to the ideal product for this situation and consider the food science and technology that may be required to achieve that goal.

The product must taste good to be consumed and have potential to deliver the nutrients. We have always heard that nutrition delivery systems will not achieve, if not consumed. As we have recently discussed, we paid substantial attention to both the quality and the quantity of our flavors.

The product must be convenient or easily accessible. Many of our targeted markets were geographically isolated or, at best, rural so that it was up to our delivery system to make the product available.

Product should not require refrigeration, labor preparation, physical facilities or equipment, cold milk or potable water. These characteristics eliminated some of our earlier considerations for a "Kool-Aid" or malted milk-type of product.

Product should deliver substantial nutrition, preferably in a small package, at low cost. We had to consider that most needs will exist in impoverished areas and the price will be dependent on ability of the system to pay. So initially, and subsequently during product introduction, we decided to supply the schools at no cost to the system. From this point we moved to replacement of some less nutritious items and used that allotted money. But the key to making the system work was to take the product retail. In this manner we are able to reduce the cost of ingredients (volume purchasing) at the same time allow profitability of the retail bar to help subsidize the poorer applications. So the product also had to have retail potential.

3. What <u>vehicle</u> would have most of these characteristics and be readily accepted by children because they would choose to eat it? After much research and discussion about the immediate environment and potential labor problems, we settled on a nutritious candy bar! Then the food technology was called into place since we decided that this product would contain as much as 100% of a child's daily requirements of protein, vitamins and minerals in <u>one bar</u>. Add to this task the uncompromising aspect of protein only from animal sources (to be complete protein). We could not subject this product to any heat since the heat labile vitamins would be destroyed. So cold extrusion was chosen as the processing technology. Thus it became extremely important to protect the high density vitamins and minerals for taste detection. This necessitated that all the vitamins and most of the minerals be protected. We chose micro-encapsulation as the means to protect these nutrients and at the same time decrease their negative taste characteristics. It now became important to:

a. do shelf-life studies to insure that the nutrients were still present after months of storage at high temperatures, and

b. that the protection was storage adequate but still allowed the nutrients to be released in the body. Ultimately, we did clinical trials in Mexican hospitals using blood chemistry.

We chose to coat these products with a high melt chocolate since that is the universally accepted "candy-type" flavor.

Finally, the packaging details were subjected to lengthy discussion. It was important to have an attractive, yet affordable packaging material that protected the product at the same time, being readily acceptable to the target population. A sterile presentation was okay for the medical uses but was totally unacceptable for the school breakfast and obviously not appropriate for the retail trade.

Let us now look at a few overheads that I have prepared for you in Spanish.

VITA·RICH®

NUEVO CONCEPTO EN NUTRICION

¿QUE ES VITA RICH?

UNA BARRA NUTRICIONAL IMPORTADA, DESARROLLADA DURANTE VARIOS AÑOS DE ESTUDIOS EN LOS ESTADOS UNIDOS, ASI COMO EN OTROS PAISES, MEXICO PRINCIPALMENTE, CON LA FINALIDAD DE COMBATIR LOS PROBLEMAS DE NUTRICION. VITA·RICH REPRESENTA UN GRAN ADELANTO, YA QUE UNA SOLA BARRA DE 45 g PROVEE EL 25% DEL USRDA (INGESTION DIARIA RECOMENDADA POR EL GOBIERNO DE LOS ESTADOS UNIDOS - FDA -) PARA PROTEINA, Y EL 35% PARA VITAMINAS Y MINERALES.

GRACIAS A SUS CARACTERISTICAS, VITA·RICH ES DE GRAN AYUDA EN EL TRATAMIENTO DE PROBLEMAS NUTRICIONALES CAUSADOS POR STRESS, PERDIDA DE APETITO, AVERSION A LOS ALIMENTOS, DESNUTRICION, ETC., ASOCIADOS CON LOS SIGUIENTES CASOS:

GERIATRIA- UNO DE LOS PRINCIPALES PROBLEMAS NUTRICIONALES EN GERIATRIA ES LA PERDIDA DEL APETITO CAUSADA POR UNA DISMINUCION EN EL SENTIDO DEL GUSTO DEBIDO A LA EDAD. EL EXCELENTE Y BALANCEADO SABOR DE VITA•RICH ESTIMULA ESTE SENTIDO, Y POR CONSIGUIENTE EL APETITO. ADEMAS, SU TEXTURA SUAVE Y DE FACIL INGESTION HACEN DE VITA•RICH EL COMPLEMENTO IDEAL.

EN GENERAL, VITA•RICH ES UN EXCELENTE COMPLEMENTO PARA PACIENTES HOSPITALIZADOS Y BAJO TRATAMIENTO MEDICO, DONDE EL MANTENER UNA NUTRICION ADECUADA ES DE VITAL IMPORTANCIA.

LEUCEMIA- GRACIAS A INVESTIGACIONES MEDICAS SE SABE DE LA IMPORTANCIA QUE TIENE UNA BUENA ALIMENTACION EN LOS RESULTADOS DEL TRATAMIENTO DE ESTA ENFERMEDAD. SE HA VISTO QUE UN 80% DE LOS NIÑOS BAJO TRATAMIENTO DE QUIMIOTERAPIA LLEGAN A SOBREVIVIR Y A SUPERAR LA ENFERMEDAD CUANDO EXISTE UNA NUTRICION ADECUADA. SIN EMBARGO, BAJO CONDICIONES DE DESNUTRICION O ALIMENTACION DEFICIENTE, ESTE PORCENTAJE SE REDUCE A SOLO EL 50%

ONCOLOGIA- DEBIDO A SU FACIL DIGESTION, VITA•RICH PUEDE SER SUMINISTRADO BAJO TRATAMINENTOS DE RADIO Y QUIMIOTERAPIA. AL MISMO TIEMPO QUE SE INGIEREN LOS NUTRIENTES NECESARIOS PARA EL ORGANISMO, SE EVITAN PROBLEMAS DE NAUSEA Y AVERSION.

PORCENTAJES DEL USRDA Y CONTENIDO POR BARRA DE 45 g

-PROTEINA	25%	11 g
-VITAMINA A	35%	1750 UI
-VITAMINA C	35%	21 mg
-TIAMINA (B1)	35%	0.53 mg
-RIBOFLAVINA (B2)	35%	0.6 mg
-NIACINA	35%	7 mg
-CALCIO	35%	350 mg
-HIERRO	35%	6.3 mg
-VITAMINA D	35%	140 UI
-VITAMINA E	35%	10.5 UI
-VITAMINA B6	35%	0.7 mg
-ACIDO FOLICO	35%	140 mcg
-VITAMINA B12	35%	2.1 mcg
-FOSFORO	35%	350 mg
-YODO	35%	52.5 mcg
-MAGNESIO	35%	140 mg
-ZINC	35%	5.3 mg
-COBRE	35%	0.7 mg
-BIOTINA	35%	105 mcg
-ACIDO PANTOTENICO	35%	3.5 mcg

(USRDA: UNITED STATES RECOMMENDED DAILY ALLOWANCE)


vita
DIF
yogurt de fresa


vita
DIF
mazapan de cacahuate
cubierto de chocolate


vita
DIF
chocolate con chocolate

You will notice that it is also critical that you extend pride of ownership to your cooperating agencies, in this case, DIF

4. Now on to some observations. These comments have been assembled from a number of visits to the DIF Headquarters in Monterrey. We noticed less absenteeism as children chose to appear in the classroom. We were able to influence being on time behavior and less tardiness since they would be too late to receive the bar.

Teachers reported more attention in class, or a longer interest span. Where available, we were able to look at improved motor skills since the youngsters could accomplish physical chores at an earlier age.

In order to reach more children, we feel that a plant in-country would make the bars more accessible, less costly and possibly supply employment to some of the parents. We are still looking at these options.

5. I would like to mention a brief comment or two about our successes with children that are malnourished and suffer from leukemia. The study that we just completed took place in three hospitals and involved thirty-eight children. This is the first time that we have saved all of them; we have conducted two similar clinicals with less success.

The following is a summary of that study:

> We have previously shown that malnutrition is an adverse prognostic factor in the outcome of children with standard-risk acute lymphoblastic leukemia (ALL). Undernourished children, due to a diminished bone marrow reserve, tolerate poorly the so-called "maintenance" chemotherapy (six-mercaptopurine, 6-MP and methotrexate, MTX), relapsing more frequently than those well-nourished children with ALL receiving full doses of chemotherapy. In order to assess the importance of an oral feeding program in children with standard-risk ALL in complete remission (CF), a group of 31 patients was given, together with "maintenance" chemotherapy, a special nutritional supplementation in the form of a snack-bar containing 200 calories, 11 g of animal protein, 8 g of fat, 21 g of carbohydrates, all vitamins and minerals of the USRDA. After a three-month period of dietary supplementation, we found, in addition to significant increases in weight, height, levels of hemoglobin (Hb), serum albumin (Alb) and body fat deposition, a better tolerance of the "maintenance" chemotherapy. A longer follow-up of these patients is mandatory to analyze if such nutritional support programs are associated to a better prognosis, specifically a longer disease-free

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I've enjoyed sharing this success story with you and remind you that an awareness program such as this requires a great deal of cooperation on all levels, please let me know if I can help.

Thanks for your warm hospitality and this beautiful experience in your city.

Sept 24, 1992

Appendix IV

RESUMEN

LA FORTIFICACIÓN DE ALIMENTOS

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La adición de nutrientes a los alimentos es un concepto amplio y puede efectuarse por las siguientes razones: a) para restituir los nutrientes perdidos durante el procesamiento de alimentos (proceso conocido históricamente como "enriquecimiento"), b) para agregar nutrientes no contenidos originalmente en los alimentos (fortificación), c) para estandarizar el contenido de nutrientes en alimentos que los contienen de manera variable (estandarización) y d) con fines tecnológicos (e.g. como antioxidante o colorante). En base a lo anterior y dependiendo del enfoque seleccionado, el agregado de nutrientes a alimentos puede tener los siguientes objetivos: a) resguardar la calidad nutritiva de los alimentos, manteniendo niveles adecuados de los nutrientes contenidos en ellos, b) corregir y prevenir carencias de nutrientes específicos en la población general o en grupos determinados de individuos (e.g. ancianos, vegetarianos, mujeres embarazadas, etc.), c) aumentar el valor nutricional agregado de un producto (visión industrial) y d) obtener ciertas funciones tecnológicas en el procesamiento de los alimentos.

En la actualidad, en diversas partes del mundo se han agregado nutrientes a alimentos tales como cereales, harinas, pan, sal, azúcar, leche, margarina, leches maternizadas, leche de soya, jugo de naranja, condimentos como el Glutamato de sodio, bebidas dietéticas para reducir de peso y hasta soluciones enterales y parenterales. Los nutrientes adicionados son principalmente vitaminas y minerales y, en algunos casos, aminoácidos esenciales.

Como ejemplos exitosos de fortificación de alimentos que han contribuido a resolver problemas de salud pública, podrían citarse, entre otros, la yodación de la sal, el agregado de vitaminas B1, B2, Niacina y hierro a la harina de trigo y cereales, la fortificación con vitamina A a la leche, la margarina y el azúcar, el agregado de vitamina D a la leche y la fortificación con hierro a leches para la alimentación infantil.

Para garantizar el éxito en este tipo de intervenciones deben de considerarse varios factores como: a) el vehículo, el cual debe de consistir en un alimento de consumo general por el grupo objetivo; b) el nutriente o agente fortificante, el cual debe de poseer características físico-químicas, organolépticas y de biodisponibilidad adecuada. Su costo es también importante, de tal manera que no aumente significativamente el precio del producto final; c) debe de contarse con un sistema de monitoreo y control del proceso que garantice el nivel apropiado del nutriente y el

cumplimiento del programa; d) el aspecto regulatorio desde el punto de vista legal (obligatorio o voluntario) y e) el costo/beneficio de la intervención.

Desde el punto de vista tecnológico, existen también consideraciones muy importantes. En primer lugar está la bio-disponibilidad del nutriente fortificado y como éste afecta la calidad del producto, principalmente su estabilidad. El nutriente tiene que ser bio-disponible, sin embargo, en general, al aumentar la bio-disponibilidad se compromete la calidad. La calidad general del producto es de vital importancia porque es lo que determina su aceptabilidad por el consumidor. El agregado de nutrientes puede afectar en términos de calidad, el color, el sabor y la textura del alimento; cambios indeseables que deben evitarse.

Como parte del proceso de fortificación, es también indiscutible el contar con un sistema permanente de monitoreo de los niveles de los nutrientes agregados, de tal manera que se cumpla con el nivel establecido. Tanto niveles bajos, como concentraciones excesivamente altas, son indeseables ya que para algunos nutrientes existe el riesgo potencial de toxicidad.

Los aspectos legales son también importantes en el sentido que exista una harmonización en las regulaciones entre países que facilite la implementación de programas de fortificación a nivel regional.

En el futuro, la fortificación de alimentos continuará siendo un instrumento importante, no solo para combatir y prevenir carencias nutricionales específicas, sino también para promover en general la buena salud en diversos grupos de poblaciones, incluyendo la prevención potencial de algunas enfermedades crónicas. Un reto importante lo constituye la identificación y desarrollo científico y tecnológico de agentes fortificantes que garanticen la calidad del producto y que al mismo tiempo sean altamente bio-disponibles.

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Food safety: An international opportunity

Sanford A. Miller

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This lecture was presented at INCAP's Annual Scientific Meeting "The Role of Food Science and Technology in Solving Food and Nutrition Problems", Guatemala City, Guatemala, September 8, 1992.

In his welcoming remarks to the Inter-American Conference on Food Protection in 1985, then Secretary of Agriculture John R. Block, said, "The western hemisphere does not belong to any one of us, we belong to the western hemisphere. We are brothers historically as well as geographically". Nowhere is this statement truer than in the area of food and food control. Every nation in the world is dependent upon the free flow of food, food of high quality, safe, and wholesome to assure survival. This is no less true of the developed countries of North America, Europe, and Asia as it is with the developing countries of Central and South America, the Caribbean Basin, Africa, Asia and the rest of the world. Indeed, food has always been a limiting factor in the survival of humanity. Faced by a continuing sequence of hazards in a fundamentally hostile environment, humankind dealt with this problem only through the evolutionary development of an incredible series of adaptations. These adaptations have resulted in exceptional flexibility to utilize a wide range of raw materials for their metabolic machinery. Humans alone have the ability to add further to their food resources by manipulation of their environment resulting in changes that, at least in the short term, offer survival advantages. In spite of this strategic advantage, humanity has almost always been threatened by the specter of famine. Relatively minor changes in environment have resulted in deaths of millions, not necessarily because of the lack of ability to adapt to the change, but rather, to the inability to modify food production and/or distribution rapidly enough to meet the challenge.

Although these issues have been with human society since the first humanoid dropped from the tree, the difference today is the rapid redistribution of people from rural communities to the cities (i.e., urbanization).

Migration has always been a major force in determining the course of human civilization. The nomadic movements of early people from Africa to Asia to Europe and the later movement to North America determined forever the path of civilization.

None, however has had the immediate, acute impact on the human condition and need as the migration of people from rural to urban areas. Primarily a product of the Industrial Revolution, this phenomena has been among the major events of the 20th Century.

One consequence of this phenomena is the increasing demand placed upon global food processing and distribution systems. By the Year 2000, more than half of the world will live in cities, a fact that has great significance for the nature of the food supply in the next century. In order to provide urban consumers, often at great distances from the sources of production --with a safe and nutritious food supply-- requires a food processing industry and an unfettered global distribution system of some sophistication. It also requires an increase in the means by which food is produced, increasing the need for more sophisticated insight into the processes by which safety of such foods are assured, ~~because~~ Urbanization results in a loss of the traditional strategies used by the consumer to determine the quality and safety of food, resulting from the remoteness of the consumer from both the source of production and processing.

It has often been said that the assurance of a safe and abundant food has the characteristics of a war. Krone expressed it well when he said, "humans have no natural right to the bounty of nature. We have to fight for it against the other children of nature --the

weevils, cockroaches, rats, mice locusts, molds, flies, viruses, eels, worms, and whatever...it is war..." To this litany of combatants one must add bacteria and the natural conflict between human desires and health needs. In their concern over the chemicals that are added to foods, we often forget that chemicals are weapons in this war and are also used to enrich and improve the food supply. To provide urban consumers with an efficient food supply, many new food formulations will be designed to be nutritionally ~~complete~~ ADEQUATE, present a variety of caloric contents, and organoleptic characteristics. This, in turn, will require rational use of safe additives and other chemical substances.

Over the course of centuries, a complex process, built upon the advance of science and technology has been developed to evaluate the safety of substances added to the food supply. Not only has this evaluation been concerned with the classical quantal issues of life and death, but has been increasingly directed towards the issues of the quality of life (i.e., those qualities most often associated with the nutritional components of the diet). With today's food and agricultural technology, it has become increasingly difficult to evaluate the impact of new food products on the well being of society. Testing systems for both toxicity and nutritional quality have become so elaborate and so complex that, with the exception of genetically modified foods, very few really new compounds or products are being developed and tested.

Nevertheless, modern biology is spectacularly increasing the possibility of modifying traditional foods and developing new food sources to meet newly defined health needs. Based on modern genetics, chemistry and molecular biology, for the first time the scientific

community is readily able to design and construct foods having specially desired characteristics. In addition, modern biology has given us increasing insight into the molecular and cellular needs of the organism allowing the possibility of a more refined, useful definition of human nutrition requirements. In other words, modern biology has provided the tools to allow the design of new food sources that not only can meet these newly defined health needs, but are also optimal for the particular environment in which they are to be grown. It has given us the possibility of a level of control over the food supply that has only been the dream of public policy officials.

It is important not to forget that plant and animal breeding have always played a significant role in agriculture. The successful application of genetic principles has greatly contributed to the enhanced productivity and nutritional quality we have witnessed in modern agriculture. Today, however we are able to bring about such changes much more rapidly and precisely.

And yet with success within our grasp, with the vision of a world free from hunger becoming real, barriers continue to be raised in the pathway of the realization of such goals. Barriers to the free movement of food in international trade based on "ghost" issues of food safety, internal political issues that impede the development and implementation of international food safety criteria, as well as lack of trained and motivated personnel are all substantial issues that need to be resolved if the vision of a garden world, free from hunger, is ever to be achieved.

Surprisingly, until today, food safety has not been a particularly important health issue in most of the world. It has been an important political and economic issue often used as an excuse for protectionist policies. This is true even though in much of the world the main cause of morbidity is food related disease, directly as a vehicle for pathogenic organisms and their toxins, or from toxic chemicals, or indirectly through its impact on the nutritional state and the economic well being of the individual and society. To a significant extent, the ubiquitous nature of the problem has made it less visible than the dramatic, but less globally significant outbreaks of other diseases, such as smallpox, which have received much greater attention and resources than food safety. This attitude has extended, until very recently, to the international organizations. At the Alma Ata meeting in 1978, the World Health Organization, in establishing the goals for Health For All by the year 2000, only implicitly considered food safety as an essential component of primary health care and public health, rather than explicitly expressing it as a significant major contributor to disease prevention and health promotion.

It is sometimes difficult to understand why this attitude prevails. There are, for example, several million cases of acute diarrhea occurring in children under five years in the developing world each year. The majority of these illnesses are caused by food or water contamination directly by microbial contamination and indirectly by reducing nutritional status in marginally nourished children. When to this total is added non-diarrhetic food-borne diseases, such as botulism, typhoid, and parasitism, as well as the chronic effects of chemical contamination of foods, resulting from inappropriate uses of agricultural chemicals, the number of people affected, and the impact of food contamination on function, well being, and economic status is appalling.

Even in industrialized countries, food-borne diseases are a significant cause of morbidity. FDA scientists estimates that as many as 40 million cases of diarrheal disease of food-borne origin occurs in the United States each year. While relatively high standards of environmental sanitation, personal hygiene and refrigerator storage of food has virtually eliminated several serious food-borne diseases, such as typhoid fever, nonetheless, major outbreaks of other such diseases do occur. The incidence of these diseases, particularly those associated with psychrophilic organisms, appears to be on the increase in the developed world. Outbreaks of relatively less serious illnesses, such as salmonellosis are still common, although to a significant extent it is now believed that other organisms, such as *Campylobacter*, *Yersenia*, and *Listeria* may be of greater importance.

By concentrating on the issues associated with microbiology, it should not be concluded that chemical contamination problems do not exist. While it is true that in much of the industrialized world, such problems are coming under increasing and better control, the difficulties of regulation in developing countries makes this an important international problem.

While we have thus far concentrated on the health impact of food contamination, the effect of widespread acute and chronic debilitation resulting from such contamination of the food supply on the economy, and the financial condition of the national and international community is also compelling. Food is one of the most important commodities in the economy of any community. The economic impact of food contamination is therefore of major consideration and is felt everywhere. Although there is relatively limited data in this area, the various ways in

which food contamination can affect individuals and whole populations suggests that the economic losses to all economies in both the developed and developing world, must be almost overwhelming. For example, it has been estimated that the average cost for food associated illnesses in the United States falls close to 20 billion dollars per year. If the problem is of such enormous magnitude in developed countries, such as the United States, what must it be in countries where these diseases are even of great consequence. In addition to the impact of such health issues on the domestic economy, the impact of continuing contamination problems on the ability of a country to engage in international trade also needs to be considered.

From the foregoing remarks, it seems clear that in all countries of the world there are common scientific and technological problems that need to be resolved prior to developing a solution to the problems of food contamination and safety. Nevertheless, there also exists a series of legislative and trade problems which also interfere with the assurance of a free flow of food of high quality between the nations of the world and of the hemisphere. To a significant extent many of these barriers are raised on scientific and technical issues.

Politics, national aspirations and economic philosophy all play a role in establishing a trade policy and more importantly, determining its outcome. This is not surprising, but what is new today is the attempt to shift the issues from the traditional basis of protection of trade to those of technology, and more interestingly, to health and safety.

In the regulation of health and safety such barriers can be erected in various ways. For example, restrictions can be imposed requiring to conduct safety testing in the importing country or different testing requirements can be established from those of the exporting country. Even when testing requirements are met, the importing country may apply a different safety standard in acting upon the results of the tests. Thus, in today's world, it is becoming increasingly clear that to resolve these scientific problems two issues have to be considered: First, common evaluation of the scientific and technical issues and second, the management of these facts within the context of jointly agreed criteria and standards, that is, a harmonized regulatory response. One of the major problems is that too often the issues become confused and scientific uncertainty and debate is used to hide the fundamental issues and support narrow national interest. The first task is to find means to resolve the purely scientific matters and find the common ground for interpretation of scientific facts. This in turn often means cooperation in the performance of research and in the establishment of testing protocols. This also means not only bringing the interested parties together for discussions restricted to scientific and technical questions, but also providing a process for objective scientific evaluations of the safety and risks associated with the proposed action.

A number of international efforts are in place to evaluate the safety of individual foods and food ingredients. These include for example the Joint Expert Committees of the WHO/FAO, the CODEX Alimentarius, the International Program in Chemical Safety, and the technical committees of OECD.

With the growth of regional trading blocks, expert committees for the regions have been formed such as the Committee on Food of the European Community.

The major role these organizations can play is the clearing away of the scientific underbrush, making visible the real issues. More importantly, the effort to attain scientific consensus in areas of food safety can also lead those countries who have not yet been able to attain an adequate level of food safety to begin making efforts to do so, particularly if the hope is to engage in world trade. It also will encourage the more affluent nations of the world to direct efforts, specifically to help such developing countries to improve the health of their own people by providing resources to permit competent, sound domestic regulation of food safety.

In 1987, Marcellin Berthelot, the great French organic chemist offered the following prediction: "People often speak about the future of human society, and I should like to foresee it as it will be in the year 2000, naturally, from the point of view of the chemist. Then there will be neither shepherd nor plowman, food products will be produced chemically. Once cheap energy is generated, it will become possible to synthesize food products from carbon isolated from carbon dioxide, hydrogen obtained from water, nitrogen and hydrogen extracted from the atmosphere. Nitrogen compounds, synthetic fats, starch and sugar, all these substances will be produced in great quantities by our plants. Manufacture of artificial food will be independent of the season, rain, drought, frost. Moreover, food stuffs will contain no pathogenic microbes - the primary cause of epidemics and enemies of the human life. Chemistry will produce a revolution, the significance of which cannot be understood today. There will be no difference

between productive and nonproductive regions, but one should not think that in the world wide power of chemistry there will be nor art, beauty and charm of human life. If the soil is not used for farming, it will be again covered by grasses, forests, flowers. It will turn into a large garden irrigated by underground waters where people will live enjoying an abundance of food stuffs and joys of the legendary golden age".

What will be required to fulfill these dreams of safe and wholesome food for all of the peoples of the hemisphere? First, we must begin to explicitly recognize the importance of food safety in the basic issue of the wholesomeness of the food supply and in the prevention of disease and maintenance of health. With the exception of a few programs at FAO, until recently, virtually no attention was paid to this area by international organizations. More recently, this has been corrected in part since the International Conference on Nutrition ~~to be~~ held ~~this~~ December 1992 in Rome will include a segment on food safety. Indeed, one can argue that the nutrition community must begin considering the issue of wholesomeness of food in a holistic sense, rather than concerning itself as it does today with the minutia of nutritional need. The fundamental issue in health is that people receive sufficient food of adequate quality that is also safe. Safety must consider, not only chemical safety, but also microbiological safety. As discussed earlier, there is sufficient evidence to suggest that the most fundamental cause of human misery and mortality is in fact food-borne diseases. ~~The opportunities offered by the International Conference to resolve these issues and to recognize the central role of food safety in international health are enormous.~~ One ~~consequence of the meeting might be a recommendation for~~ approach to the Resolution of the problem the formation of an international monitoring body to serve as an evaluation

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focus for the quality of foods domestically and international trade and to point to the main areas of difficulty. This is, seems to me, a very possible common program for the countries of the Americas.

Second, we in this hemisphere must begin to operate together in evaluating the specific scientific questions concerned with the safety of food grown, processed, and traded in our region. At the current time, there is no organization that brings together food safety officials and scientist throughout the Americas. An attempt to develop such an activity was made in 1985 at the Inter-American Conference on Food Protection, but the restricted myopic vision of national interest served to prevent such an institution from being formed. The environment is different today. The development of the North American Trading Zone has made it very possible that we are evolving towards a Western Hemisphere Trading Zone. To assure the success of such an activity, particularly in the area of food, we need a central organization that would provide an environment free from the conflicting problems of politics, economics, and cultural imperatives to permit the objective evaluation of the safety of foods and substances added to foods. Such an organization could also provide training for individuals to assure a common scientific basis for all the countries of the hemisphere.

Third, we must begin the process of harmonizing our regulations, not at the lowest acceptable point, but at the highest. Our people deserve no less. Again, an international organization that would be above national politics must be founded. To facilitate this endeavor. Such an organization could be developed over a series of years with increasing responsibilities. Its initial function might

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simply include monitoring the quality of foods as they pass from country to country. It could simultaneously consider the most reasonable way to develop harmonized regulations and ultimately could serve as a place where conflicts among the nations of the hemisphere could be resolved.

I realize that these aspirations appear ambitious and may sound naive. Nevertheless, unless an attempt is made by the countries of this hemisphere to resolve the technical and scientific issues that separate them and permit food to flow freely in international commerce, the goal of assuring to all people's of the world a food supply that will not restrict their aspirations will never be fulfilled. We now have a unique opportunity to fulfill these aspirations.

JOHN H. NELSON

Personal

Born in Chicago, Illinois, and educated in the Chicago public school system.

Education

B.S. and M.S. from Purdue University and a Ph.D. in Biochemistry from the University of Minnesota.

Professional Experience

Started as a research biochemist with General Mills progressing to department head, Research and Development Department. Joined Peavey Company in Minneapolis as Director of Research and Development. Promoted to Vice President of Research and Development and Quality Assurance and Operating Manager of the International Venture Research subsidiary. Joined American Maize Products Company as Vice President, Research and Development and Quality Control and progressed to Vice President, Marketing and Product Development. Moved to Roman Meal Company as Vice President of Corporate Development and promoted to Chief Operating Officer. Joined McCormick & Company, Inc., in May, 1986, and currently Vice President-Science and Technology.

Activities

Member of American Association of Cereal Chemists, and served as National President and Director. Member of Institute of Food Technologists, and served as National Program Committee Chairman in 1978. Chairman of Vanilla Committee of Flavor and Extract Manufacturers' Association. Was President and Director of the League for International Food Education, and is currently Chairman of the Project SUSTAIN Steering Committee. Member of Advisory Committees to the Universities of Minnesota, Illinois, North Dakota, and Maryland, and Towson State University, Towson, Maryland.

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JOHN H. NELSON
Curriculum Vitae

Personal

Born May 29, 1930, in Chicago, Illinois.
Three children--Keith Eugene, Kevin Eugene, Kristen Emma

Professional Experience

1955-1967	General Mills, Inc., Minneapolis, Minnesota Entered as Research Biochemist, progressed to Supervisor, Chemistry and Microbiology, in Quality Control Department. Promoted to Section Leader, then to Department Head, R&D, in 1967.
1968-1976	Peavey Company, Minneapolis, Minnesota Entered as Director of Research and Development; promoted in 1969 to Vice President, R&D, and appointed to Corporate Planning Group. Served as Operating Manager of International Venture Research for four years. Assumed responsibility for Corporate Quality Assurance in 1973.
1976-1978	Johnson Powell and Company, Minneapolis, Minnesota Partner
1976-1977	Charles F. Kettering Research Laboratory, Dayton, Ohio Science Program Advisor
1978-1982	American Maize Products Company, Hammond, Indiana Entered as Vice President, Research, Development, and Quality Control, and became Vice President, Marketing and Product Development, in 1980.
1982-1986	Roman Meal Company, Tacoma, Washington Entered as Vice President, Corporate Development, and promoted to Chief Operating Officer in 1984.
1986-	McCormick & Company, Inc., Hunt Valley, Maryland Entered as Corporate Director of Research and Development; promoted to Vice President-Research and Development, January 1, 1988; and named Vice President-Science and Technology, April 1, 1988.

Education

1952	B.S. Horticulture-Food Technology, Purdue University
1953	M.S. Food Technology-Microbiology, Purdue University
1961	Ph.D. Biochemistry-Microbiology, University of Minnesota

John H. Nelson
Curriculum Vitae

Special Training

1965	Kepner-Tregoe Decision-Making and Problem-Solving
1967	Harvard Research Management Program, Harvard University, Cambridge, MA
1969	Computer Applications Seminar, IBM, Minneapolis, MN
1971	Implications of the Consumer Product Safety Act, AMA, Chicago, IL

Military Service

1954-55	U. S. Army
	1954 Veterinary Corps Meat and Dairy Hygiene School
	1954-55 Origin and Destination Inspection Assignments

Honors

1950	Alpha Zeta
1958	Visking Fellow
1959	Gamma Sigma Delta
1960	Sigma Xi
1979	William F. Geddes Award--American Association of Cereal Chemists
1984	Fellow, League for International Food Education
1991	William F. Geddes Award--American Association of Cereal Chemists

Activities

1955-	American Association of Cereal Chemists
	1963-1966 Treasurer, Vice Chairman, and Chairman, Northwest Section; Organized Pesticide Residue Analysis Committee and Microbiological Methods for Cereals Committee
	1967 National Program Committee
	1970-1985 Education Committee
	1972-1974 National Board of Directors
	1974-1982 Organized and coordinated Short Course in Cereal Chemistry
	1974-1975 National President; organized Japan Section
	1976-1979 Advisor to Post-Harvest Food Loss Methodology Project

John H. Nelson
Curriculum Vitae

1977-1984 League for International Food Education
- 1977-1982 Member of Board of Directors
- 1979-1982 Chairman, Long-Range Planning Committee
- 1981-1982 President, Board of Directors

1982- Project "SUSTAIN" Steering Committee
- 1988 Chairman
- 1990- Chairman

1953- Institute of Food Technologists
- 1976-1979 Local Section Counselor
- 1978 National Program Committee Chairman
- 1978-1980 Chairman, Long-Range Planning Committee

1969-1977 North Star Research Institute
Board of Directors

1973-1976 National Academy of Sciences-National Research Council
Food Advisory Committee to Department of Defense
Chairman, Cereal and General Products, DoD

1973-1977 American Institute of Baking
Scientific Advisory Committee

1969-1977 Millers' National Federation
Nutrition Committee

1976-1979 Food and Drug Law Institute
- 1976-1979 Board of Directors, "Food Update"
- 1978-1979 Chairman, "Food Update"

1978-1982 Corn Refiners' Association
Scientific Committee

1972-1974 University of Minnesota
Advisory Committee to the Food Science Department

1978-1982 University of Illinois
Food Science Department Advisory Committee

1983-1985 North Dakota State University
Cereal Chemistry Department Advisory Committee

John H. Nelson
Curriculum Vitae

1987-	Towson State University CONAMS Industrial/Academic Partnership Board 1990-1992 Chairman
1988	University of Maryland Vice President's Advisory Council Program Committee, Governor's Conference on the Future of Maryland Agriculture
1989-	Chancellor's Advisory Council University of Maryland College Park, Maryland
1989-	Board of Visitors College of Human Ecology University of Maryland College Park, Maryland

John H. Nelson
Curriculum Vitae

Publications

Nelson, J. H., Glass, R. L., and W. F. Geddes, Silic acid chromatography of wheat lipids. Cereal Chemistry 40, 343-350 (1963).

Nelson, J. H., Glass, R. L., and W. F. Geddes, The triglycerides and fatty acids of wheat. Cereal Chemistry 40, 343-350 (1963).

Moffitt, R. A., and J. H. Nelson, Chlorinated hydrocarbon residues in cereals. Cereal Science Today 8 (1963).

Anderson, R. H., Huntley, T. E., Schwecke, W. M., and J. H. Nelson, Disappearance of BHA and BHT in relation to peroxide content in breakfast cereals. J.A.O.C.S. 40, 349-352 (1963).

Schwecke, W. H., and J. H. Nelson, Determination of antioxidants in certain food products and packaging materials by gas chromatography. Agricultural and Food Chemistry 12, 86-89 (1964).

Schwecke, W. M., and J. H. Nelson, Determination of moisture in foods by gas chromatography. Analytical Chemistry 36, 689-690 (1964).

Carter, D. E., and J. H. Nelson, The use of magnetic stirrers in microbiological analyses. Food Technology 18, 251 (1964).

Technical Presentations

1974 Keynote presentation at "Annual Highlights in Food Science Conference", Michigan State University. Title: "Integrating the R&D and Marketing Functions".

1974 "A Technology for the Fortification of Tea with Vitamin A", International Union of Food Science and Technology, Madrid, Spain.

1978 "Future Developments in Cereal Science and Technology", 6th International Cereal and Bread Congress, Winnipeg, Canada.

1983 "Review of Marketing and the American Baking Industry", a seminar sponsored by Pan News, Tokyo, Japan.

John H. Nelson
Curriculum Vitae

1984	Reconnaissance visit to evaluate the Egyptian food industry, Cairo and Alexandria.
1986	Reconnaissance visit to evaluate food industry, Belize.
1987	Reconnaissance visit to evaluate food industry, Arab Republic of Yemen.
1988	Reconnaissance visits (two) to evaluate food industry, Arab Republic of Yemen.
1989	Reconnaissance visit to evaluate food industry, Swaziland.
1989	Reconnaissance visit to evaluate food industry, Belize.
1990	Reconnaissance visit to evaluate food industry, Indonesia.
1991	Reconnaissance visit to evaluate food industry, Guatemala.

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UNIVERSITY FACULTY RESUME: CALENDAR YEAR UPDATE
April 8, 1992

I. Personal

Norman L. Betz 434-48-2783
Professor, non-tenured
114 Brehm Hall

II. Educational

Louisiana State University, 1963-66, Ph.D. Biochemistry/Food Science and Technology: Insect Physiology

Louisiana State University, 1961-63, MS Biochemistry: Fisheries Biology

Louisiana State University, 1956-61, BA Chemistry

III. Employment

The University of Tennessee at Martin, Gil Parker Chair of Excellence in Food and Fiber Industries and Professor of Food Science and Technology, 1990-present

Technological Resources, Ltd, 1985-present, Consulting business in the areas of flavor, odor, texture and appetite control (President)

BNB Technologies, Inc., 1985-present, International manufacturer of specific foods for specific needs (Partner)

BNB Tec S.A. de C.V. 1985-present, Mexican company that specializes in specific nutritional foods (Director)

Bio-Aide, Inc., 1987-present, Domestic manufacturer of specific foods for specific medical needs (President)

Ralston Purina Company, 1972-85, Corporate Director Palatability Research and Research and Development Planning, St. Louis, MO, Senior Scientist in Taste and Smell

American Association of Cereal Chemists, 1974-84, Chairman, President, Executive Editor, St. Paul, MN - concurrent with position with Ralston Purina
Mallinckrodt Chemical Company, 1968-72, Associate Senior Scientist, St. Louis, MO, Food & Pharmaceutical Research

U.S. Army Quartermaster Corps, 1966-68, Captain, Instructor Quartermaster School, Ft. Lee, VA

IV. Scholarly

* Friend of Nursing, TN Nurses Association
* Who's Who in America
* Who's Who in the Mid-West
* American Men and Women of Service
* Geddes Memorial Award
* Outstanding Young Men of America
* Certificate of Recognition for Outstanding Service, AACC
* Management Forum Participant, R.P., Co.
* Distinguished Instructor Award, Ft. Lee, VA
* Distinguished Achievement Award, L.S.U.
* L.S.U. Student Council

V. Faculty

* Fundamentals of Food Law, American Association of Cereal chemists Workshop, 1991
* Adjunct Professor, Department of Food Science and Technology, Louisiana State University
* Faculty member AACC Short Courses
* Technical Management Course, R.P., Co.
* Financial Management Course, R.P., Co.

VI. Public Service

* Provided detailed workshops around the state to small and medium sized food companies on the new Nutrition Labeling and Education Act.
* Member of Memphis Chamber of Commerce Food Task Force
* Member of Weakely County Chamber of Commerce
* Active Catholic Church member
* Participant in Corporate Philanthropic Activities
* Member Martin Rotary Club
* Consulting activities include several US and international corporations

VII. Societies

* Institute of Food Technologists, 26 years
* American Association of Cereal Chemists, 24 years
* Association for Chemoreception Science, 14 years
* Monell Chemical Senses, 26 years
* European Chemoreception Research Organization, 21 years
* Holder of 14 patents

CURRICULUM VITAE

NOMBRE

LUIS ANTONIO MEJIA

PUESTO ACTUAL

DIRECTOR DE NUTRICION PARA AMERICA LATINA DE KELLOGG'S

ESTUDIOS

- B.S. (Licenciatura) en Ciencias Biológicas y Química en la Universidad de Saint Louis Missouri y Sacramento State College en Sacramento ----- California.
- M.S. (Maestría) en Biología Celular y Molecular en California State -- University en Sacramento, California.
- Ph. D. (Doctorado) en Nutrición Humana y Metabolismo de la Universidad de California, Davis, California.

PUESTOS ANTERIORES

- Jefe del Departamento de Nutrición del Centro de Investigación en Alimentos y Desarrollo (CIAD) en Hermosillo, Son.
- Científico del Instituto de Nutrición de Centro América y Panama (INCAP), organismo regional administrado por OPS/OMS en Guatema, C.A.
- Maestro de la Escuela de Medicina y del Departamento de Biología de la Universidad de El Salvador, C.A.

ASOCIACIONES PROFESIONALES A QUE PERTENECE

- Sociedad Latinoamericana de Nutrición
- Asociación de Tecnólogos en Alimentos de México
- American Institute of Nutrition
- American College of Nutrition
- Institute of Food Technologists
- New York Academy of Sciences

SANFORD A. MILLER, Ph.D.

Biography

Dr. Sanford A. Miller is the Dean of The Graduate School of Biomedical Sciences and Professor in the Departments of Biochemistry and Medicine at The University of Texas Health Science Center at San Antonio. He is the former Director of the Center for Food Safety and Applied Nutrition at the Food and Drug Administration. Previously, he was a Professor of Nutritional Biochemistry at the Massachusetts Institute of Technology. He has also been a Visiting Lecturer in Nutrition at Tufts University School of Dental Medicine and Harvard Medical School. Dr. Miller has served on many national and international government and professional society advisory committees, including the Federation of American Societies for Experimental Biology (FASEB) Expert Committee on GRAS substances, the National Advisory Environmental Health Sciences Council of NIH, the Joint WHO/FAO Expert Advisory Panel on Food Safety and the Steering Committees of several WHO/FAO panels. He is a recipient of the Outstanding Teacher of the Year Award from M.I.T., and has received many other honors including The Conrad A. Elvehjem Award of the American Institute of Nutrition, The Esther Peterson Consumer Service Award from the Food Marketing Institute, and The Sterling B. Hendricks Award (given before the American Chemical Society) established by the Agricultural Research Service of the U.S. Department of Agriculture. In June 1991, he received the Babcock-Hart Award from the International Life Sciences Institute - Nutrition Foundation and the Institute of Food Technologists. He is author or co-author of more than 200 original scientific publications. Dr. Miller received a B.S. in Chemistry from the City College of New York, and a M.S. and Ph.D. from Rutgers University in Physiology and Biochemistry.

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a:biograph

PROGRAM SUSTAIN

SITE ON SITE VISITS PROGRAM

8:30 - 9:45	Meeting with Aliansa Luis Fernando Galindo, Quality Control Manager Daniel Taracena, Materials Manager To take place at Camino Real Hotel
10:00 - 11:15	Visit to Carohe Estuardo Castillo, Manager
11:30 - 12:45	Visit to Productos Rene (Filler's) Héctor López, Plant Manger
12:45 - 13:45	LUNCH
14:00 - 15:30	Visit to Alimentos S.A. José Miguel Guerra, Plant Engineer Pablo Kummerfelt, Plant Engineer
16:00 - 17:00	Meeting with Arome Verna Robles, Owner To take place at Camino Real Hotel

BRIEF DESCRIPTION OF THESE COMPANIES ACTIVITIES

ALIANSA: Medium size animal food producer. This company has an extruder and is applying flavorings in two of their brands. They are interested in general questions.

42 calle
2-91 z.12
ciudad

CAROHE: Cashew nut processor and exporter. This company is interested in solving some technical problems in flavor application to roasted cashews. They are planning to have extrusion equipment in a medium term.

PRODUCTOS RENE (FILLER'S): One of the largest snack processing companies in Guatemala. They have all kind of extruded products and are interested in general questions in extrusion and flavoring technologies.

ALIMENTOS S.A.: Is part of a big corporation that includes beer manufacture. They are interested in high quality protein foods and extruded snacks.

AROME: Is a small potato chips processor, interested in flavor application technology.

Appendix VIII

HOME ADDRESSES OF THE GUATEMALAN STUDENTS

OSCAR JOEL DE LEON SANCHEZ
Cuilco, Huehuetenango
Guaemala, Central America

" UTMartin Graduates "

CARLOS EDY MEJIA
4ta Ave. 9-27 Zona 1
Esquipulas, Chiquimula
Guatemala, Centro-America

ERNESTO YAC
8 Calle 0-68, Zona 4
Quetzaltenango, Quetzaltenango
Guatemala, Centro-America

CATALINO MICULAX LEON
3er Canton, C-38
San Pedro Yepocapa, Chimaltenango
Guatemala, Centro-America

GABRIEL HURTADO ROS
Jacaltenango, Huehuetenango
Guatemala, Centro-America

JORGE MARIO CHIQUIN M.
Diagonal 1, 5-43, Zona 1
Coban A.V., Guatemala
Centro-America

JOSE ANTONIO GONZALEZ
8 Avenida, 14-41, Zona 10
Guatemala, Guatemala 01010
Centro-America

ERICK ROLANDO RODRIGUEZ GODOY
3ra Calle 8-09, Z.1 Mixco
Col. Lomas de Portugal
Guatemala, Guatemala 01057
Centro-America

GUSTAVO BAEZA
Alamedas del Virrey #29
Antigua Guatemala, Sacatepequez
Guatemala 03001
Centro-America

DONALDO CASTILLO
6a Calle 8-07, Z. 1
Jutiapa
Guatemala
Centro-America