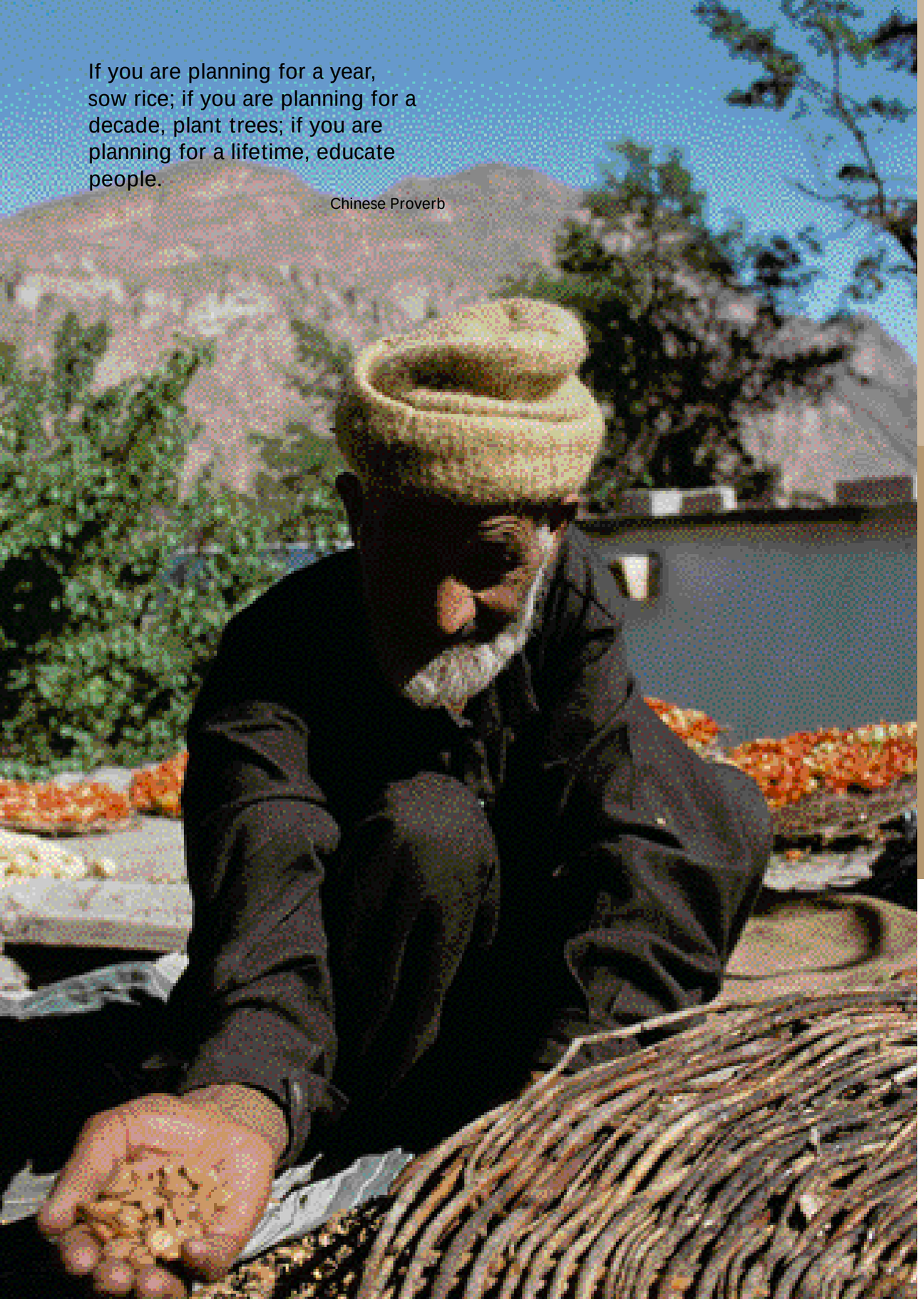

If you are planning for a year, sow rice; if you are planning for a decade, plant trees; if you are planning for a lifetime, educate people.

Chinese Proverb

FOCUSED AND GLOBAL – The Foundation for the Study of Problems of Nutrition in the World

HIGH IMPACT research projects to reduce malnutrition

INNOVATION – for success

CAPACITY BUILDING – as a basis for improvement

SUSTAINABILITY - a key mission

PUBLIC HEALTH orientated

EDUCATION - for health

The Foundation at a Glance

EVIDENCE BASED – proactivity

PARTNERSHIP for long-term success

enLINK - *ing* for a better world

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President's Message

The new layout of the Report 2004 of the Nestlé Foundation reflects the current strategy of the Council to fulfill our mandate. Our objective is to study and to propose adequate solutions to the problems of malnutrition in the world. The recent creation of the enLINK Initiative reflects the proactivity of the Foundation through its enormous potential to improve public health.

The Foundation's Council has decided to support two areas of activities: projects initiated by the Foundation, represented by the enLINK Initiative, and projects proposed by scientists from academic institutions. It is the Foundation's policy to support high-quality projects which are primarily initiated by local scientists in developing countries. The name enLINK represents our efforts to connect different strategies to combat malnutrition. The letters en stand for exploration in nutrition, in the form of research projects with a global public health relevance, and these letters also stand for education in nutrition, which represents one priority of the Foundation.

As an example of the exploration in nutrition, the Council favors a food-based approach to combat malnutrition, because food fortification or supplementation with micronutrients does not address the cause of the problem. Vitamin A deficiency is a preventable cause of childhood blindness, morbidity and mortality. Spirulina, a blue-green alga, has been proposed for many years as a potential source of vitamin A, but there is as yet no scientific evidence of the vitamin A potency and the vitamin A bioavailability from this alga. A study using modern technology to research these issues has been initiated by the Foundation.

An approach which has been little used worldwide is education in nutrition. This includes not only providing an improved knowledge of the food items that must be consumed to meet the nutritional requirements of at-risk individuals, but also teaching basic public health principles that must be implemented. The weakness of many nutrition interventions is the lack of coordination between hygiene, medicine and nutrition to improve the outcomes. Contaminated water or intestinal parasites (hookworm infection) can ruin a nutrition intervention. We plan to use a dual-level nutritional education approach. The first level consists in providing information about recent scientific developments to scientists, physicians and health personnel through an electronic nutrition library: enLINK (electronic nutrition link). The enLINK Library allows nutrition scientists and health personnel of low-income countries to get free access to the full papers of the main nutrition journals. This initiative of the Nestlé Foundation fills a gap that is, surprisingly, still neglected by international organizations. The enLINK Library has been welcomed by the scientific community because many scientists and health personnel in developing countries previously had no access to this essential source of information. The second level of education in nutrition aims to correct the lack of simple scientific knowledge at the population level.

VISION 2004 illustrates the Council's current concept for improving the efficacy of nutritional interventions and includes comments from world leaders in nutrition who share our vision and strengthen our philosophy. As a contribution to the enLINK Initiative, VISION 2004 emphasizes the linkage between education, agriculture, medicine (infections), nutrition and hygiene as a global strategy to combat malnutrition.

I am convinced that these new developments can contribute to the reduction of malnutrition in specific areas. The enLINK Initiative results from the creative mind and the proactive attitude of the Director, Dr. Paolo Suter. The Foundation is grateful to him for these new achievements. I would like to thank the Council members, the Foundation's experts and the assistant to the director, Dr. Elisabeth Müller, for their dedication to the activities of the Foundation. I also want to express my gratitude to Mr. Peter Brabeck, the Chief Executive of the founding company, to Mr. Luis Cantarell, Director, and to Prof. Wolf Endres for their encouragement and the personal interest that they have shown toward the Foundation's activities.

Prof. Dr. E. Jéquier
President Nestlé Foundation

One of the Foundation's main aims is the transfer of scientific and technological knowledge to low-income countries. Until now the Foundation has advanced nutritional science, by supporting nutrition research projects in established institutes and universities and by focused support to existing nutrition schools and educational programs. To further fulfill the mandate of the Foundation as well as to achieve a sustainable improvement in nutrition a new proactive strategic area of activities has been created:

Projects Initiated by the Foundation

The enLINK Initiative

The first project of the enLINK Initiative is the enLINK digital library. At the research level of the enLINK Initiative the elucidation of the nutritional value of the spirulina algae for the improvement of vitamin A nutriture will be studied in China and on an exceptional basis at Tufts University in the USA.

The enLINK Initiative

Sustainability and public health relevance are key issues for all activities of the Foundation. Research projects need to result in a short- and long-term public health implementation. Knowledge and know-how have to be sustainable at all levels of the population.

The vast experience of the Foundation's Council as well as past activities led to the creation of the enLINK Initiative, an initiative representing the proactivity of the Foundation in its core issues.

This initiative focuses on information transfer in the area of nutrition and malnutrition as well as on the resolution of specific research questions and their implementation at the public health level.

The name enLINK comes from the old English verb "to enlink", meaning "to chain together" or "to connect, as by links". The analysis of the semantic relations of "enlink" reveals related words which illustrate our central concepts and aims: to connect, to join, to associate, to unite, to tie, to conjoin.

Our mission is to link and join cultures, to associate and conjoin institutions and people locally to study and diminish the problems of malnutrition globally.

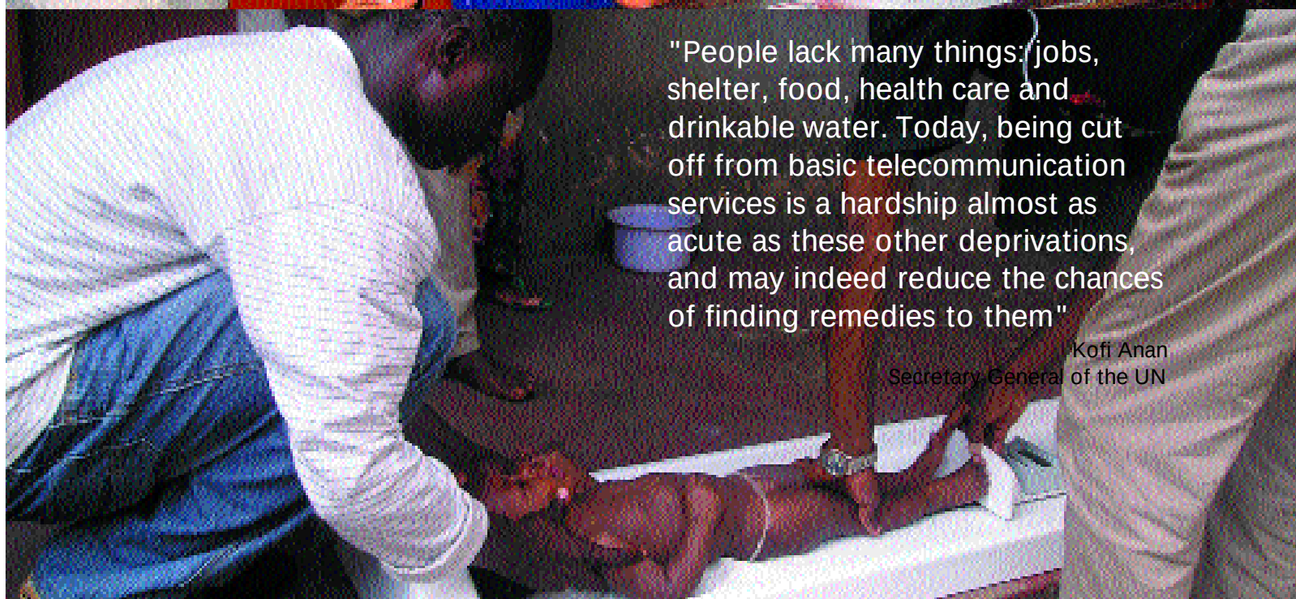
Malnutrition can only be solved by "enlinking" – connecting – different strategies and approaches: malnutrition has to be addressed universally by joint strategies at the level of medical issues (such as infection) and hygiene (such as water quality), and improvements at the level of agriculture as well as in the society at large, and, last but not least, at the level of education and information.

The enLINK Initiative has two main levels:

1. exploration in nutrition, which represents the research level, and the
2. education in nutrition level for different target populations (such as researchers, health care workers or the general population).

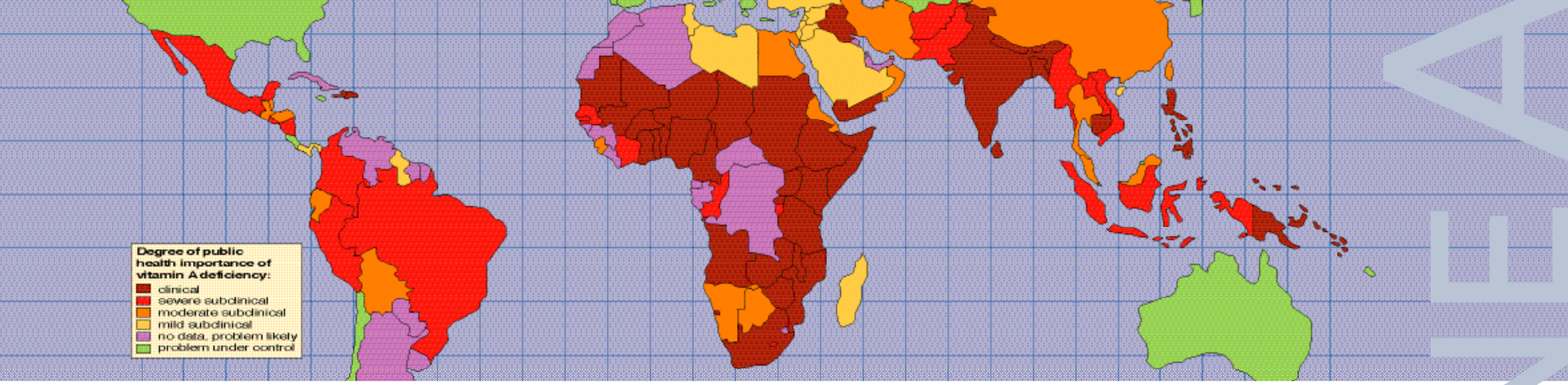
The elucidation of the bioavailability of provitamin A from Spirulina represents the first project in the exploration section of the enLINK Initiative. The enLINK Library – the electronic nutrition library – represents one core component of the educational level of the Initiative.

The solution of the nutritional problems in the world can only be achieved by enlinking capacities, uniting know-how and joining efforts – as the Foundation has done in the past and will continue to do in the future.



"People lack many things: jobs, shelter, food, health care and drinkable water. Today, being cut off from basic telecommunication services is a hardship almost as acute as these other deprivations, and may indeed reduce the chances of finding remedies to them"

Kofi Anan
Secretary General of the UN



Vitamin A deficiency (VAD) represents the most important preventable single cause of childhood blindness, morbidity and mortality. The major strategies to combat VAD are an improved diet (including breastfeeding from vitamin-A-sufficient mothers), supplementation, and/or food fortification. A food-based approach is favored by the Foundation.

The geographical distribution of vitamin A deficiency parallels the ecological parameters of poverty and overall malnutrition in the world. The key step and public health challenge in the solution to VAD is to increase the availability of affordable vitamin-A-rich or provitamin-A-rich foods. However, the content of vitamin A as well as of provitamin β-carotene varies widely as does the bioavailability, so that there is an urgent need for a good vitamin A source that is easy to grow, affordable, and highly bioavailable. Spirulina, a unicellular blue-green alga, has been identified and promoted in the past as a potentially important vitamin A and protein source. Spirulina would represent an attractive partial solution to VAD. However, there are at present still many open questions, such as vitamin A potency, bioavailability and, last but not least, also toxicological issues.

The Foundation tries to approach the problems of malnutrition with evidence-based research directly relevant to public health. Accordingly, a study to evaluate the vitamin A equivalency of spirulina using modern technology has been initiated.

Vitamin A Deficiency (VAD) – A few Facts

- Preschool children and pregnant women are most vulnerable for VAD
- Poverty and malnutrition represent the major risk factors
- VAD blindness in children under age five: 2.8 million cases
- 250,000 – 500,000 VAD children become blind each year, half of them dying within 12 months of losing their sight
- VAD represents one of the major causes of impaired immunity and thus increases the risk of infection
- VAD children are 23% more likely to die and 50% more likely to suffer acute measles
- VAD is a major cause of increased maternal mortality
- VAD is a main contributor to poor pregnancy and lactation outcomes
- VAD is a modulator of the vulnerability to anaemia
- VAD modulates the risk of mother-to-child HIV transmission

A project initiated by The Foundation:

Vitamin A value of spirulina carotenoids in humans

Guangwen Tang, Shian Yin, Gregory G. Dolnikowski, Michael A. Grusak, Jian Qin, Michael Green and Robert R. Russell
Jean Mayer, USDA Human Nutrition Center on Aging, Tufts University, Boston (USA) and Department of Maternal and Child Nutrition, National Institute for Nutrition and Food Safety, Chinese CDC, Beijing, China
USD 191'603

The goal of this project is to determine the vitamin A value (equivalence) of spirulina. The investigation will use intrinsically deuterium labeled spirulina and an isotope vitamin A reference dose in males (n = 16). Deuterium labeled spirulina will be produced by culturing cells in a nutrient solution with heavy water (deuterium oxide). Two doses will be studied in Boston (USA) (5 g and 10 g). To test the effect of vitamin A status on the bioavailability of spirulina, Chinese adults (n=8, with 10 g of spirulina) will also be studied. The results from this study will be of importance for planning future studies to test the efficacy of adding spirulina to the diet, and for planning the use of spirulina in vitamin A deficiency prevention programs. On an exceptional basis this project will be conducted in the US because advanced, very sophisticated technologies are required for growing the isotopically labeled spirulina and for the tracer analysis to determine the enrichment of the blood samples.

"… enLINK - The Source to reduce the 'know-do' gap in nutrition knowledge."

An enLINK user from Africa

The enLINK Library

Knowledge for better nutrition and health

In May 2004, as a first project in the enLINK Initiative, the Foundation launched, as a joint venture with OVID Technologies Inc. as well as certain publishers, its digital nutrition library enLINK for individual users in low-income countries. Putting the library into cyberspace led to a large international media echo and was welcomed by users all over the world, from the Americas to Zimbabwe. The library presently features more than ten key nutrition journals which are freely accessible in full text for registered users. For non-registered users the library offers a searchable database and free abstracts. A regularly updated link list completes this important digital collection for the promotion of nutrition education and knowledge in the world.

enLINK statistics during its first eight months (as of December 31, 2004)**:**

- 30 users from 19 countries
- Nearly 12,000 page views
- More than 40 page views per day

Other Activities

New Research Projects

Institutional Support

NEW RESEARCH PROJECTS

MACRONUTRIENTS

Changing diets, levels of physical activity and environments and their relationship to the emergence of adolescent overweight and obesity in Ho Chi Minh City, Vietnam

Hong K. Tang and Michael J. Dibley
Community Health Department, University Training Centre for Health Care Professionals, Ho Chi Minh City (Vietnam) and Centre for Clinical Epidemiology and Biostatistics, University of Newcastle, Newcastle, Australia
USD 100,000

Overweight and obese children and adolescents are becoming more prevalent in urban areas of Vietnam; however, the scientific data describing the situation remains incomplete. It is planned to conduct a cohort study by following up a sub-sample of the children from a cross-sectional study who reside in districts of Ho Chi Minh City where obesity is most prevalent. The cohort study will identify those risk factors related to relative change in BMI (and other indicators of adiposity) over a two-year follow-up period. The results of the proposed study will provide evidence to use in planning and evaluating the most appropriate interventions in the future.

MICRONUTRIENTS

Genetic diversity and selection of cassava (Manihot esculenta Crantz) with high β-carotene content using molecular markers

Claudia F. Ferreira
Embrapa Mandioca e Fruticultura (National Center of Cassava and Fruit Crops Research), Cruz das Almas, Bahia, Brazil
USD 7'500

Beta-carotene from certain cassava strains may represent an important vitamin A source. The purpose of this project is to use different molecular markers to assist the cassava breeding program and to help identify promising individual strains regarding β-carotene content. The use of molecular markers can open new opportunities in the identification of cassava strains with acceptable levels of this nutrient within a very short period of time.

Effects of multi-vitamin and multi-mineral supplementation on pregnant women and their infants in Chongqing, China

Ting-Yu LI
Children's Hospital, Chongqing University of Medical Sciences, Chongqing, China
USD 97,560

Young children and pregnant women are the most vulnerable groups for vitamin and mineral deficiencies. In this double-masked, randomized, controlled clinical trial the effect of a multi-vitamin / multi-mineral supplementation on pregnant women and their infants in Kai County (Chongqing) will be studied. The study aims to identify a safe and effective means for preventing vitamin and mineral deficiencies in a population at risk on a large scale. 400 pregnant women, aged from 20 to 35, will be studied from 2-month pre-pregnancy to 12-month postpartum. The changes of symptoms and signs of anemia and infection in pregnant women and infants will be investigated.

CHINA

Study on the causes of anemia in elderly women in China

Jian Zhang
Department of Elderly Nutrition, National Institute of Nutrition and Food Safety, Beijing, China
USD 93,420

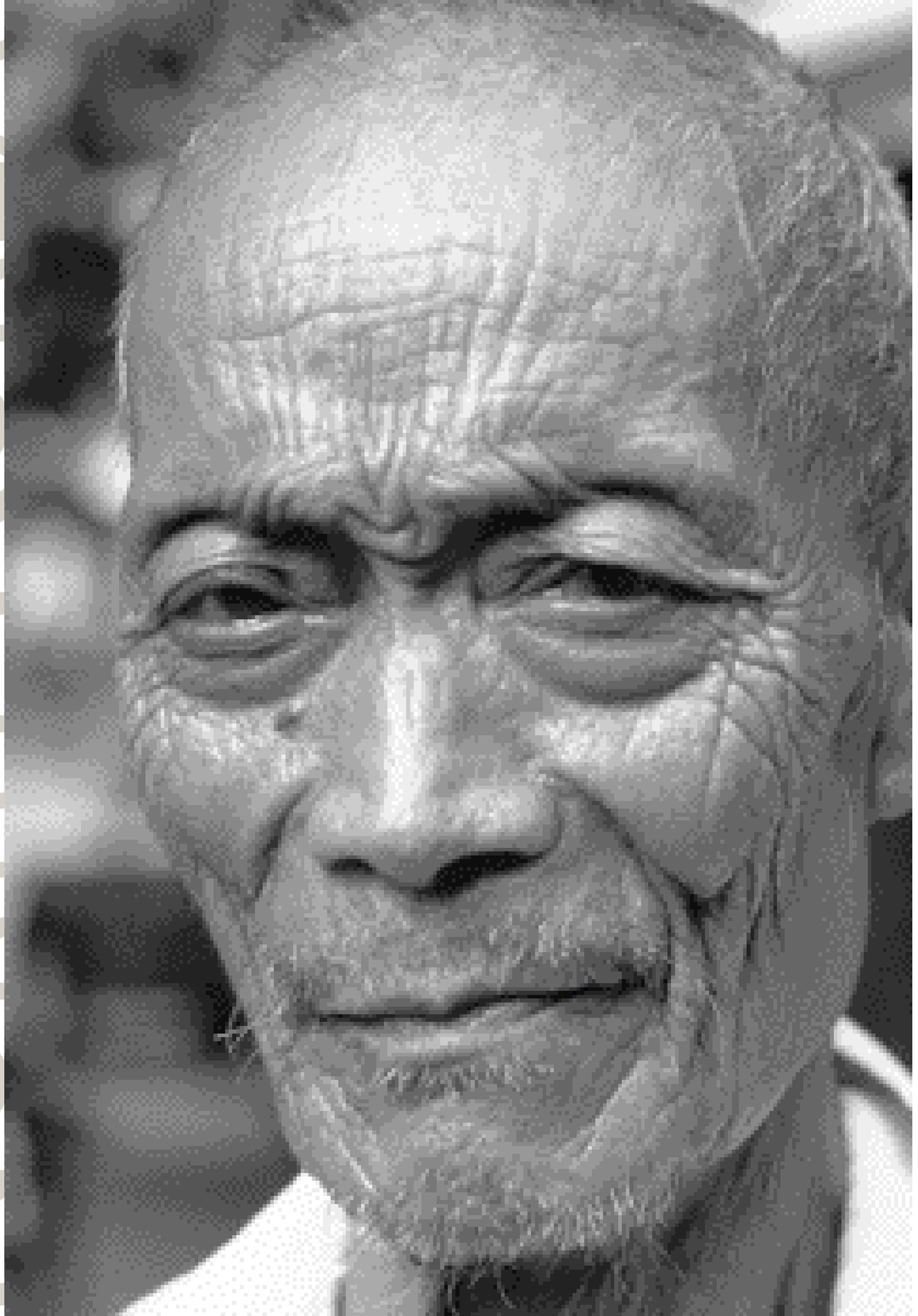
The elderly are the fastest growing population in China. Results from several surveys indicate that the anemia prevalence in the elderly is between 20-39%, even reaching 60% in some poor rural areas. Elderly females, particularly those who live in rural areas, have the highest risk of anemia. This case-control study will be conducted to investigate risk factors, particularly dietary factors, for anemia in elderly women. By analyzing and comparing information on food intake, health status and biochemical measurements, factors which might be protective will be identified. These "positive deviance risk factors" can then be implemented in preventive programs.

NORTH KOREA

Effect of iron fortification of nursery complementary food on iron status of infants

Kim Su Huan
Institute of Child Nutrition, Saesalimdong,
Pyongyang, North Korea
USD 93,850

In North Korea, under the administration of the government, a great number of children are enrolled in the nursery system, and are given meals in the nursery during the day. This is a randomized and double-blinded nursery-based iron intervention study to evaluate the efficacy of iron-fortified complementary food that is cooked in the nursery kitchen. The efficacy and feasibility of a nursery-based iron fortification program will be tested.



PAKISTAN

Investigation of blood and hair lead and manganese levels in children with different degrees of iron deficiency in Karachi

Mohammad Ataur Rahman & Nessar Ahmed
Department of Biochemistry, Ziauddin Medical University, Clifton, Karachi (Pakistan) and
Department of Biological Sciences, Manchester Metropolitan University, Manchester,
United Kingdom
USD 63,112

Multiple evidence suggests that iron deficiency may be accompanied by increased absorption of lead and manganese as these ions compete for the same transporters as iron in the small intestine. Therefore it is hypothesized that children residing in heavily polluted areas may be prone to high blood lead, and possibly also manganese levels. This hypothesis will be tested by investigating blood and hair lead and manganese levels in children with different degrees of iron deficiency. The findings may reinforce the importance of not only reducing lead and manganese environmental pollution, but also the development of national health strategies to reduce childhood iron deficiency.

Infections and other diseases affecting nutritional status

Molecular and biochemical analysis of intestinal microflora in malnourished children with cholera treated with oral rehydration solution with and without amylase resistant starch

G. B. Nair & M. Rahman
ICDDR,B, Dhaka, Bangladesh
USD 21,530

The aim of the present study is to measure the quantity and biodiversity of colonic flora as a function of time in children treated with conventional oral rehydration solution (ORS) as well as ORS containing amylase resistant starch (ARS). Biodiversity of the colonic flora will be studied with the help of temporal temperature gradient gel electrophoresis (TTGE) analysis of PCR products of DNA material extracted from fecal samples. The working hypothesis is that in the group of children receiving ARS, the number of bacteria, the biodiversity and the SCFA profile will improve faster than in the two other groups. Such a pattern should be associated with shorter duration of diarrhea and better catch-up growth.

Rehabilitation from malnutrition

Rehabilitation of severely malnourished children in Senegal (West Africa): Use of a local solid food equivalent to WHO F100 with high energetic value

Salimata Wade
Nutrition Group, University of Cheikh Anta Diop, Dakar, Senegal
USD 33,051

Foods for treatment of severe malnutrition can be prepared in solid form and consumed without added water to prevent bacterial growth. A ready to use therapeutic food (RTUF) industrially prepared and designed to be nutritionally equivalent to WHO recommendations has been proposed as an alternative to WHO F100 solution. RTUF can also be prepared at the community level using local ingredients. RTUF has an energy density that is more than five times that of F100, but a similar ratio of nutrients to energy. The aim of the present study is to evaluate the effectiveness of local RTUF transfer in a community-based nutritional rehabilitation. The objective is to assess the efficacy of community-based rehabilitation of malnourished children using locally produced RTUF in a rural area of Senegal.

Bone health

Effects of parathyroid hormone on bone metabolism in older people in China

Bo Zhou
Shenyang Medical College, Shenyang, China
USD 113,280

The loss of bone mass (osteoporosis) with aging is a worldwide problem. New evidence suggests that the skeleton of Chinese people may show a different sensitivity and response pattern to the effects of parathormone (PTH). In this research protocol a series of PTH stimulation tests using oral phosphate administration in older people in Shenyang will be done to determine whether phosphate increases PTH secretion to a similar extent as that seen in comparable Caucasian populations in England. The results will help to formulate strategies for the prevention of osteoporosis.

Nutrition education

Nutrition education program for pregnant women in Hunan province

Qian Lin
Department of Nutrition Science, Xiangya Public Health School, Central South University, Xiangya Medical School, Changsha, Hunan, China
USD 60,750

In many areas of the world pregnant women know little about nutrition and often no possibilities exist for pregnant women to seek nutrition advice. Pregnant women in WCHIs (Women Children Health Institutions) will be recruited to take part in a nutrition education program. It is expected that this program will help pregnant women to understand more about nutrition and thus it will promote the nutritional status of the mothers and the babies. The Foundation will reinforce the educational aspect in this study with a core component of the enLINK Initiative.

One of the major aims of the Nestlé Foundation is the transfer of sustainable knowledge to low-income countries.

Institutional Support

Makerere University

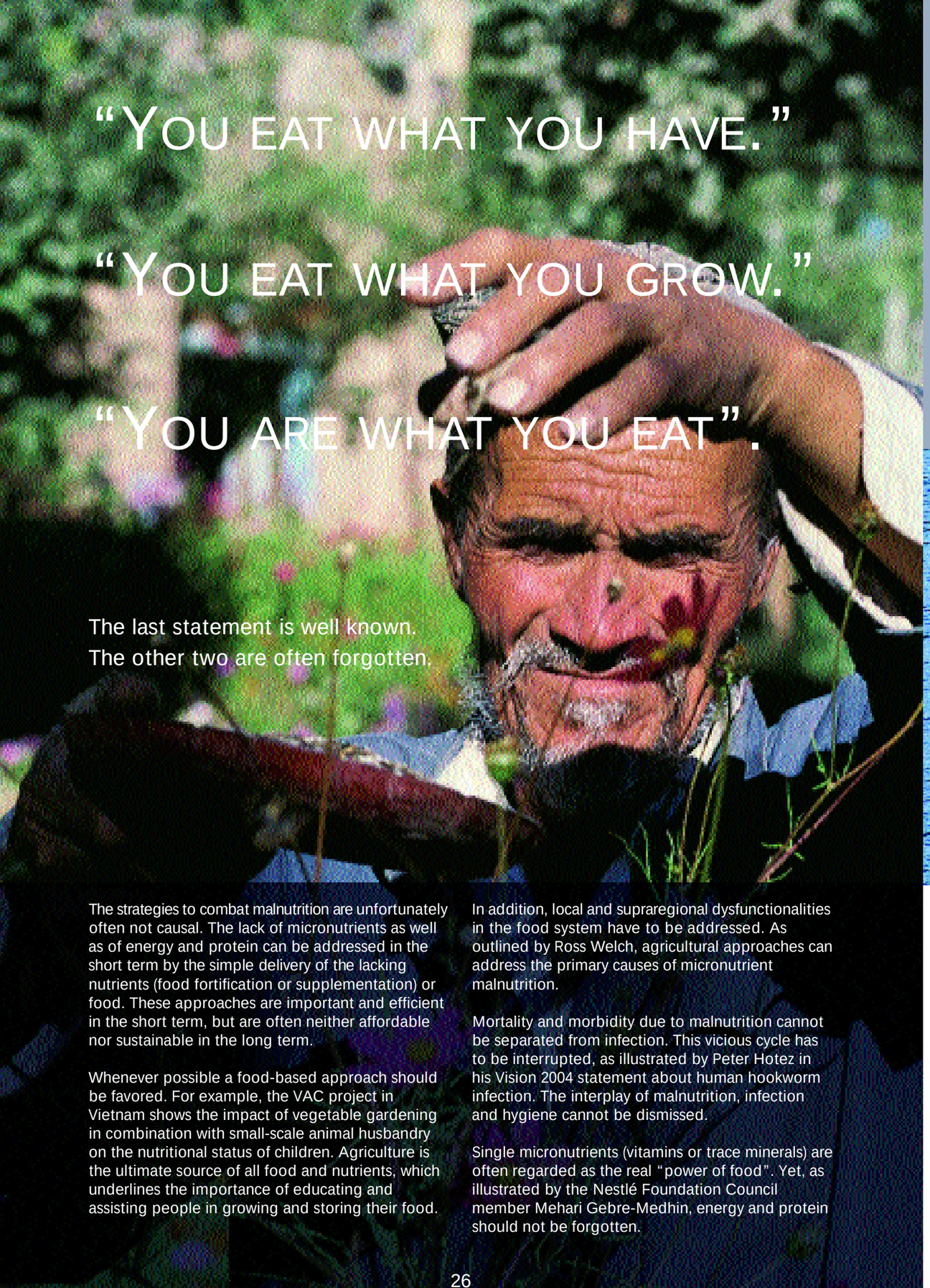
With Norwegian support, a new building was built for the Department of Food Science and Technology at Makerere University in Kampala (Uganda). To improve the teaching and research infrastructure and further various educational activities in the Master of Science in Nutrition program, the Foundation provided this institution with a one-time institutional grant of USD 50,000.

University of Benin

The Department of Nutrition at the Faculty of Agricultural Sciences of the University of Benin in Abomey-Calavi / Cotonou is a well-known African institution for nutrition science. To counter the effects of the familiar phenomenon of "brain drain", the Foundation provided a one-year USD 60,000 grant to Mr. Walioli Bodounrin A. Amoussa, a research assistant in the Department of Nutrition, to allow him to get a Master of Science in Nutrition at the London School of Hygiene and Tropical Medicine.

National Research Institute of Child Nutrition in Pyongyang

To strengthen the nutritional knowledge and research capacities of the National Research Institute of Child Nutrition in Pyongyang (North Korea), two medical doctors, Dr. Rim Hui Yong and Dr. Sim Byong Chol, were supported for a six-month educational stay at Mahidol University (Thailand). During their stay the two fellows focused in particular on basic aspects of nutrition research and study design methodologies. The first result from this intensive educational stay at Mahidol University is an efficacy study to evaluate the potential impact of a nursery-based food-fortification program with iron (see also the section on accepted projects).



“You eat what you have.”

“You eat what you grow.”

“You are what you eat”.

The last statement is well known.
The other two are often forgotten.

The strategies to combat malnutrition are unfortunately often not causal. The lack of micronutrients as well as of energy and protein can be addressed in the short term by the simple delivery of the lacking nutrients (food fortification or supplementation) or food. These approaches are important and efficient in the short term, but are often neither affordable nor sustainable in the long term.

Whenever possible a food-based approach should be favored. For example, the VAC project in Vietnam shows the impact of vegetable gardening in combination with small-scale animal husbandry on the nutritional status of children. Agriculture is the ultimate source of all food and nutrients, which underlines the importance of educating and assisting people in growing and storing their food.

In addition, local and supraregional dysfunctionalities in the food system have to be addressed. As outlined by Ross Welch, agricultural approaches can address the primary causes of micronutrient malnutrition.

Mortality and morbidity due to malnutrition cannot be separated from infection. This vicious cycle has to be interrupted, as illustrated by Peter Hotez in his Vision 2004 statement about human hookworm infection. The interplay of malnutrition, infection and hygiene cannot be dismissed.

Single micronutrients (vitamins or trace minerals) are often regarded as the real “power of food”. Yet, as illustrated by the Nestlé Foundation Council member Mehari Gebre-Medhin, energy and protein should not be forgotten.

Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime.

Chinese Proverb

Vision 2004

Vision 2004 illustrates the linkage of education and know-how, food production (agriculture), medicine (infections) and hygiene in the origin and also causal combat of malnutrition.

The activities of The Foundation try to link together the causal issues and strengthen a food-based sustainable solution to malnutrition.

The Role of Homegardening

The Impact of Gardening and Animal Husbandry on Nutritional Status*

Phan Van Huan, BSc, MSc
National Institute of Nutrition, Hanoi, Vietnam

Vietnam, with its 80 million people, is an agricultural country in Southeast Asia. Despite the increase in food production, 30.1% of children under five were reported to be malnourished in the year 2002. Micro-nutrient deficiencies are still the most important public health problem. Sub-clinical vitamin A deficiency is found in 12% of children under age five, whereas iron deficiency anaemia is prevalent in children under two, particularly in rural areas. One of the important solutions to the problem of childhood malnutrition is to promote food production at the family level through the Vegetable Garden, Fish Pond and Animal Husbandry (VAC) system. VAC is an acronym for the Vietnamese words Vuon (Garden), Ao (Pond), Chan nuoi (Animal Husbandry). In the last 20 years, the new term "VAC" has become very familiar to many Vietnamese people. VAC refers to the traditional ecosystem as perceived by Vietnamese people, and it also refers to the idea of developing an eco-organic sustainable agriculture in this country. However, until now few attempts were made to assess the impact of VAC on household food security, income and nutritional status. Our study was carried out in two stages: the first stage was a cross-sectional and the second will be an intervention study.

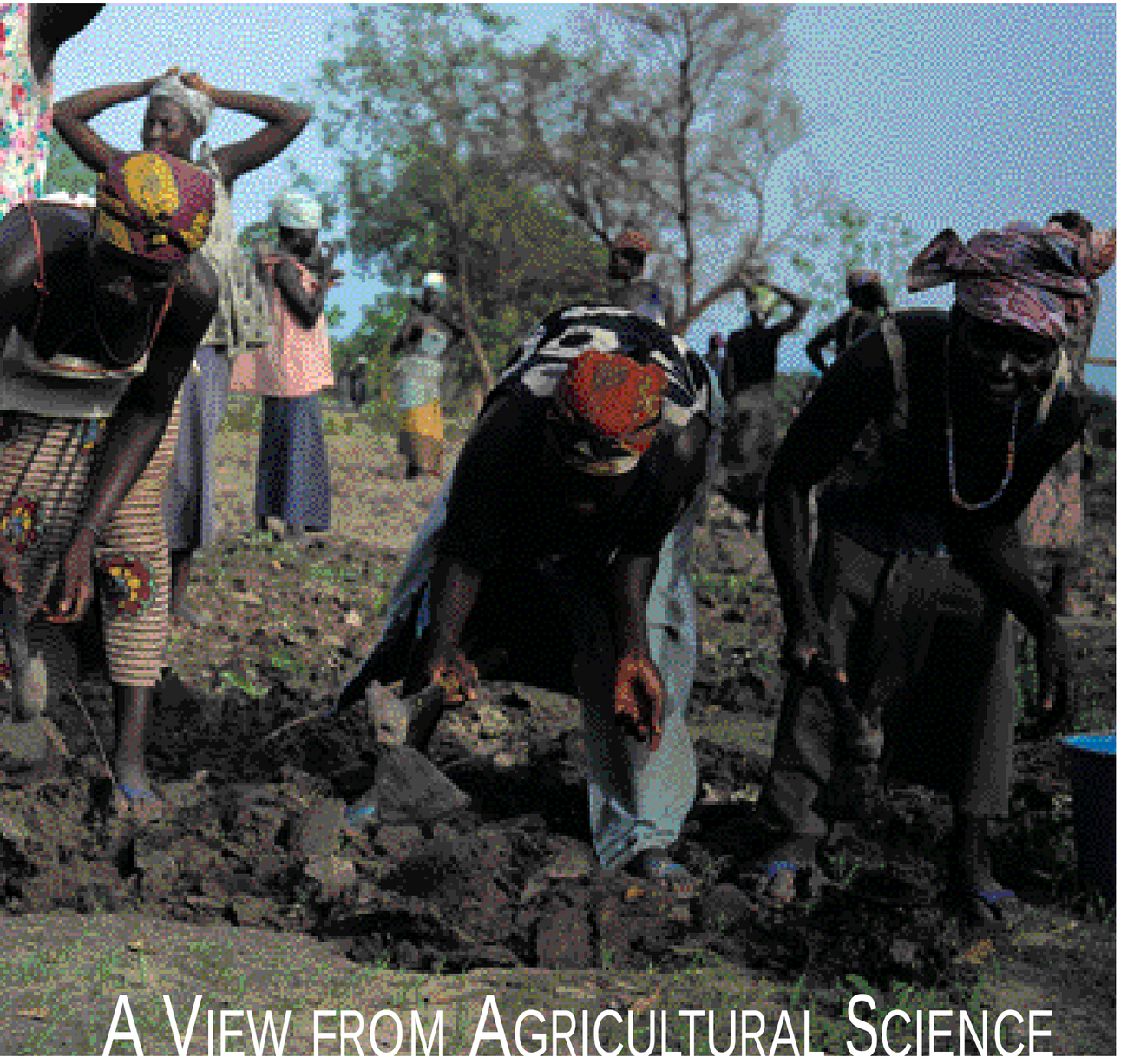
In the cross-sectional survey, which was conducted in November 2003, the data on food production, income, expenditure, food consumption of households, weight, height and biochemical parameters (Hb, ferritin, retinol, Zn, β–carotene) of children between age one and six and the nutrition knowledge and practices of the mothers were collected. Interestingly, we discovered that in the group of children under 4 years, there was no difference in the stunting prevalence between the VAC group and the non-VAC group, but for children from 5 to 6 years old, the stunting prevalence is 29.8% in the VAC group compared to 41.1% in the non-VAC group. It may be that child stunting in the later childhood period depends much more on the food availability of the family, while in the earlier period, stunting may depend on feeding practices as well as the fetal nutritional status and the nutritional situation of the mother. Thus we believe that VAC may have an impact on stunting in later childhood, while the underweight prevalence is similar in both VAC and non-VAC groups. The further analysis of the data should look at whether the foods from a family's VAC are the determinant factor for stunting in children in rural areas.

* This project has been supported by The Foundation

"One of the important solutions to the problem of childhood malnutrition is to promote food production at the family level."

Learning is a treasure that will follow its owner everywhere.

Chinese Proverb



A View from Agricultural Science

Causal Approach to Malnutrition and Diet-Related Diseases

Ross M. Welch, PhD
USDA-ARS, U.S. Plant, Soil and Nutrition Laboratory, Cornell University, Ithaca, NY, USA

Incredibly, micronutrient malnutrition (e.g., Fe, I, Se, Zn, vitamin A, folic acid, etc.) is a massive global problem afflicting over 3 billion people worldwide (over half the world's population) – mostly women, infants and children in resource-poor families in the Global South. The consequences to human health, felicity, livelihoods, and national development are staggering, resulting in increased mortality and morbidity rates, decreased worker productivity, poverty, and diminished cognitive ability in children with lower educational potential born to deficient mothers. The World Health Organization's 2002 World Health Report states that inadequate food and malnutrition leads to a downward spiral of increased susceptibility to illness, sickness and loss of livelihood, ending in death. Current trends in micronutrient malnutrition continue to increase in many nations. For example, the global burden of Fe deficiency has risen from about 35% of the world's population in 1960 to over 50% in 2000, and Fe deficiency among poor women is increasing at an alarming rate in many developing countries. Current intervention programs (i.e., food fortification and supplementation programs) to alleviate the problem have not proven to be effective or sustainable in many countries because they are not based on holistic food system perspectives. They treat the disease but do not address the primary causes of the disease and are therefore difficult to sustain. This global crisis in micronutrient malnutrition is the result of dysfunctional food systems that cannot deliver enough micronutrients to meet the nutritional requirements of all people during all seasons.

Because agriculture is the primary source of all micronutrients for human consumption, agricultural systems must be contributing to this failure to meet nutritional needs. Agricultural technologies and policies can be changed in a way that will result in enough micronutrient output of farming systems to assure adequate nutrition for all. Importantly, if agricultural technologies and government policies are directed at improving the nutritional quality of food crops, they must encompass a holistic food system perspective to assure that the intervention will be sustainable, and adopted by farmers and consumers. This will require that the agriculture sector must adopt a specific goal of improving human nutrition and health, and the nutrition and health sectors must adopt agricultural interventions as their primary tool to fight malnutrition and diet-related diseases.

Humans require at least 50 known nutrients in adequate amounts, consistently, to live healthy and productive lives. Unfortunately, many global food systems are failing to provide adequate quantities of all of these essential nutrients to vast numbers of people. Advances in crop production, incurred during the "green revolution", were dependent mostly on improvements in cereal cropping systems (rice, wheat and maize) and resulted in greatly increased food supplies for the world, preventing massive starvation. However, cereals as normally eaten only supply needed carbohydrates for energy and a small amount of protein, but few other nutrients in required amounts. This change in agricultural production to more monoculture cereal systems and away from more varied cropping systems appears to be contributing to micronutrient malnutrition by limiting food-crop diversity. This has had the unforeseen consequence of reducing available micronutrient supplies to the poor, who were formerly dependent on more diverse cropping systems which provided more traditional micronutrient-rich food crops (e.g., pulses, fruits, and certain vegetables) that are now in low supply and no longer affordable to this sector of society.

Nutrition transitions are also causing increased rates of chronic diseases (e.g., cancer, heart disease, stroke, diabetes, obesity, osteoporosis, etc.) in many rapidly developing nations where people are switching from traditional diets to more calorie-rich diets derived from adopting developed nations' food systems. Diet-related diseases are contributing greatly to the burden of disease globally. Clearly, there is an urgent need to tightly link the agricultural sector to human health to find ways to reduce the burden of diet-related diseases in the world.

In 2004, at the 57th World Health Assembly, the WHO acknowledged that malnutrition, including undernutrition and nutritional deficiencies, is still a major cause of death and disease worldwide. Non-communicable diseases were viewed as occurring in crisis proportions in developed countries and are rapidly increasing in developing nations. In 2001, chronic diseases (many diet-related) accounted for almost 60% of the 56 million deaths annually and 47% of the global burden of disease. The Assembly stated that national food and agricultural policies should be consistent with the protection and promotion of public health. Agricultural policy and production have great effects on national diets, and governments can influence agricultural production through many policy measures. The Assembly recommended that as emphasis on health increases and consumption patterns change, Member States need to take healthy nutrition into account in their agricultural policies.

Improving human health is a key component of the future of agriculture globally. Food systems dependent on agricultural production need to change in ways that will deliver enough affordable, health-enhancing and accessible diets for everyone in sustainable ways if we are to find sustainable solutions to malnutrition and diet-related chronic diseases globally. Fighting chronic diseases will also be an important component of agricultural goals in the world, and much more research directed at reducing these illnesses through agricultural systems and holistic thinking will be required.

Farming for health is the only sustainable means of achieving better nutrition and health for all worldwide.

Human Hookworm Infection

Peter J. Hotez, MD, PhD
Dept. Microbiology and Tropical Medicine,
The George Washington University,
Washington DC, USA

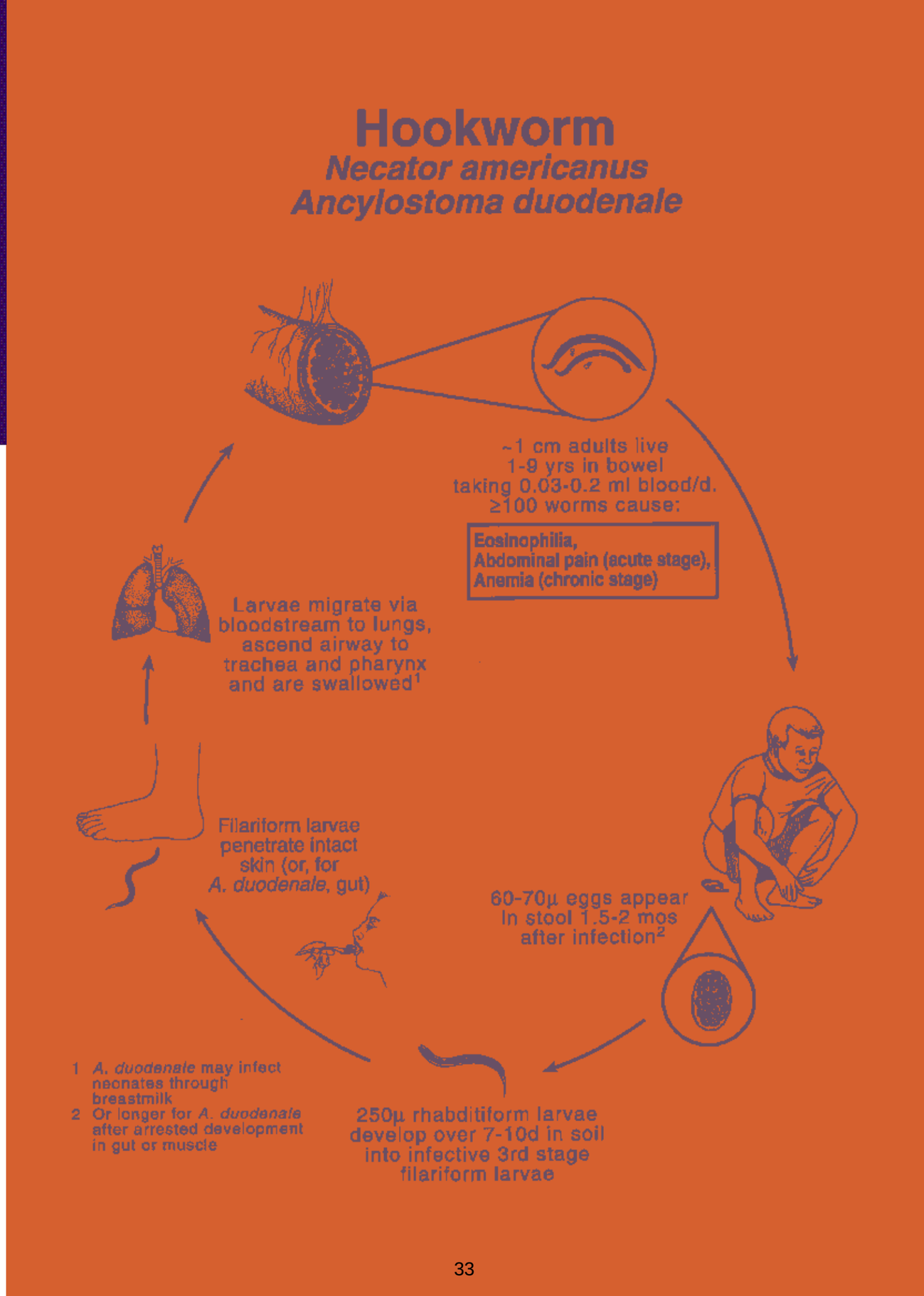
Hookworm infection is a parasitic infection and nutritional disease caused by the nematodes Necator americanus and Ancylostoma duodenale. It is one of the most common chronic infections of humans, with new estimates indicating that 740 million people are infected, especially in rural tropical areas of sub-Saharan Africa, East Asia, and the tropical regions of the Americas [1,2]. Hookworm is found almost wherever rural poverty occurs in these regions.

The nutritional deficiencies attributed to hookworm are caused by the adult parasites. Hookworms cause blood loss at their site of attachment in the gut [2]. Once host iron stores become depleted there is a correlation between hookworm intensity (usually measured by fecal egg counts) and reduced host hemoglobin [4]. Moderate and heavy intensity infections associated with large hookworm burdens produce blood loss sufficient to cause iron deficiency anemia and protein malnutrition [3]. Individuals with heavy chronic infections manifest with pallor, generalized edema, and a sallow complexion (sometimes known as 'chlorosis'). Therefore hookworm disease is essentially a nutritional deficiency of iron and protein. In many regions of Africa, hookworm is co-endemic with malaria and HIV-AIDS. Because each of these conditions is also associated with anemia, together they may cause a profound and synergistic anemia that may contribute significantly to morbidity and mortality.

In many developing countries children and women of reproductive age have the lowest iron reserves. For this reason, they are the populations considered the most vulnerable to hookworm-associated blood loss [4-11]. Hookworm accounts for up to 73% of the severe anemia in these two populations [4-11]. In children, especially preschool children, chronic hookworm disease is associated with impaired physical and intellectual development [2,5,6,12,13]. Because high intensity hookworm infections also occur commonly in adult populations [5, 14-16], hookworm anemia is a significant health problem in women of reproductive age and in pregnancy [11,17-18].

The population health and nutritional impact resulting from hookworm includes up to 65,000 annual deaths and 22 million DALYs (disability-adjusted life years) [19-21]. The disease burden caused by hookworm exceeds that caused by many other neglected tropical infectious diseases [2, 22]. In addition to its health impact, hookworm infection has been shown to reduce childhood school performance and attendance by approximately 25%; it also adversely affects future productivity and wage-earning potential [23]. Therefore, hookworm infection affects not only child health, but education and economic outcomes as well.

The WHO and other international health agencies recommend population-wide treatment with albendazole or mebendazole as the most cost-effective way to control the morbidity caused by soil-transmitted helminth infections (ascaris, trichuris, and hookworm infections) [19, 24]. Because school-aged children typically harbor the highest ascaris, trichuris and schistosome worm burdens of any single group, there has been increasing



emphasis placed on school-based treatment programs that employ regular treatments with a single dose of either mebendazole or albendazole [19, 25-26]. There are abundant data to document the health and non-health benefits of such periodic school-based deworming in school-aged children [2, 19, 25-26]. Such data have provided the basis for adoption of a resolution at the 2001 World Health Assembly, which advocates for the anthelminthic treatment of at least 75% of all at-risk school-aged children by 2010 (www.who.int/wormcontrol).

In pregnant women, antenatal anthelminthic treatment was also recently shown to improve birthweight and infant survival in rural Nepal [27]. This has led to calls for expanded safety studies of albendazole and mebendazole during pregnancy. In addition to deworming with anthelminthics in pregnancy, there are data to support supplementation with oral iron for the amelioration of hookworm anemia. Two studies among pregnant women have shown the benefits of supplemental iron and anthelminthics drugs relative to either intervention alone [27, 28].

Compared to other major childhood helminth infections, there are concerns that school-based anthelminthic deworming programs will have a reduced impact on the prevalence, intensity or transmission of hookworm infection. The reasons for this have been summarized [2, 29], and include the observations that high hookworm intensity occurs in adult populations as well as school-aged children; no impact on hookworm transmission is expected from school-based programs; the variable effects of mebendazole, and high rates of post-treatment re-infection; and the possibility of emerging drug resistance. As an alternative strategy, the Human Hookworm Initiative (HHVI) is developing a safe and cost-effective vaccine, which would provide an important new tool for the control of hookworm infection [29, 30]. Widespread use of the vaccine could avert up to one-half of the DALYs resulting from hookworm. Pending U.S. FDA approval, clinical testing of the vaccine is scheduled for the first quarter of 2005.

"If hookworm infection is present, the primary strategy is to remove the hookworms, not supplement with iron."

Peter J. Hotez, MD, PhD

Protein-energy Nutrition and Micronutrients Revisited

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A few months ago I had the privilege of publicly scrutinizing a PhD-thesis on anaemia and iron deficiency in children and women in Tanzania, with special reference to dietary iron intake and supplementation with multiple micronutrient beverage [1]. The dissertation took place at the Chalmers University of Technology in Sweden. This formal academic event usually lasts 2 to 4 hours, and has the form of an intellectual discourse between an external examiner, bearing the ominous title "opponent", and the doctoral candidate, who is referred to as the "respondent". The dialogue may turn out to be a pleasant, entertaining and educative exercise, or may develop into a fretful probing bordering on harassment of the respondent. In this particular case the dissertation proceeded well in all respects, and the two of us will remain friends in the future. The first part of the dissertation is followed by a similar discourse between the respondent and an examination committee comprising 3 to 5 professors. It is these professors who have the exclusive mandate to mark the thesis, and their verdict is final and binding.

It was a well-written, and satisfactorily defended, thesis on a topic that reflects the flourishing, as it were, pandemic focus on micronutrient supplementation of women and children that has become evident in recent years. There is currently a veritable proliferation of research projects and intervention programmes dealing with micronutrients, and this topic is to be found uppermost on the agenda of many a respectable research centre in the world today. Micronutrient research on humans now commands a significant proportion of grants allocated to nutrition research, and a plethora of excellent tools for policymakers and public health workers have recently been published [2].

A closer look at the rationale for this focus reveals a couple of considerations. Firstly, the approach presupposes that the basic energy needs of groups have been adequately met. Secondly, it has to be presumed, based on satisfactory documentation, that adequate macronutrient (protein-energy) intake in groups eating to appetite cannot be expected to cover the needs of specific nutrients. Once these conditions have been fulfilled it would be reasonable to consider micronutrient supplementation on a population basis.

As I was preparing for the public scrutiny of this thesis, several thoughts came to my mind and I felt a strong urge to try and clarify a few issues of principal character. How sound is the scientific basis for the micronutrient supplementation, at the public health level, that is being advocated at the present moment, particularly in the low-income countries? Is micronutrient supplementation, with the exception of the case for iodine, the right way to solve possible nutrient deficiencies at the population level? Are there other nutritional priorities that need to be addressed before we embark on such specific interventions? How cost-effective and sustainable, or even ethically acceptable, are these programmes in situations where the basic protein-energy needs of undernourished population groups obviously have not been adequately met?

While processing these thoughts in my mind, I was reminded of an important upheaval in the modern history of human nutrition that occurred just 30 years ago. That was the year when D. S. McLaren, through his article in the Lancet of July 13, 1974, entitled "The Great Protein Fiasco" [3], initiated a debate that proved to have far-reaching consequences for our work among malnourished children. His article coincided with a meeting of the World Food Congress in Rome, the ninth meeting of the FAO/WHO Expert Group considering nutrition policy planning, and a special Task force that reported to the Protein Advisory Group (PAG) of the UN, with the result that this group gained Calorie in its name, and became the Protein-Calorie Advisory Group [4].

The debate triggered by McLaren was not intended to debunk protein. It was an invitation to dialogue that could lead away from the preoccupation with protein that many at that time felt was growing to be counter-productive. The argument was rather that the great dietary staples: maize, rice and wheat contain sufficient protein to meet the needs of vulnerable groups as long as they are eaten in quantities which satisfy energy requirements [5].

Perhaps we should ask ourselves: Is the time now mature for us to apply the same considerations, perhaps initiate a similar debate or dialogue, regarding micronutrients as was done in the case of dietary protein three decades ago? It was with these thoughts in my mind that I approached my task as reviewer of an important academic work.

To my happy surprise, I found that my reflections perhaps were not baseless. Let me explain. A highly thought-provoking material that was presented in this thesis is indicated in the table summarizing the daily (energy and) nutrient intakes in schoolchildren in a district in Tanzania grouped by their iron status [1]. (see Table, for ease of reference ranges and SD have been removed).

It is evident from this table that there is a clear correlation, on the one hand, between iron intake and iron status and, on the other hand, between energy intake, iron intake, iron deficiency and anaemia. Those in the study groups, who had low serum ferritin, elevated erythrocyte protoporphyrin and low haemoglobin, also had inadequate protein-energy intake. This fact is brought forth in a striking manner by the deficit in energy intake (fat and protein, 65% and 63%, respectively) in the group with iron deficiency anaemia, as indicated by elevated erythrocyte protoporphyrin, compared to those with normal iron status. The mean total energy intake in this group is close to 30% lower than the recommended intake as well as the intake in the group with normal iron status.

In contrast to this, those in the study who had normal indicators of iron status, on the average, also had adequate energy and nutrient intakes from the same diet. From this it would follow that, in this particular instance, those with adequate energy intake evidently are not in need of iron supplementation, whereas those with energy deficiency, iron deficiency and anaemia would logically be expected to rectify their iron deficiency, without iron supplementation, provided they are given the same diet in quantities that satisfy their energy requirements. This is the essence of the present argument.

The present study, as well as several other similar investigations, which this brief commentary cannot accommodate, call for a critical look at current concepts and rationale behind research undertakings and programmes related to public health interventions focusing on micronutrient supplementation. A call for international debate on this topic would not be to show the good intentions and aspirations of researchers, research foundations, international organizations or the industry to be spurious but to learn from the past so that the future may be better. We owe it to the women and children of the world to constantly review our knowledge, experiences and policies in this as well as other related fields.

Daily nutrient intake of schoolchildren in a district in Tanzania grouped by their iron status

	Serum ferritin (µg/L)			Erythrocyte protoporphyrin (µmol/mol haem)			Haemoglobin (g/dL)		
	Low (n=30)		Normal (n=50)	High (n=20)		Normal (n=60)	Anaemic (n=38)		Normal (n=42)
Iron (mg)	23	(88)	26	22	(85)	26	22	(81)	27
Vitamin C (mg)	29	(71)	41	30	(77)	39	40	(108)	37
Carbohydrate (g)	228	(81)	282	225	(81)	279	255	(88)	290
Fat (g)	77	(80)	96	64	(65)	98	78	(88)	89
Protein (g)	61	(88)	69	47	(63)	74	61	(84)	73
Energy (kcal)	1764	(85)	2076	1612	(77)	2105	1891	(88)	2159
Dietary Fibre (g)	18	(95)	19	14	(67)	21	18	(95)	19

Figures indicate mean values. Figures within brackets indicate percentage adequacy of intake in those with iron deficiency anaemia compared to those with normal iron status. Iron deficiency and anaemia: Serum ferritin < 20 µg/L; Erythrocyte protoporphyrin > 125 µmol/mol haem; Hb < 11.5 g/dL

Profile of a Nutrition Institute

Institute for Nutrition and Food Safety, Beijing, China

Jian Zhang, MD & Maoqi Wang, MD, Director
Institute for Nutrition and Food Safety, Beijing, China

The Institute for Nutrition and Food Safety (INFS), located in Beijing, is affiliated with the Chinese Center for Disease Control and Prevention, in the Ministry of Health of the People's Republic of China. The INFS was established in 2001 by integrating two prestigious institutes, the Nutrition and Food Hygiene Research Institute of the Chinese Academy of Preventive Medicine, and the National Food Safety Monitoring Institute. Financially supported by the government, the INFS is a non-profit organization and its mission is to provide credible and objective science-based information on food and nutrition issues to the central and local governments, health-care professionals, industry and consumers.

The INFS is a multidisciplinary organization and its members come from many areas within the fields of nutrition, food, biology, chemistry, etc. Currently, the Institute has 16 academic departments and 302 staff members, including 25 professors, 26 associate professors, nine supervisors for doctoral students and 30 supervisors for students in the masters program. The key working areas are nutrition (including Community Nutrition, Child and Maternal Nutrition, School Nutrition, Elderly Nutrition and Trace Elements Nutrition), chemical food contamination, biological food contamination, food toxicology, and food standards research. Most professors at the INFS are very influential in their area of research, both in China and abroad, and various academic associations are chaired by INFS professors. Several centers, such as the Food Safety Analysis Center, the Food Nutrients Analysis Center, the Nutrition and Food Safety Assessment Center for Biotech Food, the Trace Element Lab of the Health Ministry, and the National Food Contamination Monitoring Center are located at the institute.

Funded by the government, the INFS takes on many large projects, such as overseeing the National Nutrition Survey four times since 1959, the National Nutrition Action, the Total Diet Study, or the Application of HACCP (Hazard Analysis and Critical Control Point) in Food Cooperation. The Chinese Nutrition and Health Survey in 2002 was executed by the INFS, in cooperation with local health institutes in 31 provinces and 132 counties. As part of this project approximately 250,000 people across the country were surveyed, thus providing much valuable information about the current nutrition status of the Chinese people, and particularly about the prevalence of malnutrition among children, as well as of anemia and the major chronic diseases such as hypertension, diabetes, dyslipidemia, and obesity. In the field of food safety, the INFS has set up a national food contamination monitoring system and conducts annual monitoring in 15 provinces. Based on its research results, the INFS assists the Ministry of Health in formulating national food policies and regulations. The INFS also provides technical assistance to the health institutes in all 31 provinces, autonomous regions and municipalities.

Each year, staff members of the INFS make great efforts to obtain research grants to support their

CHINA

Area
9 572 419 km^2

Population (2004)
1 298 847 624

Population growth rate (2004)
0.57%

GNP (2002)
960 USD

Life expectancy (2004)
72 years

Child mortality rate (2004)
3%

Facts from the China Nutrition and Health Survey (2002-2004)

Assessment in 31 provinces, autonomous regions and the municipalities directly under the central government.

Approximately 5300 researchers involved

71 971 Households studied

243 479 Individuals studied

24 034 / 68 656 Urban households/Individuals

47 937 / 174 823 Rural households/Individuals

51 347 Children aged < 10 years

30 461 Adolescents aged 10-20 years

130 305 Adults

31 306 Elderly aged > 60 years

Key data from children

Prevalence of low birth weight		3.6%
Breast feeding within first 4 months		71.6%
Urban	65.5%	
Rural	74.4%	
Malnutrition for children under 5 years		
Growth retardation		14.3%
Urban	4.9%	
Rural	17.3%	
Low body weight		7.8%
Urban	3.1%	
Rural	9.3%	
Vitamin A deficiency		9.3%
(Children aged 3-12 years)		
Urban	3.0%	
Rural	11.2%	
Anemia		24.2%
(Children under 2 years)		

Key data from adults (>18 years)

Malnutrition		8.5%
Urban	7.5%	
Rural	8.9%	
Overweight		22.8%
Obesity		7.1%
Hypertension		18.8%
Type II Diabetes		2.6%

Key data from elderly (>60 years)

Anemia	21.5%
Obesity	8.9%
Hypertension	49.1%
Type II Diabetes	6.8%

academic activities, including both population-based studies and basic research work. The primary focus is on public health problems in nutrition and food safety in China. One example of the significant achievements of the INFS is the success in battling the cardiomyopathy known as Keshan disease, which thirty years ago threatened the life of many Chinese. Through arduous work, INFS researchers were able to prove that low selenium intake is one of the principle causes of this disease, and that selenium supplementation is effective in its prevention. This achievement gained the institute great respect worldwide. Unfortunately, malnutrition is today still a serious problem in China for those living in poor areas, and in an effort to combat this problem, the INFS has done a series of studies on the problems of vitamin A deficiency, calcium deficiency and iron deficiency anemia in children and pregnant women. The institute has already achieved many valuable results which aid the government in its fight against malnutrition.

The INFS also conducts much basic research. Many staff members contribute their time and energy to establishing standardized methods to determine food nutrients, chemical contaminants, harmful microorganisms, etc. Much of this work represents the most sophisticated research in the field in China, and is valued around the world. FAO/WHO named the INFS the Collaborative Center for Food Contamination Monitoring in China. Other essential research such as establishing a food composition table, or developing a method for the detection of biotech food has been accomplished or is being conducted with the leadership of the INFS. The institute also uses many advanced technological methods to do research on the health effects of some natural components that exist in foods. The successful research on tea, for example, provides strong evidence for its anti-cancer and cardiovascular disease prevention effects and explains the possible molecular biological mechanisms. All this basic research is essential for the improvement of food safety in the country as well as of the nutrition status and the well-being of the Chinese people.

The staff members at the INFS are open and enterprising, and have established many collaborative relationships with their counterparts in countries such as the Netherlands, the United Kingdom, Norway, the United States, Canada, Australia, and Japan, and with several international organizations such as WHO, FAO, and UNICEF. The institute has also received a number of financial and technical grants from independent foundations such as the Nestlé Foundation or the Global Alliance for Improved Nutrition. All of these collaborative activities have made the INFS known around the world and established it in the field of modern nutrition research.

The INFS is continuing its devotion to nutrition and food safety and hopes to share its achievements with the world.

Ongoing Projects

PROTEIN AND AMINO ACID REQUIREMENTS

MICRONUTRIENTS

	TITLE	PRINCIPAL INVESTIGATOR
1	2001 / Sulfur amino acid requirements of a normal healthy Indian population	Anura Kurpad Department of Physiology, St. John's Medical College, Bangalore, India

MICRONUTRIENTS

2	2002 / Efficacy of multiple micronutrients supplementation in improving micronutrient status among anaemic adolescent girls in Bangladesh	Faruk Ahmed School of Population Health, University of Queensland, Brisbane, Australia
3	2002 / Effect of calcium supplementation to low-calcium-intake pregnant women on placental hemodynamic and fetal growth: A randomized clinical trial	Guillermo Carroli Centro Rosarino de Estudios Perinatales, Rosario, Argentina
4	2002 / Iron deficiency anemia among adolescent school girls and the relative importance of vitamin A and riboflavin	Drupadi Dillon SEAMEO-TROPMED RCCN, University of Indonesia, Jakarta, Indonesia
5	2002 / Effects of an additional meal fortified with multiple micronutrients on the nutritional and micronutritional status of Vietnamese children	Nguyen Quang Dung Basic Nutrition Department, National Institute of Nutrition, Hanoi, Vietnam

MICRONUTRIENTS

6	2002 / Effect of vitamin A and B2 supplementation added to iron on anemia of pregnant women in China	Ai-Guo Ma Institute of Human Nutrition, Qingdao University Medical College, Qingdao, China
7	2003 / Evaluation of valid biomarkers to distinguish between iron deficiency anemia and anemia of inflammation in areas of high rates of parasite infestation and nutritional deficiencies	Mohamed Ag Ayoya Division of Nutritional Sciences, Cornell University, Ithaca, NY, USA
8	2003 / Usefulness of ferrous fumarate and ferric pyrophosphate as food fortificants for infants and young children in developing countries	Lena Davidsson Human Nutrition Laboratory, Swiss Federal Institute of Technology, Rüschlikon, Switzerland
9	2003/ Effect of zinc supplementation and its interaction with vitamin A on child immune responses and morbidity rate	Martha Kartasurya School of Population Health, Brisbane, Queensland, Australia
10	2003 / Zinc homeostasis in and zinc requirements of young Chinese children	Xiaoyang Sheng Xin-Hua Hospital, Shanghai Second Medical University, Shanghai, China
11	2004 / Effect of iron fortification of nursery complementary food on iron status of infants	Kim Su Huan National Research Institute of Child Nutrition, Pyongyang, North Korea
12	2004 / Effects of multi-vitamin and multi-mineral supplementation on pregnant women and their infants in Chongqing, China	Ting-Yu Li Children's Hospital, Chongqing University of Medical Sciences, Chongqing, China
13	2004 / Investigation of blood, hair lead and manganese levels in children with different degrees of iron deficiency in Karachi	Mohammad Ataur Rahman Department of Biochemistry, Ziauddin Medical University, Karachi, Pakistan
14	2004 / Vitamin A value of spirulina carotenoids in humans	Guangwen Tang Carotenoids & Health Laboratory, Human Nutrition Research Center on Aging, Boston, MA, USA
15	2004 / Study on the causes of anemia in elderly women in China	Jian Zhang Department of Elderly Nutrition, National Institute of Nutrition and Food Safety, Beijing, China

TITLE

PRINCIPAL INVESTIGATOR

TITLE

PRINCIPAL INVESTIGATOR

BREASTFEEDING

16	2001 / Validation of a model to predict the need for supplementing breastfeeding in premature infants	Nathalie Charpak Fundacion Canguro, Bogota, Colombia
17	2003 / Evaluation of two counseling strategies to improve exclusive breastfeeding rates among HIV-negative mothers in Kibera slum of Nairobi, Kenya: A randomized clinical trial	Sophie Ochola Department of Nutrition, Kenyatta University, Nairobi, Kenya

REHABILITATION FROM MALNUTRITION

18	2001 / Oral rehydration solution containing amylase resistant starch in severely malnourished children with watery diarrhea due to Vibrio cholerae	Nur Haque Alam Clinical Sciences Division, International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh
19	2002 / Rehabilitation of severely malnourished children in Senegal (West Africa): Use of a local solid food equivalent to WHO F100 with high energetic value. Part I	Salimata Wade Laboratoire de Physiologie, Université Cheikh Anta Diop, Dakar, Senegal
20	2004 / Rehabilitation of severely malnourished children in Senegal (West Africa): Use of a local solid food equivalent to WHO F100 with high energetic value. Part II	Salimata Wade Laboratoire de Physiologie, Université Cheikh Anta Diop, Dakar, Senegal

INFANT NUTRITION

21	2003 / Comparison of the efficacy and acceptability of three types of micronutrient supplements added to complementary foods for infants in Ghana	Anna Lartey Department of Nutrition and Food Science, University of Ghana, Legon - Accra, Ghana

CHILD BEHAVIORAL DEVELOPMENT

22	2001 / Cognitive performance of iron deficient, non-anemic Peruvian infants	Theodore Wachs Department of Psychological Sciences, Purdue University, West Lafayette, IN, USA

TITLE

PRINCIPAL INVESTIGATOR

NUTRITION, IMMUNE DEFENSE AND INFECTION

23	2002 / Nutrition assessment of children orphaned from HIV/AIDS	Judith Ernst School of Allied Health Sciences, Indiana University, Indianapolis, IN, USA
24	2002 / Randomized trial of micronutrient supplementation in HIV-infected Thai patients: Follow-up	Shabbar Jaffar MRC Tropical Epidemiology Group, London School of Hygiene & Tropical Medicine, London, United Kingdom
25	2002 / Examination of the relationships between low body mass index and micronutrient malnutrition and the risk of morbidity in adults aged 18 to 60 years in rural Vietnam	TranThanh Do National Institute of Nutrition, Hanoi, Vietnam
26	2004 / Molecular and biochemical analysis of intestinal microflora in malnourished children with cholera treated with oral rehydration solution with and without amylase resistant starch	GB Nair Laboratory Sciences Division, International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh

EPIDEMIOLOGIC TRANSITION

27	2001 / Follow-up study of dietary fat content and physical activity as predictors of change in body fatness and fat distribution in Chinese adults	Susan Roberts Energy Metabolism Laboratory, Tufts University, Boston, MA, USA
28	2002 / Validation of questionnaires examining inter-ethnic differences in socio-cultural and attitudinal factors associated with obesity in South African women and their daughters	Julia Goedecke Research Unit for Exercise Science, University of Cape Town, Newlands, South Africa
29	2003 / Assessing physical activity of obese children by a clinical score	Claude Godard Unidad de Endocrinologia Infantil, Instituto de Nutricion y Tecnologia de los Alimentos, Santiago, Chile
30	2004 / Changing diets, levels of physical activity and environments and their relationship to the emergence of adolescent overweight and obesity in Ho Chi Minh City, Vietnam	Hong K Tang Community Health Department, Training Centre for Health Care Professionals, Ho Chi Minh City, Vietnam

BONE HEALTH

31	2001 / Effect of vitamin D replacement on musculo-skeletal parameters in healthy adolescents: A randomized controlled trial	Ghada El-Hajj Fuleihan Medical Center, American University of Beirut, Beirut, Lebanon
32	2002 / Genetic, pubertal and nutritional determinants of peak bone mass accretion in adolescence	Heather Greenfield Department of Animal Science, University of Sydney, Sydney, Australia
33	2002 / Determinants of nutrition-related rickets in Chinese children and associated health outcomes	Mark Strand Health and Behavioral Sciences, University of Colorado, Denver, CO, USA
34	2003 / Heritability, nutrition and adolescent bone health	Ghada El-Hajj Fuleihan Medical Center, American University of Beirut, Lebanon
35	2004 / Effects of parathyroid hormone on bone metabolism in older people in China	Bo Zhou Nutrition and Food Hygiene Group, Shenyang Medical College, Shenyang, China

NUTRITION INTERVENTIONS

36	2002 / Impact of vegetable gardening, fishpond and animal husbandry on household food security and nutritional status in some communes in Midland Vietnam	Phan Van Huan Planning Department, National Institute of Nutrition, Hanoi, Vietnam
37	2003 / School-based nutrition intervention pilot program	Dien N Le Nutrition Center, Ho-Chi-Minh-City, Vietnam

EDUCATION

NUTRITION

OTHER RESEARCH PROJECTS

TITLE

PRINCIPAL INVESTIGATOR

38 2004 / Nutrition education program for pregnant women in Hunan Province

Qian Lin
Department of Nutrition Science, Xiangya Public Health School, Changsha, China

39 2004 / Genetic diversity and selection of cassava (Manihot esculenta Crantz) with high beta-carotene content using molecular markers

Claudia Fortes Ferreira
Embrapa Mandioca e Fruticultura, Cruz das Almas, Brazil

PUBLICATIONS

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Valeggia C, Ellison PT. Lactational amenorrhoea in well-nourished Toba women of Formosa, Argentina. J Biosoc Sci 2004;36:573-95.

Walker SP, Chang SM, Powell CA, Grantham-McGregor SM. Psychosocial intervention improves the development of term low-birth-weight infants. J Nutr 2004;134:1417-23.

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The publications are available free of charge upon request .

PUBLICATIONS

The Foundation

Origin and nature

The Nestlé Foundation for the Study of Problems of Nutrition in the World was established in 1966 by a donation of the Nestlé Company on the occasion of its centenary. The Foundation was self-constituting and formed a council consisting of five internationally well-known Council Members. The Foundation is financially and operationally independent of the Nestlé Company. The offices of the Nestlé Foundation are in Lausanne, Switzerland.

Purpose

The Nestlé Foundation initiates and supports research in human nutrition with public health relevance in IDA-eligible countries (IDA = International Development Association, see also http://www.worldbank.org). The results of the research projects should provide a basis for implementation which will lead to sustainable effects in the studied populations as well as in the population at large.
The Foundation expects research proposals to be primarily the initiative of local researchers from the developing countries.

Current policy

Sustainable improvement in human nutrition is one of the major issues in the portfolio of the Foundation. During more than 30 years basic and applied research in nutrition has been supported by the Foundation in more than 40 developing countries. In view of the past activities of the Foundation as well as the world's situation at the turn of the millennium, it was recognized that the public health relevance of the supported research as well as aspects of sustainability and educational issues should have a higher priority. Thus, priority is given to projects which lead to sustainable developments, and the implementation of the results of a research project should be immediate as well as sustainable. Highly sophisticated nutrition research of mainly academic interest without public health relevance has lower priority for support.

At present the Foundation's work is primarily concerned with human nutrition research issues dealing with:

(1) nutrition education and health promotion

(2) maternal and child nutrition, including breastfeeding and complementary feeding

(3) macro- and micronutrient deficiencies and imbalances

(4) interactions between infection and nutrition.

Studies in other areas of human nutrition research might also be considered, as long as they are dealing with problems of malnutrition in eligible countries.

The precise priorities and goals of the Foundation are modified from time to time to meet emerging public health and nutritional needs in the developing world.

Funded projects are usually of one- to three-year duration. Projects with a high potential for effective and sustainable improvement of the nutritional status will be funded preferentially. The budget of the projects must be appropriate and has to be justified in detail.

One of the Foundation's main aims is the transfer of scientific and technological knowledge to eligible countries. In cases where Foundation-sponsored research projects are realized in collaboration with scientists at universities and research institutes in high-income countries, at least 80% of the budget has to be allocated in the low-income country.

Research grant applications from high-income countries can normally not be considered except under exceptional conditions.

The Foundation does not normally fund:

(1) projects with low public health relevance

(2) projects with doubtful sustainability

(3) projects lacking transfer of scientific, technical and educational knowledge, i.e. lacking a capacity-building component

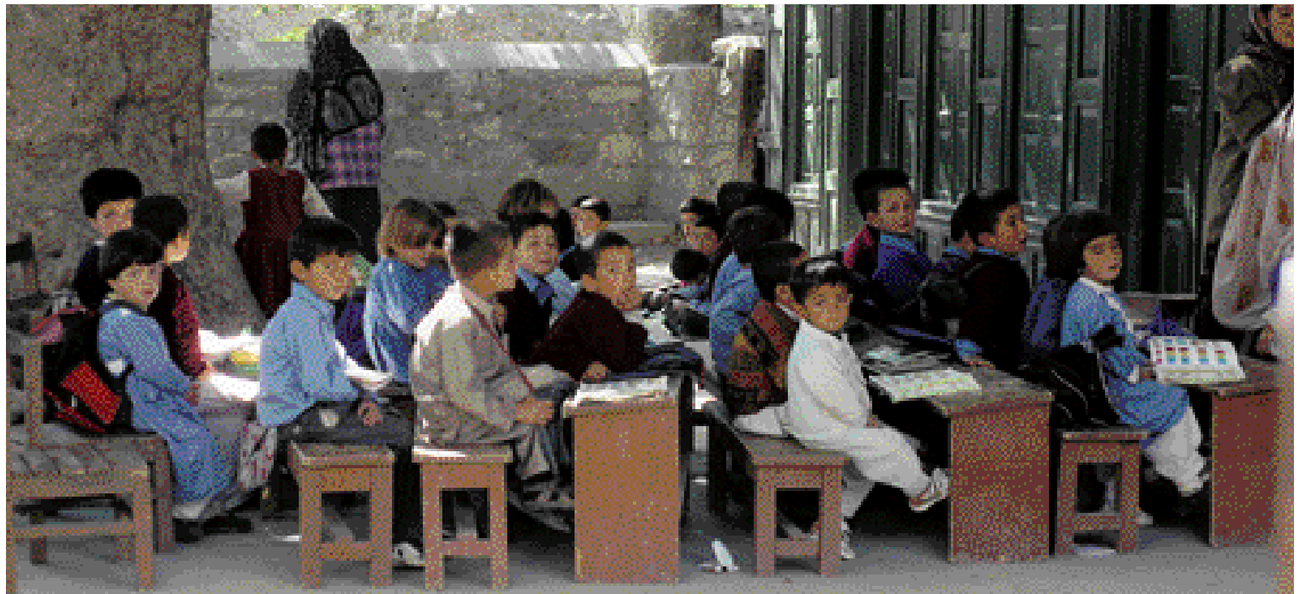
(4) very expensive projects

(5) nutrition surveys

(6) research on food policy, food production and food technology except when linked to an intervention with high potential for sustainable improvement of the nutritional status

(7) in vitro and/or animal experiments.

Although obesity and related diseases are of emerging importance in several IDA countries, the Foundation does not generally support projects in this specific area unless the protocol is innovative and exceptionally well justified.



How to apply

Interested scientists should first submit a letter of intent in which they describe very briefly the kind of project they would like to undertake, including an estimated budget. Instructions for the letter of intent are available on the Foundation website at **www.nestlefoundation.org**. For a submission of a letter of intent only the downloadable form should be used. If the suggested project is compatible with the Foundation's current funding policy, applicants will receive an invitation to submit a full grant proposal. The guidelines as well as a downloadable form for the submission of a full grant proposal are also available on our website. Other formats will not be accepted, neither for the letter of intent nor for the full grant application.

In the letter of intent and in the grant application, detailed, evidence-based information about the public health relevance of the project as well as its immediate impact and sustainability have to be reported. This part of the application is as important as the scientific section of the application.

Research grant applications are evaluated twice a year by the Foundation's Council, a group of independent international scientists. The funding of projects is primarily based on the scientific quality, public health relevance in the short and long term, sustainability, capacity-building component and, last but not least, budget considerations.

Applications are accepted all year, and the Foundation encourages applicants to submit their proposals early to allow sufficient time for internal as well as external reviews. All submissions should be made electronically by e-mail. Final deadlines for submission are January 10 and May 10 for the Spring and Fall meeting respectively.

www.nestlefoundation.org

The Council of the Foundation consists of Council Members and Advisors. All are internationally well-known scientists with a specific expertise in different fields of nutrition. The Council is self-constituting and operates independently.
The Foundation is directed by the Director and the President of the Foundation.

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Photo:

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Concept & Text: Paolo M. Suter

Design: Diane Constans-Marsens

Print: Imprimerie Marsens Lausanne