

Nestlé Foundation

for the study of problems of nutrition in the world



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REFERENCES AND CREDITS:

PAGE 2: Spirulina algae: Prof. Dr. H.R. Preisig, Botanical Garden & Institute of Systematic Botany, University Zürich, Switzerland. **PAGE 10-11:** VAD Map, with permission: Drs. M.Frigg & K. Kraemer, The Task Force SIGHT & LIFE, DSM, Basel (Switzerland). **PAGE 15:** 1. From Gutenberg to the Global Information Infrastructure. Christine L. Borgman. MIT Press 2003, Cambridge MA, USA. 2. Building a World Class Personal Library with Free Web Resources. Nicolas G. Tomaiuolo. Information Today Inc., Medford, NJ (USA), 2004. **PAGE 38-39:** 1. Widdowson EM. Proc Nut Soc 1962;21:121-8. 2. Ravussin E et al. N Engl J Med 1988;318:467-472. 3. Sims EAH et al. Recent Progress Hormone Research 1973;29:457-496. 4. Minghelli G et al. Am J Clin Nutr 1990;51:563-570. 5. Minghelli G et al. Am J Clin Nutr 1991;53:14-20. 6. Ravussin E et al. Am J Physiol 1985;249: E470-477. **PAGE 42-43:** 1. McDade TW et al. Am J Clin Nutr 2001;74:543-548. 2. Moore SE et al. Am J Clin Nutr 2004; 80:453-459. 3. Barreto ML et al. J Infect Dis 2000;182:1800-1803. 4. Elliott AM et al. Lancet 1999;354:1000-1001. 5. Berclaz PY et al. Pediatr Res 1996;39:401-409. 6. Shetty PS & Shetty N. Parasitology 1993;107 Suppl:S159-S167. 7. Desjeux JF & Ramakrishna BS. Annual Report 1996 Nestlé Foundation 1997;75-100. 8. Ramakrishna BS et al. N Engl J Med 2000;342:308-313. 9. West KP, Jr. Food Nutr Bull 2003;24(4 Suppl):S78-S90. 10. Manary MJ et al. Am J Clin Nutr 2002;75:1057-1061. 11. Paknawin-Mock J et al. Eur J Clin Nutr 2000;54 Suppl 2:S28-S42. 12. Pollitt E et al. Eur J Clin Nutr 2000;54 Suppl.2:S80-S90. 13. Pollitt E et al. Eur J Clin Nutr 2000;54 Suppl.2:S16-S20. 14. Pollitt E. Eur J Clin Nutr 2000;54 Suppl.2:S2-10. 15. Pollitt E. J Nutr 2000;130(2S Suppl):350S-353S. 16. Pollitt E. J Nutr 2001;131(2S-2):669S-675S. 17. Pollitt E et al. J Nutr 2002;132:2617-2625. 18. Gardner JM et al. Am J Clin Nutr 2005;82:399-405. 19. Walker SP et al. J Nutr 2004;134:1417-1423. **PAGE 46-47:** 1. Energy and protein requirements. Report of Joint FAO/WHO/UNU Expert Consultation. Technical Report Series 724, WHO, Geneva, 1985. 2. Human energy requirements. Report of the Joint FAO/WHO/UNU Expert Consultation. Food & Nutrition Technical Report Series 1. Food & Agricultural Organization, Rome, 2004. 3. Protein and amino acid requirements in human nutrition. Report of the Joint FAO/WHO/UNU Expert Consultation Technical Report Series. WHO, Geneva, 2006. 4. James WPT et al. Definition of chronic energy deficiency in adults. Report of a working party of the International Dietary Energy Consultative Group. Eur J Clin Nutr 1988;42: 969-81. **PAGE 50-51:** 1. Singh J et al. Br J Nutr 1989;62:31-329. 2. Pollitt E et al. Eur J Clin Nutr 2000;54 Suppl 2:S16-S20. 3. Shetty PS et al. Eur J Clin Nutr 1994;48:S28-S38. 4. Dietary Reference Intakes. Washington, DC: NAS, 2002. 5. Flatt JP. Obesity 2006;14:A65. 6. Flatt JP. Differences in basal energy expenditure, BMI and obesity. Obesity (submitted). 7. Flatt JP. Progr Obes Res 2003;9:713-717.

PHOTO:

Cover: Girl in front of a petroglyphe near Chilas in the Indus valley in Northern Pakistan - photograph by Paolo M. Suter

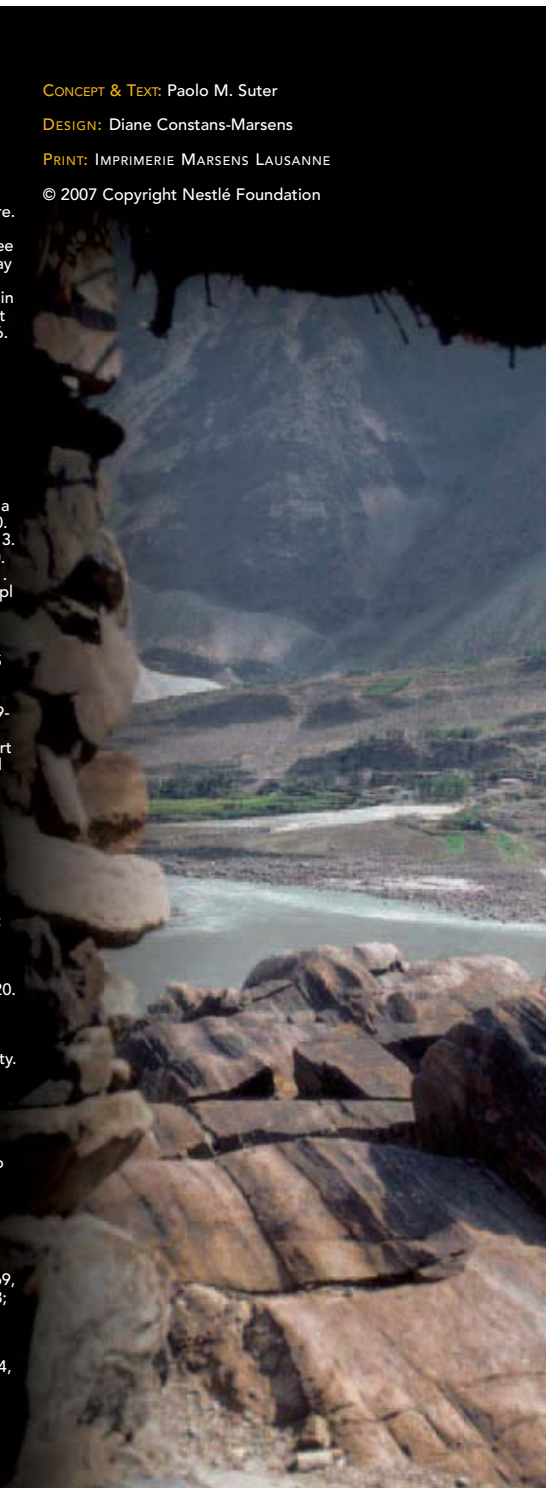
Spirulina algae (page 2 middle): Prof. Dr. HR Preisig, Botanical Garden & Institute of Systematic Botany, University of Zürich; Kaufmann Marcel / bmi-bild.ch: page 2 top/bottom, 6 top/bottom, 9 top/bottom, 17, 26/27, 29, 32/33, 34/35, 40, 42, 48, 50, 54, 61, 64, 67, 69, 73, 74/75; Notter Rolf / bmi-bild.ch: page 31, 59, 65, 68; Grüter Heinz / bmi-bild.ch: page 66; Hübscher-Jucker Bruno & Marianne / bmi-bild.ch: page 46; Christian Lattmann: page 30, 53, 57; Eric Jéquier: page 38, 44; Paolo M. Suter: inside front/back cover, page 4, 8, 11-14, 18-20, 22/23, 26, 28, 36, 37, 52, 70, 72.

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FOCUSED AND GLOBAL – THE FOUNDATION FOR THE STUDY OF THE PROBLEMS OF NUTRITION IN THE WORLD

HIGH IMPACT – RESEARCH PROJECTS TO REDUCE MALNUTRITION

INNOVATIVE – FOR SUCCESS

CAPACITY BUILDING – AS A BASIS FOR IMPROVEMENT

SUSTAINABILITY – A KEY MISSION

ENDURABLE NUTRITION – THE PRESCRIPTION FOR SUCCESS

PUBLIC HEALTH – ORIENTATED

THE FOUNDATION AT A GLANCE

EVIDENCE-BASED – PROACTIVITY

PARTNERSHIP – FOR LONG-TERM SUCCESS

enLINK-ing FOR A BETTER WORLD



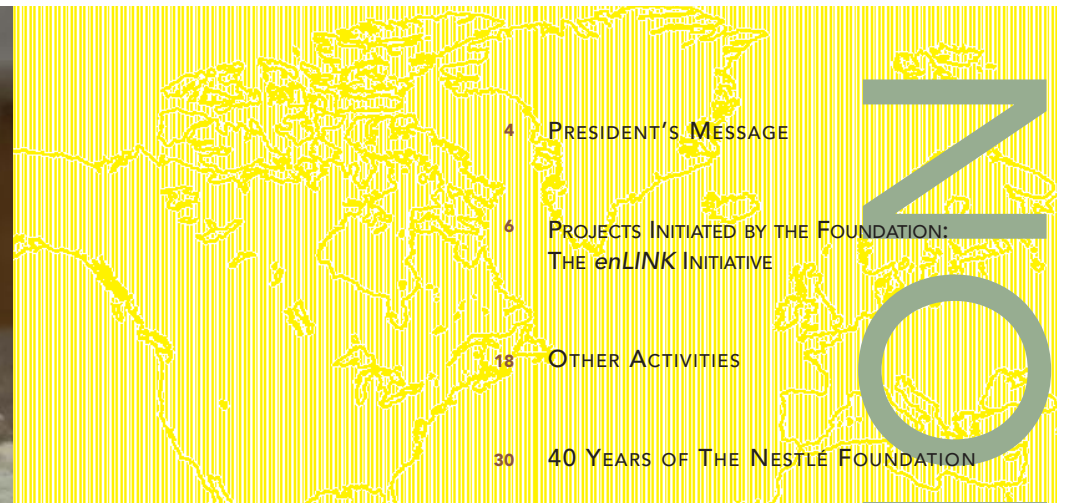
CAPACITY BUILDING



enLINK-ing FOR A BETTER WORLD



PUBLIC-HEALTH ORIENTATED



4 PRESIDENT'S MESSAGE

6 PROJECTS INITIATED BY THE FOUNDATION:
THE enLINK INITIATIVE

18 OTHER ACTIVITIES

30 40 YEARS OF THE NESTLE FOUNDATION

36 VISION 2005

52 CONGRATULATIONS

62 ONGOING PROJECTS

71 PUBLICATIONS

72 THE FOUNDATION

76 THE COUNCIL

NUTRITION



PRESIDENT'S MESSAGE

Created in 1966, the Nestlé Foundation celebrated its fortieth anniversary in 2006. This report presents some key achievements of the Foundation over the last twenty years. Whereas most research foundations deal with the financing of projects designed by scientists from developed countries, the Nestlé Foundation has a different policy, one based on the initiation and support of research in low-income countries.

One of the major achievements of the Foundation has been its contribution to the study of human energy requirements, with a particular emphasis on energy needs during pregnancy and lactation. The main results of these studies, summarized in this report, were published in the best scientific journals

and served as a basis for the recent recommendations of the experts' consultation on human energy requirements organised by the FAO/WHO/UNU. The purpose of the published document (2004) was to provide international agencies and their member countries with tools to assess the adequacy of food supplies and design adequate nutrition programmes to meet a population's nutritional needs. Since requirements for energy and protein are closely interrelated, the Foundation has also been instrumental in evaluating a considerable amount of new information on human protein needs that were published in supplements of the European Journal of Clinical Nutrition. These scientific data were also reviewed by the experts FAO/WHO/UNU experts'

consultation mentioned above.

Between 1986 and 1996, council members and experts initiated several research projects designed to assess the magnitude of adaptation of individuals who are subjected to seasonal conditions of low energy intake. In rural Gambia, for example, a shortage of food supply occurs each year at the beginning of the summer season. Using modern technologies, several studies were designed to assess the extent of the physiological variability in energy utilization. A summary of these investigations is presented in this report.

During the last ten years, the Foundation received many applications dealing with the problems of micronutrient deficiencies and the ways to prevent these disorders. Over half the world's population, mostly women, infants and children, suffer from micronutrient malnutrition, with the consequences of increased mortality and morbidity rates and altered cognitive ability in children. Large programmes of micronutrient supplementation for women and children aiming at improving their nutritional status have been implemented in many low-income countries with inconsistent results. Food fortification and supplementation programmes have often not proven to be effective or sustainable for several reasons. For example, these programmes are not linked to local agricultural production, which explains the lack of sustainability. In addition, the poor improvement in the nutritional status of infants and children often results from a lack of appetite due to infections and illnesses. As a consequence, the basic energy needs of infants and children are often not met.

Thirty years ago, protein deficiency was considered to be a key factor responsible for malnutrition in children in low-income countries. It was later demonstrated that a deficient energy intake was often the cause of this apparent protein deficiency and the term 'energy-protein malnutrition' was coined. Could this reasoning also apply to micronutrient deficiencies? To describe iron or zinc deficiencies, should we use the term 'energy-iron/zinc malnutrition'? One of our council members, Professor Gebre-Medhin, has originated this concept and he has recently challenged the current concepts and rationale supporting micronutrient interventions. Several recent studies have shown that individuals with signs of micronutrient deficiencies, such as children with iron deficiency anemia, often simultaneously suffer from a deficit in energy and protein intake. By contrast, children with adequate energy and protein intakes from the same diet had no anemia. The implication is that a diet containing maize, rice, wheat, pulses, fruits and certain vegetables may cover all micronutrients needs without any supplementation. These observations have far-reaching consequences

and may be the start at the origin of important changes in nutrition interventions in low-income countries, by promoting a food-based approach instead of the present policy of micronutrient supplementation or food fortification. For these reasons, the Nestlé Foundation favors a food-based approach, whenever it is possible.

An anniversary is an opportunity to assess whether our activities have been appreciated by the scientific community. We are happy to receive positive comments from renowned scientists all over the world, but we know that we can increase our modest contributions for improving nutrition in low-income countries. Our mandate is not to implement large programmes of nutrition intervention. As a scientific foundation, we aim at providing a sound scientific basis for public health interventions. An example is the emphasis on first meeting energy and protein requirements in any nutrition intervention, even if the goal is to correct micronutrient deficiencies.

This report describes the progress in the activities initiated by the Foundation. It is a pleasure for me to thank the Director, Professor Paolo Suter, who has been proactive and has greatly improved the visibility of the Foundation through these new achievements. I also thank Dr. Elisabeth Müller, Assistant to the Director, for her dedication to the many everyday tasks. My warm thanks go to the Council members, who play a crucial role in all our activities. It is a privilege to work with such colleagues and friends, and the Foundation benefits greatly from their unique expertise. I also express my gratitude to Mr. Peter Brabeck, the President and Chief Executive of the founding company, to Mr. Richard Laube, Director, and to Dr. Irène Cortésy for their personal interest and support.

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. The Foundation advances nutritional science both by supporting nutrition research projects in established institutes and universities and by giving focused support to existing nutrition schools and educational programs. To further fulfil the mandate of the Council and also encourage sustainable improvement in nutrition, a proactive strategic area of activities was introduced in 2003: **The enLINK Initiative**. This year the enLINK hard copy service has been added.

enLINK PROJECTS INITIATED BY THE FOUNDATION

THE enLINK INITIATIVE

- Vitamin A value of spirulina carotenoids in humans
- The enLINK micronutrient powder
- The enLINK digital library
- The enLINK hard copy service



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 members as well as the Foundation's past activities led to the creation of the **enLINK Initiative**, a project which illustrates the proactivity of the Foundation regarding 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 which address many levels, looking at the level of medical issues (such as infection) and hygiene (such as water quality), proposing changes at the level of agriculture as well as in the society at large, and, last but not least, working to improve the level of education and information.

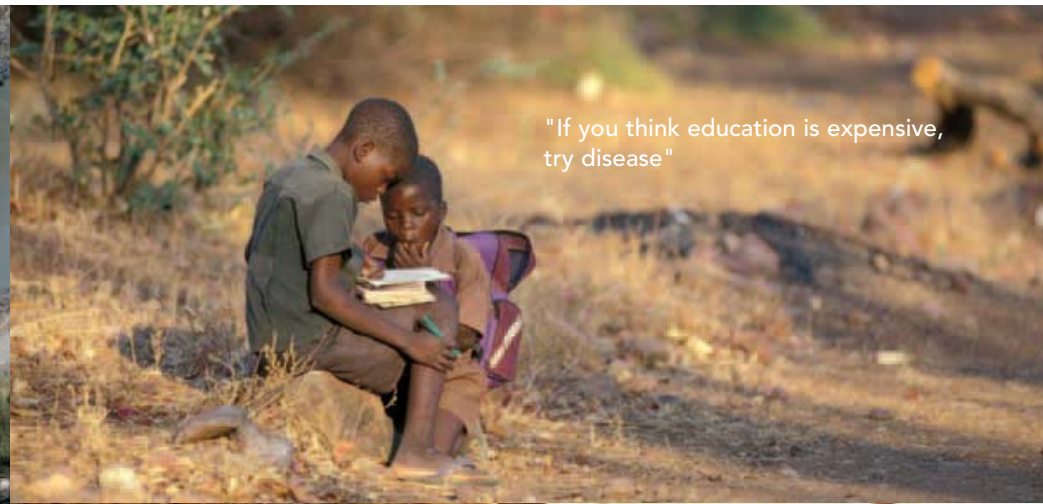
The enLINK Initiative has three main levels:

1. exploration in nutrition, which represents the research level
2. education in nutrition, targeting populations such as researchers, medical doctors, or health care workers, or the general population or specific population groups such as women
3. endurable nutrition

The elucidation of the bioavailability of provitamin A represents the first project in the exploration section of the **enLINK Initiative**. The **enLINK powder** is the first project of the endurable nutrition aspect of the initiative.

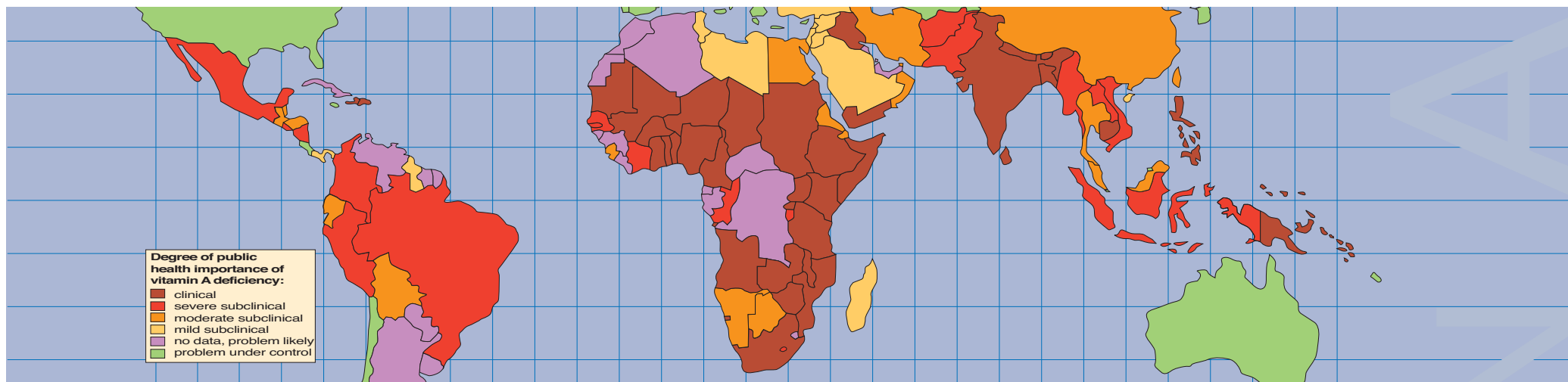
The **enLINK library** – the electronic nutrition library – represents the core component of the educational level of the initiative. Information access is the key issue in education and for any advancement. Despite the Internet, printed documents in the form of books and other publications remain the cornerstone for education and information transfer. This is especially true for low-income countries where Internet access is not yet fully developed or even completely lacking, making books and printed materials indispensable.

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 do in the future.



"If you think education is expensive, try disease"





VITAMIN A DEFICIENCY (VAD) - IS PROVITAMIN A FROM ALGAE THE SOLUTION?

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. Whenever possible, a food-based approach is the strategy favored by the Foundation.

The geographical distribution of vitamin A deficiency in the world parallels the ecological parameters of poverty and overall malnutrition. The key step and public health challenge in the solution to VAD is increasing the availability of affordable vitamin-A-rich or provitamin-A-rich foods. However, the content of vitamin A as well as of 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, an unicellular blue-green algae, has been identified and promoted in the past as a potentially important source of vitamin A and protein. Spirulina would represent an attractive partial solution to VAD.

The Foundation approaches the problems of vitamin A 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 by the Foundation (see opposite page).

A project initiated by the Foundation:

VITAMIN A VALUE OF SPIRULINA CAROTENOIDS IN HUMANS

Under the principal investigatorship of Guangwen Tang and colleagues (Jean Mayer, USDA Human Nutrition Center on Aging, Tufts University, Boston, USA), the vitamin A value (equivalence) of spirulina using intrinsically deuterium labelled spirulina and an isotope vitamin A reference dose in males ($n = 16$) has been determined. Deuterium labeled spirulina have been produced by culturing cells in a nutrient solution with heavy water (deuterium oxide). Two doses have been studied in Boston (5 g and 10 g). To test the effect of vitamin A status on the bioavailability of spirulina, Chinese adults with a borderline vitamin A status ($n=8$, with 10 g of spirulina) have also been studied.

The results, which will be presented for the first time at the Experimental Biology 2007 meeting (J. Wang et al), show that spirulina β -carotene can be converted to retinol efficiently in humans. As expected, the conversion ratio varied among individuals, but nevertheless in a range which shows that spirulina β -carotene could contribute considerably to the maintenance of an adequate vitamin A nutriture.

The results from this study are important 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 programmes. Based on the very promising results, a controlled intervention trial has been planned and will be carried out soon.

enLINK - RESEARCH





enLINK MICRONUTRIENT POWDER

The food-based approach of the Foundation to promote nutritional adequacy is well-known and widely respected. However, sometimes food is not enough. Often one encounters a setting where food is available but there is nevertheless an insufficient consumption of protein and energy and thus also of micronutrients, which in the long run will lead to malnutrition.

The enLINK initiative includes the concept of endurable nutrition, which corresponds to a liveable, supportable and, last but not least, sustainable intake of nutrients.

Following the saying 'Prevention is better than cure' the Foundation, in collaboration with the Nestlé Company, designed a micronutrient powder with a small amount of selected micronutrients for use as an addition to complementary food. The amount of micronutrients (vitamin A, iron, iodine, zinc, and vitamin C) in this preparation is considerably lower than the current RDA. The purpose of the preparation is twofold: it should both prevent micronutrient malnutrition and enhance the appetite, and thus increase the usual food intake by improving the taste of the food to which it is added.

Delivering some micronutrients and simultaneously increasing food intake by enhancing the appetite bears a high potential of 'double success' for improving energy and micronutrient nutriture.

A preliminary study to test the efficacy of this micronutrient preparation is being performed by a research group at the Aga Khan University in Karachi, Pakistan and will be finished in spring 2007. The results are awaited with interest by the research community.

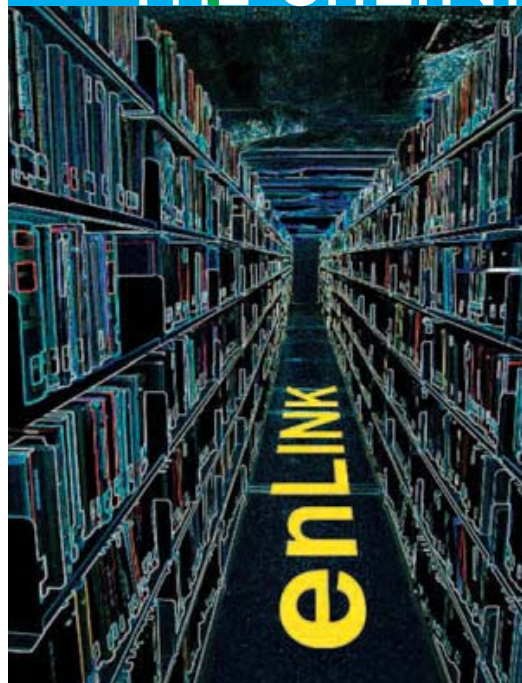




"Teachers die, but books live on."

Dutch proverb

THE enLINK LIBRARY



Without access to information there is no education. Three years ago the Foundation created the enLINK digital library of nutrition research, which is appreciated by users in more than 30 different low-income countries. This library is a concerted action between OVID Technologies, certain publishers and the Foundation.

For nutrition information the enLINK library is already an established and valued source of information. The enLINK library targets individual users and so far 70 registered users have access to this unique library.

Scientific nutrition journals primarily contain the latest studies and ongoing developments in the field of nutrition research, while the knowledge base of nutrition is summarized in different nutrition textbooks. Since spring 2006 the classic nutrition textbook *Modern Nutrition in Health and Disease* (edited by Maurice E. Shils) is available online for enLINK users.

enLINK statistics as of December 31, 2006:

- 70 users from 31 countries
- More than 25,000 page views per month
- More than 800 page views per day

THE enLINK LIBRARY: A HYBRID COLLECTION

Access to information in the context of digital libraries means computer connectivity. Yet in many low-income countries, computer connectivity is just being established or is still non-existent, making access to the enLINK library and other digital information resources often difficult or even impossible.

In addition, there are several reasons why the Internet cannot replace the conventional library. There are three major misconceptions about the use of the Internet as an information source: 1) all useful information exists on the Internet, 2) (useful and reliable) information is free of charge on the Internet, and last but not least, 3) the needed high-quality information can be found quickly on the Internet.

As in most academic libraries in the developed world, integrated access to hybrid collections of printed and electronic resources is at present the most powerful tool for education.

Based on the experiences from the first years of the enLINK digital library, the Foundation recognized that a well-chosen combination of printed and electronic media represents the future of nutrition and health information dissemination in low-income countries. Thus the enLINK library has become a virtual 'hybrid collection'.

To improve the performance of the enLINK library in the future, the Foundation will add paper-based information in the form of selected books and printed journals which will be offered to the libraries of selected institutes and medical faculties. The enLINK paper collection will include

nutrition textbooks and medical textbooks and will be implemented initially in several African countries. This activity will be accompanied by a critical evaluation of its short- and long-term impact. This will allow for the optimal future improvement and expansion of these educational efforts.

www.enlink.org



PRESENT KNOWLEDGE IN NUTRITION

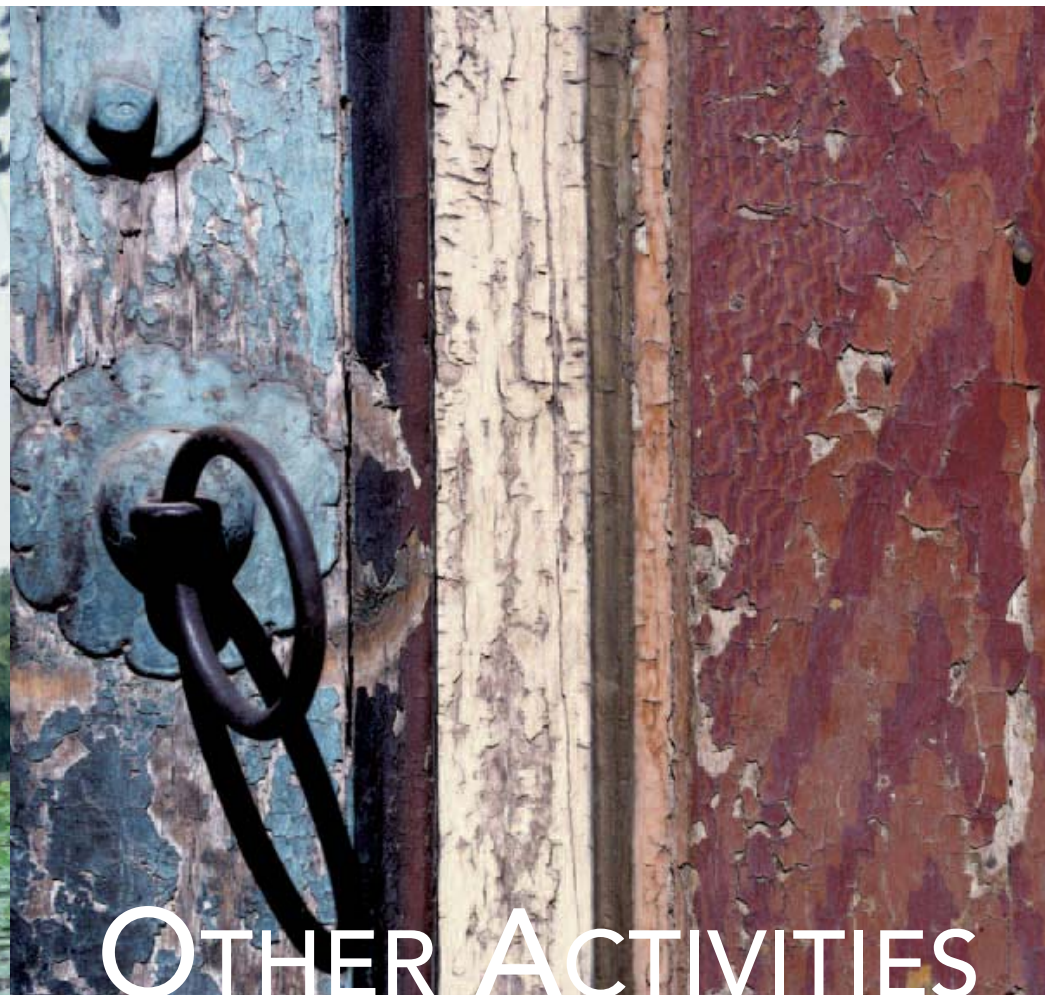
Where can I find and study the present knowledge in nutrition? This is a key question asked by hundreds of doctors, researchers, students and nurses in low-income countries every day.

'Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information on it.' This saying from Samuel Johnson illustrates nicely the capacity building activities of the Foundation. Present knowledge in nutrition can either be found in the enLINK digital library or in one of the leading textbooks about human nutrition, '*Present Knowledge in Nutrition*' (PKN).

As the first step in the enLINK hard copy service a concerted action between the Foundation and the International Life Science Institute (ILSI) in Washington, D.C. (USA) was initiated. '*Present Knowledge in Nutrition*' (8th edition, 2002) was shipped free of charge to interested individuals and institutions in low-income countries. ILSI donated the 8th edition of the book and the Foundation financed the shipment.

So far, a total of 2,461 volumes of '*Present Knowledge in Nutrition*' have been shipped for personal and institutional use to 36 countries.





OTHER ACTIVITIES

NEW RESEARCH PROJECTS

INSTITUTIONAL SUPPORT



CHILD DEVELOPMENT

EDUCATION

COMPLEMENTARY FEEDING

BREASTFEEDING

Promoting breastfeeding: a formative study among women and their husbands with infants aged 0 to 6 months in urban households

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University of Indonesia
Jakarta, Indonesia
USD 25,284

Breastfeeding is recognized to be important for both mother and child. Current recommendations on breastfeeding in Indonesia include 1) early initiation of breastfeeding (within 30 minutes after birth), 2) exclusive breastfeeding after birth until the age of 6 months, and 3) continued breastfeeding until the age of 2 years. However, practices are not always in accordance with the recommendations, because mothers are exposed to a range of factors that also affect the choices for child feeding. In Indonesia, current recommendations on breastfeeding are promoted publicly, and behaviour change communication (BCC) is one of the effective strategies for improving breastfeeding practice. BCC operates on the basis that new ideas, services, or products can best be introduced if the intended beneficiaries see them as fulfilling their own aspirations and well-being. As such, understanding the existing knowledge, perceptions, attitudes, and behaviour influencing breastfeeding practice is essential for BCC. Understanding that breastfeeding practice is influenced by many factors and that successful breastfeeding is enhanced through timely breastfeeding initiation, a formative study investigating determinant factors related to initiation and continuation of breastfeeding among potential beneficiaries such as nursing women and their husbands is important. Such a study is also designed to assess the existing communication problem, looking at knowledge, perceptions, attitudes, and practice as well as available potentials within the social network of the intended target audiences. With an understanding of the current practice and the barriers and potentials, existing communication resources as well as psychographic information of these target audiences will shape the breastfeeding promotion to be more evidence-based, which in turn is expected to make it more effective. This study aims at investigating the communication problem(s) related to initiation and continuation of breastfeeding among women and their husbands having infants aged 0 to 6 months in urban households.

MACRONUTRIENTS: OBESITY

Diet, physical activity or environmental change: what are the key factors underlying the emerging child obesity epidemic in Ho Chi Minh City, Vietnam?

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Professionals
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USD 100,000

Overweight and obese children and adolescents are becoming more prevalent in urban areas of Vietnam. Results of two recent cross-sectional studies showed that Ho Chi Minh City is in an early 'nutrition transition' where both malnutrition and an emerging problem with obesity can be found in adolescents. From 2002 to 2004 there was an increase in the prevalence of overweight and obesity from 5.0% and 0.8% in 2002 to 11.7% and 2.0% in 2004, respectively. In the context of the rapidly changing physical and social environments in Vietnam, this study aims to assess how changes in home, neighbourhood and school micro-environments are impacting on diets and physical activity behaviours and indicators of adiposity in an ongoing cohort of adolescents in urban areas of Ho Chi Minh City. The cohort will be followed up until they reach the end of junior high school. This study will identify micro-environmental risk factors in homes, schools, and local neighbourhoods, as well as the physical activity and diet behaviours of the children that are key risk factors for overweight/obesity in adolescents. The results will aid in understanding which factors are changing most rapidly, and which are the most important risk factors for overweight and obesity, thus providing an evidence base for developing preventive interventions in the future.

MICRONUTRIENTS

Assessment of iron status of children in rural communities in Abia State, Nigeria

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Umudike, Nigeria
USD 30,834

Anaemia affects all segments of the population but the incidence is highest among infants, pre-school children, school age children, pregnant and lactating women. In Nigeria and in fact in many developing countries, iron deficiency and anaemia can be precipitated by infections and infestations by malaria parasites, helminthes and other organisms. Iron deficiency and anaemia can be prevented, controlled or eradicated by appropriate measures. Such measures include food based approaches (intake of adequate amount of protein and energy), control of infections and infestations. This research is targeted at the children of 7 yrs to 12 yrs being among the most vulnerable groups to iron deficiency and anaemia. Iron status will be determined using the haemoglobin of the blood and serum ferritin levels which will be collected from subjects. Different anthropometric data will be monitored. Infection control will be implemented. Food or dietary intake of the subjects will be determined to find out if iron deficiency is due to poor dietary intake.

Improving iron status of women of reproductive age and preschool children in rural communities of Sokoto State, Nigeria

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Usmanu Danfodiyo University
Sokoto, Nigeria
USD 20,000

The principal goal of the project is to reduce the incidence of Iron Deficiency Anaemia (IDA) in the rural communities of Sokoto State, Nigeria, through educational strategies to increase iron intake by dietary diversification and control of infectious diseases (mainly hookworm and malaria). For this purpose multidimensional guidelines for the control of IDA will be worked out, based on the international recommendations but adapted according to the local needs as well as to local food and medical conditions. These guidelines will be summarized in a small educational booklet for health care workers. In a workshop, health care workers will be able to learn the ideal strategies for their work. In addition, a small local campaign will be organized to raise awareness and facilitate the efforts of the health care workers.

CHILD DEVELOPMENT

Effect of psychosocial stimulation on development of iron-deficient anaemic infants: a randomized controlled trial

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ICDDR, B
Centre for Health and Population Research (ICDDR, B)
Dhaka, Bangladesh
USD 130,235

In developing countries, poor nutrition, high morbidity, poverty and poor parental education and stimulation in the home all detrimentally affect children's development. These conditions frequently occur together, increasing the risk of poor development. Iron deficiency anaemia (IDA) affects large numbers of young children and is associated with poor child development. There is some question as to whether infants with IDA can catch up in mental development to non-IDA infants. This study examines the effect of psychosocial stimulation on IDA children's growth and development using a randomized controlled trial, and compares them with non-anaemic children. The study will be located in poor villages accessible to Dhaka. Children aged 6 to 9 months with IDA (haemoglobin (Hb) 80.0-109 g/L, ferritin <12micro g/L) will be identified by survey and randomly assigned to 2 groups: stimulation (n=100), and no-stimulation (n=100). A group of 100 non-anaemic infants (Hb>109 g/L) matched to each non-stimulated IDA infant will also be enrolled. Intervention will include weekly home visits for 9 months by a play leader, who will demonstrate playing with homemade toys and teach the mothers about child development. All IDA children will be given 30 mg ferrous-sulphate daily for 6 months. At the beginning and end of the study, the following measurements will be made: Bayley Scales of Infant Development (mental and motor indices), Wolke's behaviour ratings, Hb, serum ferritin, anthropometry, home stimulation, and mothers' knowledge and practices of child development. Stool microscopy, urinary iodine, dietary history, perinatal history and socioeconomic conditions will be assessed at the beginning and children's language development at the end. The treatment effect will be examined by intention to treat analyses using multiple regression of the outcome variables controlling for initial measures. The findings of this project will have implications for international and national policies on early childhood development programs for IDA children.

EDUCATION

Medical & Nutrition Education Program (SMNEP): A contribution to the reduction of malnutrition and improvement of health. A pilot study. (A project of the enLINK initiative)

Mohamed Ag Ayoya
Malian Center for Medical Research
Bamako, Mali
USD 26,355

The lack of information access, and hence the lack of education, is one of the root causes of malnutrition in many developing countries. The easiest and most cost-efficient strategy to reach a large fraction of a population is by means of modern communication technology, such as radio and TV technology. Radio broadcasting remains the cheapest way for information transfer in many areas of the world.

In this pilot study, we propose a project for satellite radio-based nutrition education for medical doctors (MDs) because training MDs in nutrition changes their counselling skills and their behaviours. It therefore improves their patients' /audience's knowledge acquisition and hence likely their nutritional status. The hypothesis to be tested in this phase is that the nutritional knowledge of MDs (general practitioners and internists) in Mali will be improved by a satellite radio-based educational course. SMNEP is also expected to be extended to different health professionals, teachers, and finally to the public in the future.

This is an intervention study with a control group. Participants will be conveniently selected in one health district. The programmes will be developed using vitamin A deficiency as the main topic because it is relevant to the Malian population.

In addition to its public health relevance, individual and institutional development, and capacity building components, this project has a high potential to be a pacemaker in fighting vitamin A deficiency through adequate education.

Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand

Rhona M. Hanning & Suttalak Smitasiri
University of Waterloo, Department of Health Studies and Gerontology, Waterloo, Ontario, Canada and Institute of Nutrition, Mahidol University, Nakhon Pathom, Thailand
USD 100,000

The main objective of this programme is to build capacity for chronic disease prevention in Thailand through application of learning technologies in the nutrition education, support and accreditation of lay health care workers (LHCWs). Specifically, a computer-based programme for type 2 diabetes prevention will be developed and tested. Through this project a template for a computer-based diabetes prevention education/support programme will be developed and modified based on extensive input from key stakeholders. The process and outcomes of implementing the 4-month programme will be tested. The effects of the programme on the knowledge and practices of LHCWs will be assessed and compared between ten randomly allocated intervention and ten control communities at baseline, end of programme (4 months) and following a 6-month community implementation phase. Thirty to fifty local LHCWs will be trained in the diabetes prevention programme. An inventory of community interventions will be made as part of the process evaluation. The awareness of key messages regarding diet, physical activity, smoking and diabetes of the at-risk population will be assessed and compared in intervention and control communities, both pre-programme and post-community implementation phase. Prevention of chronic diseases and associated risk factors should be enhanced.

COMPLEMENTARY FEEDING

Complementary feeding-based approach to alleviate linear growth retardation and nutrient deficiencies in infants aged 6 to 12 months in the south of Benin (Step I)

Romain Dossa & Waliou B. A. Amoussa
Faculty of Agricultural Sciences
University of Abomey-Calavi
Cotonou, Republic of Benin
USD 10,000

Growth is one of the best indicators of the nutritional status of children. In Benin the prevalence of stunted growth varies from 21% to 36% through departments. In most rural areas of Benin, feeding of infants aged 6 to 24 months is associated with low energy, protein and micronutrient intake. The main traditional complementary food given to infants in the south of Benin is fermented cereal porridge, based on maize only. This study intends to improve the quality of complementary food in rural areas by a food-based approach with maize, groundnuts and beans as ingredients. These crops are available inexpensively in rural areas and, when well combined, can enhance the nutritional value of porridge. However, rural mothers are either not aware of this or do not know the proper combination of ingredients. An improved gruel will be developed, which will be about 70% maize, 25% groundnuts and 5% malted beans, and which aims to meet energy, protein and most other nutritional requirements. This study, the first part of a large research program, is concerned with household food-processing technologies with the aim of improving the nutritional quality, safety and acceptability of complementary foods. Maize and groundnuts will be roasted in order to increase organoleptic properties, safety and nutrient stability. Beans will be malted to obtain amylase-rich flour (ARF) to increase the energy density of the porridge. The addition of beans and groundnuts to maize is also expected to increase the energy, protein and nutritional content of the new porridge. In step I of this project an appropriate maize-groundnut-ARF based complementary food capable of improving the growth of infants 6 to 24 months old will be developed, and the state of the mothers' feeding knowledge, attitude and practices (KAP) will be evaluated.

Efficacy of multiple-micronutrient supplementation on anaemia in rural Burkinabe children aged 6 to 23 months

Hermann Ouedraogo
Institut de Recherche en Sciences de la Santé
Ouagadougou, Burkina Faso
USD 50,498

Micronutrient deficiencies are common in children in developing countries, leading to impaired development. In the rural district of Kongoussi, anaemia affects more than 99% of young children, and coexists with other micronutrient deficiencies. Iron supplementation is efficacious in reducing anaemia. However, supplementation with iron alone might be insufficient to control anaemia, because of limiting effects of protein-energy malnutrition and other micronutrient deficiencies. Studies on multiple-micronutrient supplementation showed positive results regarding the improvement of haemoglobin and micronutrient status. However, full control of anaemia was not achieved. It has been suggested that dosages of micronutrients such as iron and zinc should be increased, and that other causes of anaemia such as malaria should be taken into account. This double-blind randomised controlled study assesses the impact of multiple-micronutrient supplementation on anaemia in young children of a malaria-endemic, underprivileged area. One-hundred-twenty-six children ranging in age from 6 to 23 months will receive a multiple-micronutrient alone or in combination with a locally produced protein-energy-rich gruel. All will receive treatment for associated infections (mainly hookworm and malaria). It is hypothesized that adequate protein and energy will be as important for anaemia control and growth as the multi-micronutrient supplement.



INSTITUTIONAL SUPPORT

SENEGAL

Since 1997 a DEA (Diplôme d'Etudes Approfondies) in Nutrition, equivalent to a Master of Science in Nutrition, has been offered at the Nutrition Unit of the Faculty of Sciences of the University Cheikh Anta Diop in Dakar, Senegal. This programme is supported with an institutional grant by the Foundation. This programme in Senegal, the second French-language nutrition programme in Africa, is headed by Prof. Salimata Wade. During the last year very promising projects have been started which may lead to the creation of a sustainable centre of excellence in nutritional sciences in this part of Africa.

AFRICAN NUTRITION LEADERSHIP PROGRAMME

The African Nutrition Leadership Programme (ANLP) is a leadership development and networking seminar in the field of human nutrition in Africa. The ANLP concept is based on activities initiated by the Food and Nutrition Programme of the United Nations University (UNU-FNP) and the International Union of Nutrition Sciences (IUNS). Every year a one-week leadership programme is held at the University of Potchefstroom, South Africa. The Foundation supports this programme and yearly event with an annual contribution of USD 9,600.

AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT

Local dissemination of nutrition knowledge is of great importance. There are only a few nutrition journals on the African continent, one of them being the African Journal of Food, Agriculture, Nutrition and Development (AJFAND) (see also <http://www.ajfand.net>). Hon. Prof. Ruth Oniang'o, Editor-in-Chief, thinks that there is hope for Africa. Despite the grim television pictures of starvation and human suffering, there is tremendous hope for a continent whose people are its greatest resource. The AJFAND is meant to create awareness of the multiplicity of challenges facing Africa that lead to abject poverty and destitution. The Foundation is supporting this important effort with a contribution of USD 2,000 for each journal issue. Due to the high printing cost, the journal is no longer available in a printed version but only as a web-based publication. Yet despite only being available in digital form, the AJFAND is widely appreciated and is continuously improving.



A STORY OF OPTIMAL CAPACITY BUILDING

The problems of malnutrition and health are complex and can only be solved by multidisciplinary approaches. Similarly, nutrition research is becoming more complex and time consuming and usually larger research teams or groups work closely together. In 2003 the Foundation granted support for a doctoral research project entitled 'Evaluation of valid biomarkers to distinguish between iron deficiency anaemia and anaemia of inflammation in areas of high rates of parasite infestation and nutritional deficiencies' to Dr. Mohamed Ag Ayoya from Mali (Malian Center for Medical Research). As a 'side product' – also supported by the Nestlé Foundation – of the support to Dr. Ag Ayoya, two young Malian students who assisted in the study were able to write their doctoral theses in medicine and in pharmacy. Two others are finishing up their doctoral work. The work and strategy of the Malian researchers show that a team approach and mutual assistance will enhance local capacity building. Often aspects of local mutual capacity building is forgotten – the example of Dr. Keita and Dr. Koné (and soon Dr. Touré and Dr. Sangaré) underlines the importance of local and regional capacity building. Thinking and acting globally is a fashionable goal but rarely a realistic and effective one. The strategy chosen by the Malian researchers and funded by the Nestlé Foundation is a good example of how local capacity building can have a sustainable high impact.

EFFICACY OF IRON SUPPLEMENTATION AMONG ANAEMIC SCHOOL CHILDREN WITH HAEMOGLOBINOPATHIES S AND C IN MALI

Sadio Keita, MD

In Mali the high prevalence and the association of anaemia and haemoglobinopathies constitute real problems of public health. The study was a longitudinal randomised single-blinded trial, the objective of which was to evaluate the efficacy of iron supplementation among anaemic school children with haemoglobinopathies S and C. A total of 246 children were included and treated for 3 months. Hemoglobin was assessed at inclusion and at 45 and 90 days of the intervention. The results showed a reduction in anaemia among all children. However, the response to iron treatment was better among AA and AC groups than among children with haemoglobinopathy AS. In conclusion, anaemic children with haemoglobinopathies can benefit from iron supplements. Nonetheless, it is necessary to understand the reasons for a lower response among subjects with AS.

URINARY SCHISTOSOMIASIS AND IRON DEFICIENCY ANAEMIA IN SCHOOL CHILDREN IN BAMAKO

Kadiatou Mahamady Kone, PharmD

In Mali, the high prevalence of urinary schistosomiasis and iron deficiency anaemia among school-aged children justifies appropriate interventions. The objective of this study was to assess the association between Schistosoma haematobium and iron deficiency among school children in Bamako, and the efficacy of daily iron supplementation in reducing this anaemia. Children (n=244) aged from 7 to 12 years were randomly assigned to receive praziquantel with and without iron. Haemoglobin and serum ferritin concentrations were measured at baseline (day 0), and at day 45 and day 90 of the intervention. At baseline, the prevalences of anaemia and iron deficiency anaemia were 72 and 17.2%, respectively. Iron supplementation (60 mg of elemental iron) given 5 days a week during 3 months significantly improved ($P < 0.001$) children's haemoglobin and iron stores at day 90. In countries where iron deficiency anaemia and Schistosoma haematobium are prevalent and often coexist, daily iron supplementation for 3 months and control of parasites should be recommended for school-aged children who are anaemic.





40 YEARS OF THE NESTLÉ FOUNDATION

Activities on 5 continents

Research in more than 50 countries

**An investment of over 50 million USD
for research and fellowships**

Over 250 research projects

Basis for 450 research publications

**Support for over 120 Master of Science
and Ph.D. degrees in nutrition**

ANGOLA
 ARGENTINIA
 BANGLADESH
 BENIN
 BRAZIL
 BURKINA FASO
 CAMEROON
 CHILE
 CHINA
 COLUMBIA
 CONGO
 COSTA RICA
 EL SALVADOR



SMALL FOUNDATION - BIG ACHIEVEMENTS

40 YEARS OF THE NESTLÉ FOUNDATION

In 2006 the Nestlé Foundation celebrated its 40th anniversary. As with every anniversary it is a time to make a strategic review – to have a look into the past and, more importantly, envision activities for the future.

The 40th anniversary takes place in a very dynamic period of history and politics but also of nutrition and science. Genomics, proteomics, metabolomics and many other new areas of research are worldwide priorities – basic nutrition research for the sustainable elimination of malnutrition is often no longer regarded as an adequate aim for research in the academic setting. Yet still in the year 2006 nutrient deficiencies can be eliminated by food only if a sustainable agriculture is locally available.

All aspects of life have been globalised and interdependence has reached an unseen level. This interdependence has created common advantages and common disadvantages. Also diseases, especially lifestyle-related chronic diseases, are emerging more and more frequently in low-income countries, contributing to the significant morbidity and mortality. In a world of affluence and diseases of affluence, the classic deficiency diseases and classic malnutrition nonetheless remain widespread and yet are in danger of being easily forgotten. As in the past, the Foundation will continue to focus

on the latter central aspects. Over the years, the Foundation has adapted to new needs and objectives, while not getting lost in academic ivory tower research. Focusing on adequate intakes of micronutrients, protein and energy was and will remain a central endeavour of the Foundation, along with the promotion of a food-based approach as the ultimate goal to fight malnutrition in a sustainable way. A major concern of the Foundation is the implementation of new scientific nutrition knowledge at the population level in order to improve the nutritional status of children and women of low socio-economic classes.

ETHIOPIA
 GHANA
 GUATEMALA
 GUINEA
 HONDURAS
 INDIA
 INDONESIA
 IVORY COAST
 JAMAICA
 JORDAN
 KENYA
 LEBANON
 MALAYSIA

MALI

MAROCCO

MEXICO

MOZAMBIQUE

NEPAL

NICARAGUA

NIGERIA

NORTH KOREA

PAKISTAN

PANAMA

PERU

RWANDA

SENEGAL

SOUTH AFRICA



40 years of capacity building in nutrition research for the sustainable improvement of nutrition in low-income countries:

At the occasion of the general assembly of the Nestlé Company on May 6th 1966, in honour of the centenary of the Nestlé Company, the decision was made to constitute a Foundation. The legal constitution of the Foundation took place on July 17th 1967 and on September 1st the Foundation officially started its work, in its offices in Lausanne. The Foundation was self-constituting and independently formed a Council consisting of five internationally well-known scientists as Council Members. The first President of the Foundation was Prof. Alexandre von Muralt of the University of Bern (Switzerland). Other Presidents, Council Members and Advisors followed, and all assisted in a sustainable implementation of the portfolio and the mandate of the Foundation. From the very first day the Foundation was financially and operationally independent from the founding company.

During the past 40 years the Foundation has become a widely recognized organization and an indispensable and highly respected institution for the promotion of nutrition research and nutrition education in low-income countries. The Foundation has contributed with innumerable studies to the knowledge base for the reduction of malnutrition. The results of many research projects which have been supported and in part also initiated by the Foundation provided a basis for implementation at the local, national and also international levels. Looking at the activities and achievements of the Foundation it can be easily recognized that the Foundation is a key institution for the study of the problems of nutrition in the world.

SRI LANKA

SUDAN

TANZANIA

THAILAND

THE GAMBIA

TUNESIA

UGANDA

UZBEKISTAN

VIETNAM

WEST INDIES

ZAIRE

ZAMBIA

ZIMBABWE



Vision 2006 reviews the most important activities of the Foundation during the last 40 years. These activities illustrate the evidence for the need to link different disciplines to control malnutrition. The Foundation favoured and stressed during all the years - and against all fashion trends - a food-based approach. There are many fields in which the Foundation supported and initiated research. Nevertheless the major activities can be grouped into five categories, which are briefly summarized by our Council members:

- Energy Metabolism
- Child Nutrition and Health
- Micronutrients, Infection and Child Development
- Energy, Amino Acids and Protein
- Pregnancy and Lactation

In addition, two former Council members present their personal views on two different topics: Roger Whitehead (1968-2005) describes his view of the work of the Foundation in a changing world and J.P. Flatt (1990-2005) discusses an obvious but neglected aspect of the overweight and obesity pandemic. Our website (www.nestlefoundation.org) provides an almost complete list of publications resulting from the many supported research projects. Looking at this list one quickly realizes that most of the supported research was not 'l'art pour l'art', but that these research endeavours often led to a sustainable implementation and reduction of malnutrition.

40 YEARS OF
THE NESTLÉ FOUNDATION

1966-2006



VISION 2006

ENERGY METABOLISM

PREGNANCY AND LACTATION

MICRONUTRIENTS, INFECTION AND
CHILD DEVELOPMENT

CHILD NUTRITION AND HEALTH

ENERGY, AMINO ACIDS AND PROTEIN

MATCHING POLICIES TO NEED

ENERGY EXPENDITURE AND OBESITY



CAN HUMANS ADAPT TO LOW OR TO HIGH ENERGY INTAKE ?

Eric Jéquier
President Nestlé Foundation

Undernutrition and overnutrition are two public health problems that are responsible for a large burden of diseases. In developing countries, food insecurity, hunger and poor nutrition still affect over 800 million people, whereas energy excess, leading to positive energy balance, overweight and obesity, is a worldwide phenomenon affecting 1.2 billion people. Can humans adapt to low or to high energy intake to limit the negative effects on health of these environmental influences?

The concept of a variability in energy metabolism was proposed about 45 years ago to account for the

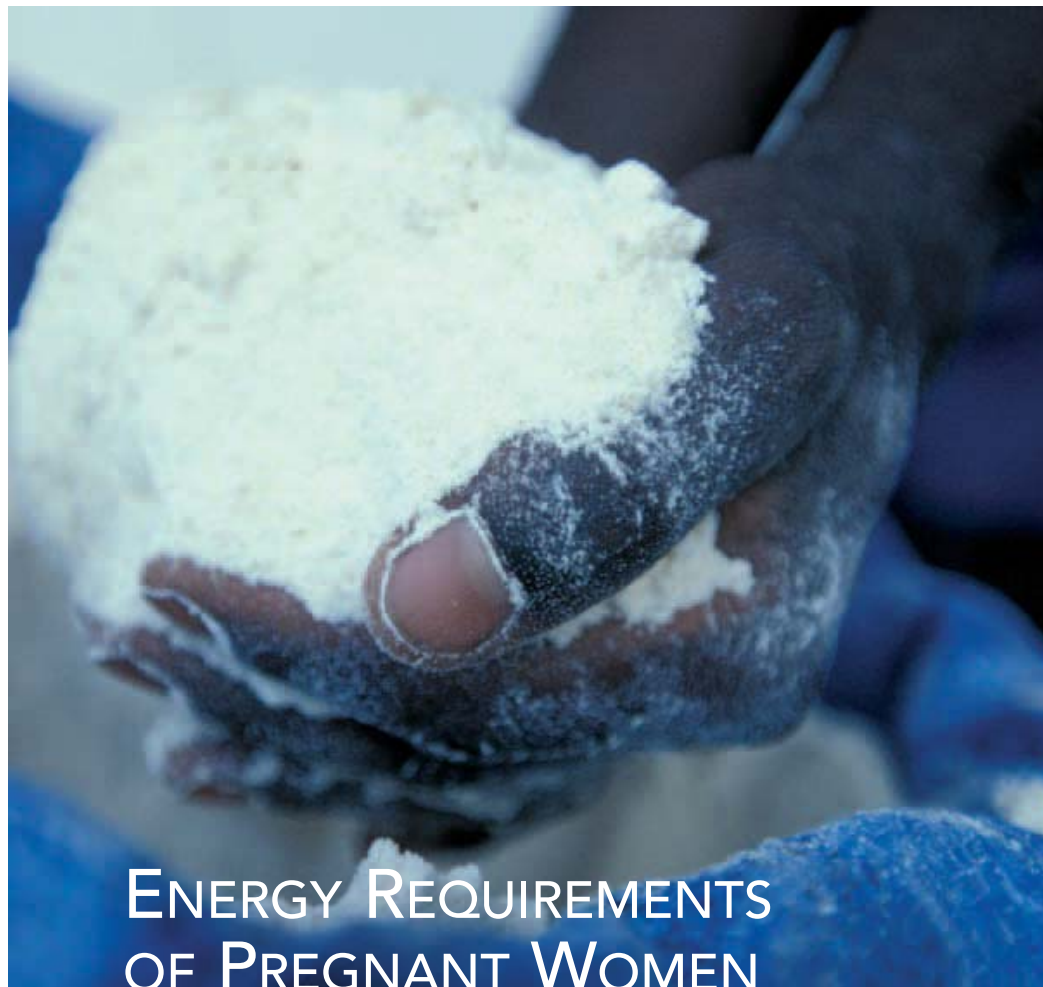
observation that energy intake can apparently vary as much as twofold without influencing body weight or body composition in adult individuals¹. The question was also asked whether an insufficient adaptation to low energy intake could explain why some individuals are prone to become malnourished. A similar reasoning was proposed for the development of obesity: a low resting metabolic rate and a blunted dietary induced-thermogenesis (the increase in energy expenditure following meal ingestion) were described as risk factors for overweight and obesity². By contrast, individuals submitted to a prolonged experimental overfeeding

regimen were shown to exhibit a lower weight gain than that predicted by the cumulative daily positive energy balance, suggesting a mechanism of 'luxus consumption' by which a substantial fraction of the excess in energy intake could be dissipated as heat³. These individuals appeared to be 'resistant to the development of obesity' by a metabolic adaptation to the excessive energy intake.

The Nestlé Foundation has been proactive in this research area by initiating and supporting human studies. In several developing countries, seasonal variations in the habitual energy intakes of the population occur each year due to the decrease in the amount of food stores before the new crops can be harvested. During this 'hungry season', the body weight of adult individuals decreases by 2 to 4 kg, demonstrating a chronic negative energy balance. In order to assess the magnitude of a possible adaptation to the low energy intake during the 'hungry season', we carried out several investigations in a rural village of The Gambia, West Africa, by using a respiration chamber (an airtight room in which an individual can spend 24 hours). Free physical activity was allowed during the test except for periods of imposed exercise on a treadmill. The chamber was used to continuously calculate energy expenditure of the subject by measuring the individual's oxygen consumption and CO₂ production. The results of these studies clearly showed that changes in body composition are the main factors which explain a decrease of about 10% of energy expenditure during the 'hungry season' compared with the period when the subjects had regained the lost body weight⁴. The saving of energy during the 'hungry season' was mainly explained by the loss of metabolically active tissue (lean body mass which mainly consists in muscle tissue) as a result of the chronic negative energy balance⁴. This was further demonstrated by the finding that the saving of energy disappeared when body weight (and lean body mass) was fully recovered⁵. Our studies (and many others) do not confirm the existence of an enhanced metabolic efficiency in subjects living in environments that impose a chronic low daily energy intake. There is no evidence of a metabolic adaptation when energy intake is chronically restricted. As a practical result, the recommendations for energy requirements of adults in the developing countries must not be influenced by the unproven concept of metabolic adaptation. By contrast, behavioural adaptation in physical activity patterns can occur when energy intake is chronically restricted, with negative consequences on work output and socially desirable activities. These behavioural adaptations are undesirable, and energy requirements must cover the energy cost of these activities.

Similar to the lack of evidence for a metabolic adaptation to low energy intake, we found that the concept of 'luxus consumption', which was proposed to explain the variability in weight gain during experimental overfeeding conditions, was not supported by measurements of energy expenditure⁶. When all the components of the energy balance equation are carefully measured, there is no evidence for a change in metabolic efficiency during overfeeding.

In conclusion, the efficiency of metabolic processes is very stable in humans. Energy expenditure is little influenced by the level of energy intake. The small modifications in energy expenditure that are observed during under- or overfeeding are mainly explained by the changes in the mass of metabolically active tissues. In addition, changes in the energy cost of weight-bearing activities, such as walking uphill, can contribute to the changes of total energy expenditure during chronic under- or overfeeding. There are no mysterious energy-saving or energy-dissipating mechanisms in humans. These important scientific findings based on precise measurements of energy expenditure allow us to derive adequate recommendations for energy intake of individuals by taking into consideration their body size (and body composition) and their physical activity level. These data on energy expenditure contrast with the uncertain measurements of food and energy intakes which were at the origin of the erroneous concept of metabolic adaptation.



ENERGY REQUIREMENTS OF PREGNANT WOMEN

Joseph Hautvast, MD, PhD and
Joop van Raaij, PhD
Wageningen University, The Netherlands

A recent paper in The Lancet (30 September 2006) reports that overweight or obese women are at greater risk of major maternal and perinatal complications. The present pandemic of overweight and obesity obviously also affects pregnant women. It is therefore relevant to study the complex issue of energy balance in pregnancies of women living in today's obesogenic environment. However, relevant lessons might also be learned from a research effort from about 20 years ago, supported by the Nestlé Foundation.

The Foundation organized around 1980 a broad consultation on the issue of energy requirements in pregnancy. There was much conflicting evidence on maternal energy balances under various free-living situations. One of the main conclusions of that consultation was that there was a serious lack of comprehensive longitudinal data using uniform research methods on the various components of maternal energy balance. The Foundation consequently decided to design the most adequate multi-centre study possible, of course within a certain budgetary limit, under the leadership of

Professor John Durnin, then Foundation Advisor. Up to then the most relevant available data on energy requirements had been studied and compiled by Hytten and Leitch. They estimated the energy cost of pregnancy of Caucasian women to be 335 MJ, partly based upon the estimate for fat gain during pregnancy of 3.35 kg. What were the findings of the multi-centre studies initiated by the Foundation in the period 1980-1985?

Longitudinal studies during pregnancy were carried out in five countries, in women living under different social, environmental and economical circumstances: in Scotland, the Netherlands, the Gambia, Thailand and the Philippines. The research teams used similar measurement designs and were very well trained in using the same or very similar methodologies to study the various components of energy balance. The findings in Gambian women were quite exceptional when compared to the results from the other countries involved, but it was not clear whether this was caused by remarkable physiological adjustments or by methodological issues. In Scotland and the Netherlands women were recruited and studied before pregnancy started. In Thailand and the Philippines women could only be recruited from week 10-12 of pregnancy onwards. Main data collected in all countries include height, weight, skinfold thicknesses, energy intake, basal metabolic rate (BMR), daily activity pattern and birth weight and birth length.

The gain in fat mass during pregnancy brought a significantly different view compared to the estimate by Hytten and Leitch of 3.35 kg. This gain was substantially lower: about 2 kg in Scottish and Dutch women and about 1.5 kg in Thai and Philippine women. This finding consequently had a considerable impact on the calculation of the energy cost of pregnancy. Hytten and Leitch arrived at a figure of 335 MJ for the whole of pregnancy, and the Foundation studies, after standardization for maternal body weight, came to an average estimate of about 250 MJ. When expressed on a daily basis these figures are 1200 kJ and 900 kJ, respectively. The WHO stated that if pregnant mothers may reduce their physical activity, the average daily energy requirements might be lowered to 840 kJ and 600 kJ, respectively.

The next question was whether the extra energy costs of pregnancy would be accompanied by extra energy intake during pregnancy. The findings of the multi-centre studies did not confirm substantial increases in energy intake. Only a modest increase in energy intake of not more than, on average, 420 kJ per day was measured, which is substantially lower than current recommendations. There is no valid explanation for this discrepancy. It is

conceivable that the reduction in physical activity is higher than estimated or measured. Supplementary studies have shown that diet-induced thermogenesis and metabolic efficiency are not really adapted in pregnancy and therefore also cannot explain the observed discrepancy.

This paper started with a citation on the health consequences of overweight and obesity in pregnant women. What lesson can be learned from the still valid results of the Foundation studies carried out more than 20 years ago? The main lesson probably is that for a normal pregnancy the extra daily energy requirement is quite small, and that a pregnant woman living in an obesogenic environment should not be stimulated to eat more. It would be much better for more attention to be given to the quality of her daily diet rather than to quantity.

Main researchers at the various locations:

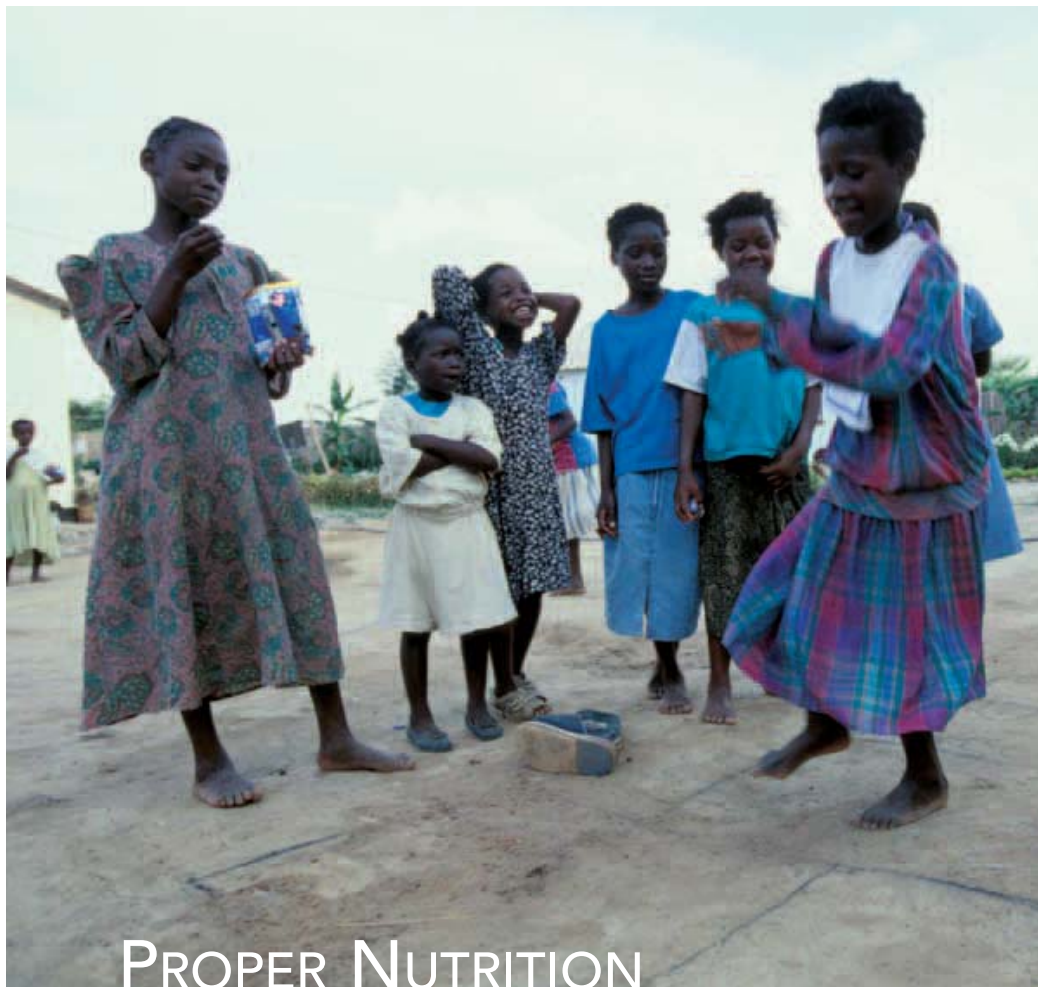
Glasgow: John Durnin, Fiona McKillop

Wageningen: Jo Hautvast, Joop van Raaij, Meta Peek, Susan Vermaat

Gambia: Roger Whitehead, Mark Lawrence

Thailand: Arie Valyasevi, Kallaya Kijboonchoo

Philippines: Cora Barba, Peachay Tuazon



PROPER NUTRITION

PROPER NUTRITION IS ESSENTIAL TO PREVENT INFECTIOUS DISEASES AND ALLOW FOR PSYCHO-SOCIAL DEVELOPMENT

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Conservatoire National des Arts et Métiers
Consultant in Paediatrics, Nutrition and
Gastroenterology
Member C, Académie Nationale de Médecine,
Paris, France

In addition to aiding growth, proper nutrition is essential to prevent infectious diseases and allow for psycho-social development. Specific nutrients may also be used for specific functions. Prenatal and postnatal undernutrition may have long-term consequences on health, including hypertension, coronary heart diseases and type 2 diabetes. The Nestlé Foundation supported studies in the Philippines and Pakistan which extended the concept of foetal and early infant programming by nutritional status to the immune system. Early nutrition has short-term consequences on infant growth; it may also have long-term consequences for immuno-competence and infectious diseases risk, including infectious diarrhoea^{1,2}. Immunisation is an essential way to reduce the risk of bacterial or

viral infection. In addition to tuberculosis, the BCG may also protect against intestinal parasitic infection, as indicated by studies in Brazil and Uganda^{3,4}. In turn, parasitic infection alters the nutritional status. In Gambian children suffering from an acute episode of malaria, the resting energy expenditure increased by 40%, and whole protein turnover by a factor of 2, compared to control values⁵. Malnutrition and parasitic infection are undoubtedly closely linked in adults as in the case of children in a community⁶.

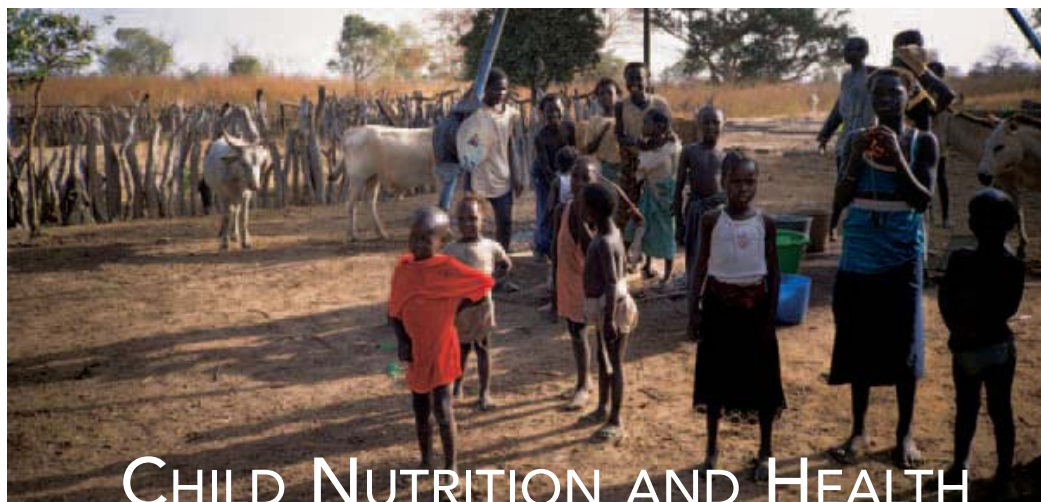
Specific nutrients may also help in the prevention and treatment of infectious diseases. This is the case for amylase-resistant starch in the treatment of infectious diarrhoea. Starch which is resistant to amylase is metabolised by the bacteria in the colon in the form of short chain fatty acids, and essentially plays in the colon the same role glucose does in the small intestine in stimulating water absorption⁷. The Nestlé Foundation supported a study showing that the addition of a resistant starch to oral rehydration solution reduced faecal fluid loss and shortened the duration of diarrhoea in Indian adolescents and adults with cholera⁸. There is an ongoing study in Bangladesh to see if the results could be extended to malnourished children and understand the mechanism of action.

Globally, 4.4 million preschool children have xerophthalmia and 6 million mothers suffer night blindness during pregnancy. Both conditions are associated with increased risk of morbidity and mortality. While reductions in child mortality from 19 to 54% following vitamin A treatment have been widely reported, more recent work suggests that dosing newborns with vitamin A may, in some settings, lower infant mortality⁹. Zinc is another specific nutrient that is now used to treat infectious diseases, including diarrhoea and infectious respiratory diseases. However the bioavailability of zinc from food may be reduced by the presence of dietary phytate. In a study conducted in Malawi and supported by the Nestlé Foundation, phytate reduction was found to improve zinc status in groups with increased zinc requirements who consume a cereal-based diet¹⁰.

Several studies supported by the Foundation indicate that undernourished children are at high risk not only of increased mortality and morbidity but also of poor cognitive development and subsequent school failure. In such a context a large intervention study was funded by the Nestlé Foundation and conducted in six tea plantations in West Java, Indonesia¹⁰⁻¹⁷. The malnourished children received a daily supplementary feeding for 12 to 18 months. In that cohort, the group that received a energy + micronutrient supplement (E+M) had an advantage as measured by the Bayley

Scale of Mental Development over groups that received either skim milk + micronutrients (M) or solely skim milk (S). The functional advantage was interpreted as an indication of the beneficial effect of energy. However, another interpretation would be that isolated micronutrient supplementation is associated in a modest decline in development. Such a study points to several important issues, including: 1) the need for an energy supply with micronutrient supplements, 2) the potential adverse effect of micronutrient supplementation, 3) the need to select appropriate and sensitive tests of development, 4) the need to follow the child's development by repeated measurements and 5) the realisation that supplements could have long-lasting effects on a specific domain if associated with the proper stimulation. Some nutritional interventions have been coupled with psychosocial stimulation. For example, the Foundation supported a study done with undernourished children in Jamaica. Zinc supplementation was found to benefit development in those children, and the benefit was enhanced if stimulation was also provided¹⁸. A similar study is underway in Bangladesh with undernourished and anaemic children.

Low birth weight (LBW) with intrauterine growth retardation affects 11% of infants born in developing countries. It is often associated with poverty and inadequate psychosocial stimulation in the home. The effect of regular stimulation at home was assessed in Jamaica. The intervention benefited the infants' development quotient and performance subscale at 15 and 24 months, and home environment at 12 months. Thus LBW was associated with development delays, which were reduced with psychosocial intervention¹⁹. Clearly the mechanism linking undernutrition to poor development needs further understanding before initiating large-scale intervention.



A BIRD'S-EYE VIEW OF THE FOUNDATION'S RESEARCH PROGRAMMES ON CHILD NUTRITION AND HEALTH 1994–2005

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Department of Women's and Children's Health
University Hospital Uppsala, Sweden

The 40th anniversary edition of the Nestlé Foundation Annual Report offers a valuable opportunity for a retrospective look at the scope, orientation and focus of the research and fellowship support given to issues related to the health and nutrition of infants and children throughout the world. During the ten-year period 1994 to 2005 a total of approximately 210 scientific publications supported by the Foundation on various aspects of nutrition have seen the light of the day. Roughly half of these, about 120 articles, pertain to the nutrition and health of infants, children and adolescents. This amounts to, on average, the publication of approximately one Foundation-supported article every month for the last ten years.

Growth in relation to nutrition and health occupies a central and dominating place in the series of publications. Quite a number of articles have attempted to elucidate the exclusive position of breastfeeding in this respect as well as the nutritional determinants of size at birth, and growth during infancy, childhood and adolescence.

Significant space has been given to the study of stunting in children. This topic is investigated in relation to body composition, fat distribution, energy and nutrient metabolism, energy intake

regulation, physical activity and response to interventions using specific nutrients. A few studies have focused on development, cognition and intellectual performance in stunted children. In some instances multivitamin preparations along with iron were provided to these children with a view to enhancing their appetite and stimulating catch-up growth or improving their physical and intellectual performance.

Interaction between infection and malnutrition has always been a challenging and productive topic in child nutrition research, so also in this series. Several articles have looked closely at the nutritional and health status of children suffering from intestinal parasites, pneumonia, malaria, measles, tuberculosis, and in recent years also HIV/AIDS, occasionally with pilot interventions using multivitamins and other micronutrients. A recurrent subject that has attracted several investigations consists of the search for the circumstances around the development of Cancrem oris - noma, including possible causative or precipitating factors such as malnutrition, nutrient deficiencies and oral hygiene.

In view of their increased nutritional requirements and vulnerability, the study of the bioavailability of various nutrients in children has always had a

prominent place in nutrition research. A number of studies in the present series have emphasised the bioavailability of iron, zinc and vitamin A in infants and children under different circumstances.

With the emergence of the hypothesis that prenatal and early postnatal malnutrition may be significant predictors of certain diseases later on in life, interest has grown in the possible effects of early malnutrition on parameters such as plasma insulin in adults and the relationship between size at birth, maternal energy status and lipid profile in adolescence. A few articles dwell on this topic.

The pathogenesis and clinical as well as biochemical, immunological and metabolic manifestations of severe malnutrition continue to fascinate researchers more than half a century after the pioneering studies from East Africa and the Caribbean Islands. Sustained interest in this topic is manifested in this series by a few articles dealing with the kinetics of specific nutrients and substances measured during the progression of severe malnutrition or the treatment of the condition.

Iodine deficiency occupies a special place among micronutrient deficiencies in view of its devastating effects on infants and children and the fact that its intake principally can only be guaranteed through universal salt iodization. While the question regarding implementation of national salt iodization programmes has not attracted much scientific attention in this series, some reports provide interesting data on indicators of iodine status and on iodine and mental performance. A related and operationally significant and fairly unusual contribution relates to the benefit of home-visiting interventions for the support of low birth weight infants and those in need of follow-up for improved cognition and intellectual performance.

The geographic origin of the majority of the reports in this series shows a wide international spread with a clear domination of developing countries in Africa, South America, the Caribbean Islands, Asia and the East Indies. West Asia and North East Asia, with the exception of China and Pakistan, are barely represented in this series.

The present bird's-eye view of research support to child nutrition and health has clearly shown that the support given has been instrumental in creating awareness about the needs of children. The support has helped to produce a solid and massive foundation of theoretical and some practical knowledge and experience on a wide range of topics, from a multitude of environmental, social, economic and cultural settings throughout the world. The support has also contributed significantly to the

development of local capacity and infrastructure for the improvement of child nutrition and health.

Researchers, field workers, UN agencies and civil society have never had as much knowledge about child nutrition and health as we have today. However, whether a rear-view mirror will show that the situation of children in the developing countries has improved in a sustainable manner as a result of the application of this knowledge will need a separate analysis.



ENERGY AND PROTEIN: NESTLÉ FOUNDATION'S CONTRIBUTION OVER THE YEARS

Prakash S. Shetty, MD, PhD
Former Professor of Human Nutrition, London
School of Hygiene & Tropical Medicine, London (UK)
Currently Chief, Nutrition Planning, Assessment &
Evaluation, Food & Nutrition Division, FAO,
Rome, Italy

Much progress has been made in our understanding of human energy and protein requirements over the two decades since the last international expert consultation report on human energy and protein requirements¹. In 2001 and 2002, the international agencies FAO and WHO along with the UNU convened their Joint Expert Consultations on 'Human Energy Requirements' (17-24 October 2001, Rome, Italy)² and 'Protein and Amino Acid Requirements' (9-16 April 2002, Geneva, Switzerland)³. It is a matter of considerable pride and achievement for the Foundation to acknowledge that much of the new information that informed the deliberations of these recent international expert consultations were attributable to its crucial support to furthering scientific research in these areas. Significant aspects among these contributions include the support provided to conduct calorimetric and stable isotopic measurements of total energy expenditure among individuals in developing countries. Support was provided to compile databases of basal metabolic rate (BMR) measurements made worldwide and to update their use in generating predictive equations for BMR and to validate them in different population groups to establish their better

predictive performance for international use. Compilation and tabulation of the energy cost and expenditures related to individuals' physical activities were also supported to enable better estimates of total energy expenditures of people from different parts of the world. A large part of the current revised recommendations on requirements of pregnancy and lactation are largely attributable to the data generated from longitudinal studies in both developed and developing countries supported by the Nestlé Foundation. New research that has since helped deal with a contentious issue of adaptation and accommodation that may influence requirements for energy among different populations and during seasonal variations in intakes, a topic that the 1985 report seriously wrestled with, was also largely attributable to support provided by the Foundation for studies of human energy metabolism in several developing countries.

The Nestlé Foundation also made a major investment in supporting research related to human amino acid requirements in developing countries. This resulted in obtaining data on the adult requirements of several amino acids, such as lysine,

leucine, threonine, valine, and methionine. The data was obtained using the stable isotopic tracer methods and analysis by sophisticated mass spectrometry in developing countries. It is a matter of pride that the recommendations for amino acid requirements of adults, which have been revised in the 2006 report³, are almost entirely attributable to projects supported by the Foundation. Not only did they provide much valuable data and contribute to fill a lacuna in the science; they also contributed to the transfer of essential albeit sophisticated research techniques to developing country scientists while enabling them to procure expensive equipment and set up sophisticated nutrition laboratories in their countries. This is indeed just another example of the yeoman contribution to crucial research in nutrition in developing countries that support from the Foundation has accomplished over the years.

The International Dietary Energy Consultancy Group (IDECCG) was founded jointly by the United Nations University (UNU) and the International Union of Nutritional Sciences (IUNS) in 1986 in Geneva by interested scientists who were attending a scientific meeting of the Foundation. The Foundation has hosted the Secretariat of the IDECCG since its inception and its then Director, Dr Schürch, served as its Executive Secretary. Although IDECCG was established principally 'for the study of dietary energy intake in relation to the health and welfare of individuals and societies', over the years it has dealt with related issues and in particular with energy and protein. The Foundation has provided unstinting support to IDECCG since it was founded and has provided resources for convening numerous meetings of interested scientists all over the world. Essential outputs of these meetings have included a whole series of excellent publications – both as peer-reviewed supplements of journals and as much valued individual publications (see a detailed list at www.nestlefoundation.org) on such varied topics as Chronic Energy Deficiency (CED), low body mass index (BMI), protein-energy interactions, limits of adaptation to energy intake, physical activity in children and the impact of human ageing on energy and protein requirements. Singular attention must of course be drawn to the support the Foundation provided through IDECCG in defining CED⁴ (published in the European Journal of Clinical Nutrition in 1988 and now featured by the journal among its four most often cited papers) and the meeting on 'Energy and Protein Requirements' held in 1994, which was an essential forerunner to the recent Joint Expert Consultations on energy and protein convened by the UN agencies. It is no exaggeration to state that it may be well-nigh impossible to describe fully the crucial role the Nestlé Foundation has played in our current knowledge in this important area of nutrition over the 40 years since it was founded.



MATCHING POLICIES TO NEED

Dr. Roger G. Whitehead, CBE
Former Director, MRC Dunn Nutrition Center,
Cambridge, UK and Keneba, The Gambia

For any organisation to make significant scientific contributions continuously over a period of 40 years means it has had to respond to changing circumstances. The work of the Foundation is exclusively devoted to research into the nutritional health problems of the developing world and its inception occurred in the immediate post-colonial era. Things are very different now. In one capacity or another I was associated with the Foundation for much of this time and have thus been in a position to witness this evolution. Perhaps, therefore, I may be excused for contributing a rather personal

assessment of the main things I think the Foundation has achieved.

Back in the 1960s the main aim was to ensure that appropriate high quality research was carried out by encouraging talented scientists, mainly from the more privileged parts of the world, to develop interests in this area. As well as awarding the traditional type of research grant, a research institute was also established in the Ivory Coast. As time went on, however, the Council realised that such an approach was not sufficiently focussed on

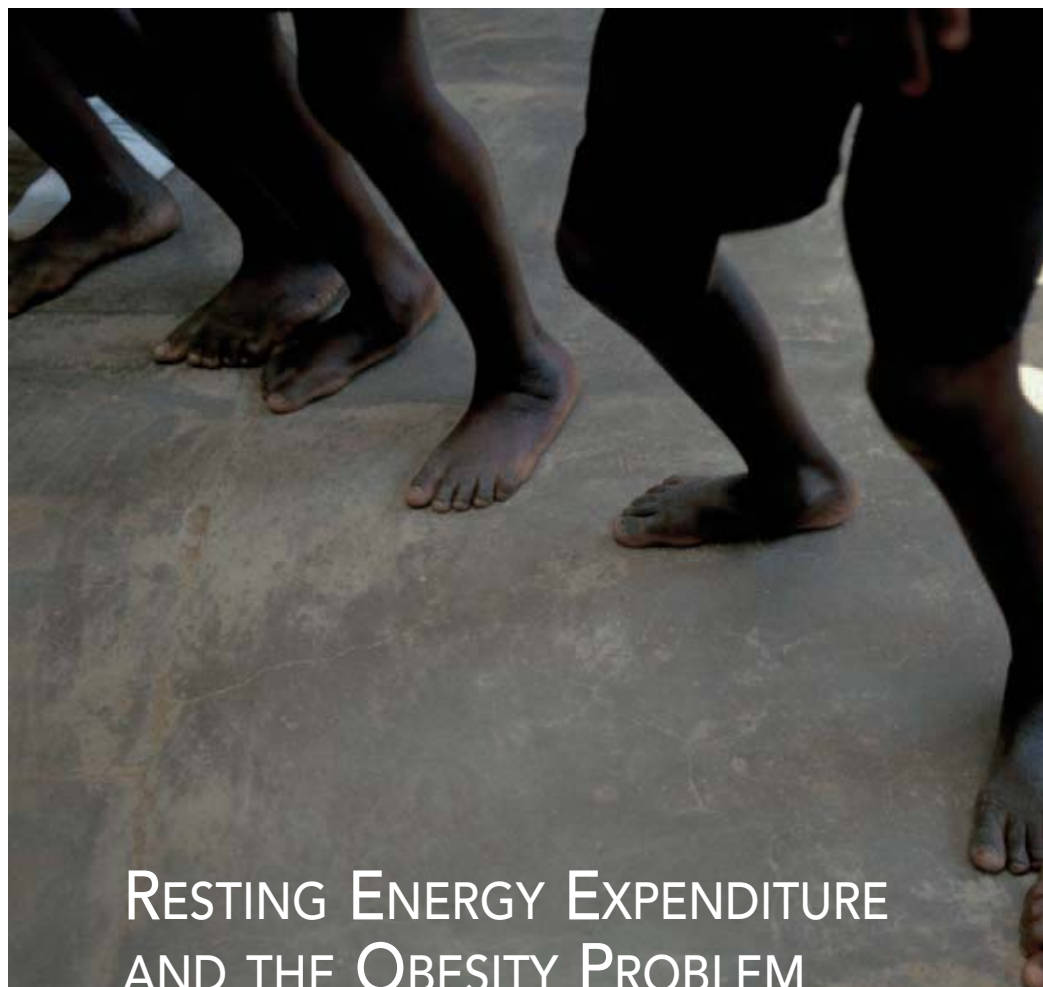
emerging issues and thus it was decided to identify specific topics for priority investigation, one example being the highly successful investigations into the extra-nutritional needs of pregnant and lactating women. The multi-centre approach enabled young scientists in different parts of the world to collaborate with more experienced investigators.

It became increasingly obvious to the Council, however, that if they were really to help nutritional research in the developing world to emerge, a more adventurous approach was going to be necessary. It was insufficient just to have collaborators working in association with universities and institutes from the western world – it was essential to encourage research proposals to come directly from those countries. A more fundamental approach was going to be necessary. The developing world is far from homogeneous – particularly in tropical Africa and in some Asian countries research capacity is often lacking – but merely providing even sorely needed equipment to such universities and research institutes was not the complete answer, by any means. The concept of supporting institutional development emerged. Although the Council had for a number of years provided grants so that talented individual students could travel abroad to work for higher degrees, their full potential was often not achieved on returning home. Successful post-doctoral development is dependant on the newly qualified investigator entering an establishment where there is a tradition for, and encouragement of, research. All too often it was found that the young scientist did not find the local enthusiasm he or she yearned for and not infrequently this was resulting in his/her desire to return to the western world.

Contrary to popular opinion because of the shared name, the Nestlé Foundation is not a wealthy one. It was necessary for the Council to devise a pragmatic plan that would make a significant contribution within its limited financial means. To assist in the formulation a meeting was organised with scientists from different parts of the developing world to find out more exactly what they thought was needed. A policy emerged which, although now well known, merits restatement as it remains a model worthy of emulation by others. Specific university departments of nutrition, especially in Africa – the continent where arguably the need was greatest – were invited to produce an institutional development plan which they would like to get underway if only the appropriate personnel could receive, say, an extra one year's specialist training. It was the responsibility of the department to identify the preferred place for this training. It was envisaged that up to a total of six persons at post-doctoral level would eventually form a sufficiently self-

stimulating cohort of investigators, but it was also appreciated that they would need continuing support and encouragement after the initial period of training. Consequently it was proposed they be given preferential research support as long as their research proposals were equally competitive with any others received. Although it was recognised that outside collaboration was often going to be desirable, a critical requirement was that the intellectual input in any research proposal came from the local scientist. It is still young days and I will be interested to see the eventual outcome! To divert from the usual policies by which grant-awarding bodies usually decide on which types of research to support was never going to be easy. On more than one occasion I realised that well-prepared proposals from eminent investigators were being turned down because the developing world input was little more than nominal.

One final issue I have often been called upon to address over the years is the degree of academic freedom the Nestlé Foundation enjoys. I am taking this opportunity to say once again that this has been total. A series of eminent Presidents and Directors of the Council have always ensured that this was so.



RESTING ENERGY EXPENDITURE AND THE OBESITY PROBLEM

J P Flatt, PhD
Department of Biochemistry and Molecular
Pharmacology
University of Massachusetts Medical School
Worcester, MA, USA

The Nestlé Foundation has supported a number of studies on human energy expenditure. They provided important data for the assessment of the additional energy needs during pregnancy and lactation¹. The Foundation also supported extensive studies of nutritional supplementation in undernourished children, which showed that the greatest benefits occur when additional food energy is provided to infants in the 6 to 18 months age-

range². Other studies conducted with support from the Foundation have shown that in poorly nourished population groups, resting energy expenditure is relatively low due to small body size, with little evidence of adaptive decreases in thermogenesis³.

A statistical analysis of anthropometric and energy expenditure data for 433 women and 335 men

published in the 'Dietary Reference Intake' report⁴ reveals that there is no correlation between % Body Fat content (calculated using the equation linking % Body Fat to BMI in the NHANES3 data⁴) and deviations from predicted ('normal') basal energy expenditure in women or in men (Figure)^{5,6}. In another examination of the NHANES3 data, no negative correlation between height and adiposity could be detected⁷, even though height has a readily recognizable impact on basal as well as total energy expenditure⁴. Such evidence contradicts the widely held notion, that low rates of resting energy expenditure promote fat accumulation and the development of obesity.

At a time of great concern about the rapidly increasing preponderance of obesity even in less affluent countries, this insight helps to recognize that weight maintenance as well as excessive weight gain should be attributed to the factors influencing food intake and physical activity, but not to differences in resting energy expenditure.

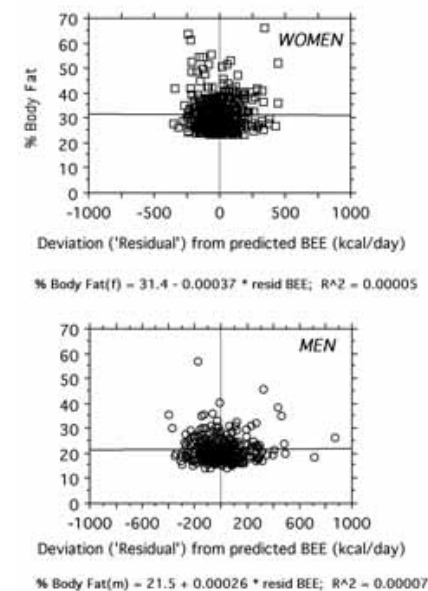


FIGURE 1

Percent (%) body fat in 433 women (upper panel) and in 335 men (lower panel) whose ages, anthropometric data and basal energy expenditure are listed in the DRI database (4), plotted against the deviation from their 'normal' daily basal energy expenditure (fBEE for women, mBEE for men), as predicted using the basal energy expenditure equation given in (4,5)



AT THE OCCASION OF THE 40TH ANNIVERSARY OF THE NESTLÉ FOUNDATION MANY BIRTHDAY WISHES HAVE BEEN SENT TO THE FOUNDATION. A SMALL SELECTION IS PRESENTED HERE. THE FOUNDATION APPRECIATES THE GREAT RESPECT AND LOYALTY IT RECEIVES FROM THE WORLDWIDE NUTRITION RESEARCH COMMUNITY.



CONGRATULATIONS

From an old-timer

I am proud to have been associated with the Nestlé Foundation, in one capacity or another, almost from its beginning. There are many aspects I could highlight but I will stick with two. The first is the scientific independence it has resolutely safeguarded. The second is the flexibility shown in the prioritisation of programme policies. Success in one type of initiative has not been allowed to fossilise future initiatives. As the nutritional research needs of the developing countries have changed so has the nature of the nutritional research supported by the Foundation. This adaptability of approach has been accomplished through the wise guidance of a succession of excellent Presidents and Directors.

Roger G. Whitehead
MRC Dunn Nutrition Unit, Cambridge, UK & Keneba, The Gambia

Splendid 40 years

During the past 40 years, the Foundation has given a great deal of love to the world. The Nestlé Foundation has educated and trained students and experts of all colours around the world; moreover, the Foundation has supported hundreds of projects and greatly improved the nutritional status and health condition of millions of people.

Ma Aiguo
Medical College of Qingdao, Qingdao, PRC

The contribution of the Nestlé Foundation to science has been admirable and I hope they can contribute more and more to improving our knowledge.

Jena Derakhshani Hamadani
ICDDR B, Dhaka, Bangladesh



Your endeavour makes the world a better place
In the last 40 year the Nestlé Foundation is working with health staff around the world to fight against malnutrition and poverty in developing countries. The achievement is wonderful and the most important is that weak and fragile populations get real and sustainable benefits from the supported programs.

Jian Zhang
Institute of Nutrition and Food Safety, CDC
Beijing, PRC

Hearty Congratulations !

You have been a friend in need and hence a friend indeed, through your unconditional institutional support to our young MSc Programme in Applied Human Nutrition, which is producing the much needed human capacity in nutrition, both for Uganda and the African region at large.

Joyce Kikafunda
Makerere University, Kampala, Uganda

Nestle Foundation: A golden research grantor!
Beyond financial support, the Foundation also provides us with valuable technical support and professional advice, particularly in the person of Professor Paolo Suter, who has always provided me immediate advice and encouragement. In addition, the Enlink library and global networking establishment are valuable to researchers at all levels. For researchers in developing countries such as Vietnam, the Foundation helps scientists achieve far more than they would otherwise be able to in academic research on crucial issues. Once again, my sincere thanks to the Nestlé Foundation – a great research opportunity provider and partner for researchers around the world.

Dien N. Le
Nutrition Center, Ho Chi Minh City, Vietnam

I hope the Nestlé Foundation will continue its contribution to nutrition research by strengthening research abilities and facilities in the developing countries.

Drupadi H.S. Dillon
SEAMEO-TROPED, University of Indonesia,
Jakarta, Indonesia

Your role in promoting and supporting nutrition research in developing countries is commendable. As you celebrate your 40th anniversary, I congratulate you and wish you many more productive years ahead.

Anna Lartey,
University of Ghana, Legon, Ghana

Congratulations on a job well done. We spent a very formative and productive period with Dr. Beat Schürch and the Foundation. Our best wishes for the future.

Anura Kurpad
St. John's National Academy of Health Sciences,
Bangalore, India

Many years ago I was invited to become a member of the Nestlé Foundation's Council, but I could not accept because shortly before I had joined an advisory body of the Nestlé Company, in the hope of influencing their policy on infant foods. I have always regretted this, since the Foundation's activities were much more important. These have focussed on the Third World. For me the most outstanding were the conferences that the Foundation organized jointly with the International Dietary Energy Consultative Group on Protein and Energy Requirements, Linear Growth Retardation in Children, and many others. I pay a special tribute to Dr. Beat Schürch, for his activity and vision as Director of the Foundation.

John C. Waterlow
Emeritus Professor in the University of London

Making a difference for child nutrition
The Nestlé Foundation is one of the few organizations in the world that funds research on key nutrition issues relevant to developing countries. We are very grateful for the opportunity to carry out research, which has great potential to influence policies and programs to improve infant and young child nutrition. Congratulations to the Foundation for 40 years of sustained support for research on ways to improve child nutrition.

Kathryn G. Dewey
University of California, Davis, CA, USA

Wishes for a happy birthday and a long life
The Senegalese Nutrition Staff wishes a long life to the Nestlé Foundation and thanks all the persons in charge of your institution. Your support for capacity building and training African nutritionists is an unquestionable contribution to the fight against malnutrition.

Salimata Wade
Université Cheikh Anta Diop de Dakar, Sénégal

Lausanne meets Guatemala City

Happy 40th anniversary, Nestlé Foundation. You were born the year I graduated from college. CeSSIAM celebrated 20 years in Guatemala in 1985. The Nestlé Foundation was instrumental in our premier decade, in providing us with the funds for a project on the interaction of nutrition and inflammation. This has become an important research theme of our group through the years. I have also had the opportunity from time to time to serve as a reviewer of submitted proposals; this has been a learning experience. Eric is a long-term friend; Paolo is a buddy from scientific meetings; Beat was a dear friend and colleague who is sorely missed.

Noel W. Solomons
Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM), Guatemala City, Guatemala

The Nestlé Foundation has been very instrumental to human development programmes in Africa and the world over. Their level of commitment to the course of nutrition globally has been unparalleled in recent times. The specific role they play in the fight against malnutrition is highly commendable, especially in the creation of the enLINK library and the initiation and support of research in human nutrition and the insightful VISION 2005 project, focusing on disease burden in developing countries. Without mincing words, Nestlé Foundation has made an indelible mark in achieving optimal nutrition for many generations and wishing them more fruitful years ahead may be an understatement.

Tola Atinmo
University of Ibadan, Nigeria and President of the Federation of African Nutrition Societies (FANUS)

Congratulations on your 40th anniversary. The Nestlé Foundation played a significant role in supporting the development of a new research group to investigate the effects of nutrition and health on child development. The Foundation is one of the few funders who have fostered research in developing countries and have had an explicit policy of encouraging the training of young researchers. They have lead the way in discouraging the exploitation of developing country researchers by academics in developed countries. Several young scientists you supported in Jamaica are now making a great contribution to medical/nutrition research in the Caribbean. I hope you will be able to continue your work for many years.

Sally Grantham-McGregor
Centre for International Child Health, Institute of Child Health, University College London, UK

Science has contributed greatly to nutritional development in the past 50 years. Nestlé Foundation, in my view, has been a significant partner in this development. I hope the Foundation will remain a proactive contributor in the future. Congratulations for 40 years of continuous work to reduce nutrition problems in the world.

Suttalak Smitasiri
Mahidol University, Thailand

We wish Nestlé Foundation many more years of unselfish and scientifically rigorous support to sound research aimed at ameliorating the nutritional problems of the infants in the world.

Nathalie Charpak, Zita Figueroa & Juan Gabriel Ruiz
Kangaroo Foundation and Kangaroo Mother Care Program, Bogota, Colombia

As Director of the Nestlé Foundation for the Study of the Problems of Nutrition in the World in Lausanne, Switzerland from 1979-2002, Beat Schürch quietly and effectively made major contributions to international nutrition, for which he was greatly admired by those who knew him well. He initiated an important international fellowship program to strengthen nutrition institutions in low-income countries, particularly in Africa. His determined support of excellence in the research of selected nutrition groups in developing country institutions reinforced the benefits of the fellowship program. His judgment of what constituted good research and his ability to select high-quality grant recipients were outstanding. Jointly we proposed the International Dietary Energy Consultative Group (IDECCG) whose working group meetings produced a series of valuable reports on key issues. The quality of the participants and subsequent reports owed much to his uncanny ability to identify and critically evaluate nutrition leaders throughout the world. This extended to his ability to know the most important nutrition issues at a given time. As Technical Secretary of IDECCG, he meticulously and skilfully edited these reports and ensured their wide distribution in developing countries free of charge by the Nestlé Foundation. As its Director, this modest, dedicated, unselfish, hardworking man maintained the value of the nutrition contributions of the Nestlé Foundation to the world. His loss is keenly felt by his many friends and colleagues throughout the world and especially by the developing country nutrition scientists and their institutions that he did so much to help.

Nevin S. Scrimshaw
International Nutrition Foundation and United Nations University

A happy anniversary is the least I can wish to a good friend of mine: the Nestlé Foundation. For the occasion of the 40th anniversary of the Foundation, it is a pleasure for me to sincerely acknowledge the very key role this institution has been playing in the less developed countries in the field of human nutrition for so many decades. I wish long life to the Nestlé Foundation and a happy anniversary.

Romain Anselme Marc Dossa
Abomey-Calavi University, Cotonou, Benin

The developing countries benefit much from nutrition research because all research issues can aid in developing feasible interventions for improving people's health and nutrition status, especially that of vulnerable groups. The Nestlé Foundation is an organization with such a purpose.

Nguyen Cong Khan
National Institute of Nutrition Hanoi, Vietnam



Well done Nestlé Foundation for 40 years of empowering developing nations in finding solutions to making a difference to nutrition of the underprivileged. We look forward to more concerted efforts and capacity development in tackling past, present and emerging health issues.

Lucie C. Malaba
University of Zimbabwe, Harare, Zimbabwe

The Foundation gave me a lifeline!
I had earlier tried rather unsuccessfully to secure funds from other sources and the Nestlé Foundation supported me to give me the skills which I am now employing in solving the nutrition problems which we face in developing countries.

Sam Newton
Kintampo Health Research Centre, Kintampo, Ghana

Capacity building in a country with urgent need

I was involved in providing a short-term training program for two fellows from the Institute of Child Nutrition (Pyongyang, North Korea) with the support of the Foundation. I was pleased with the opportunity, as capacity building in nutrition research is badly needed for them. Both fellows were able to formulate a research proposal, which later was also funded by the Foundation. This is very important for a country in need. As a trainer, I am proud to see that the efforts have been fruitful.

Pattanee Winichagoon
Mahidol University, Thailand

It gives me great pleasure to extend my heartiest congratulations to the board and staff at the occasion of the 40th anniversary of the Nestlé Foundation. The Nestlé Foundation has maintained an independent profile and proven their commitment to addressing the problem of undernutrition in developing countries. In particular the training and research grants have greatly helped foster capacity development in nutrition in developing countries. One hopes that the Nestlé Foundation will continue to thrive and expand its fraternity of collaborators and partners in the years to come.

Zulfiqar A. Bhutta
The Aga Khan University and Medical Center, Karachi, Pakistan

For the past 40 years, the Nestle Foundation has sponsored many health and nutrition studies that have contributed to improving the health and nutrition status of people, especially the vulnerable groups living in developing countries. Vietnam has benefited greatly from the Foundation's meaningful activities.

Phan Van Huan
The National Institute of Nutrition, Hanoi, Vietnam







MICRONUTRIENTS

- 1 2001 / Effect of vitamin A and B2 supplementation added to iron on anemia of pregnant women in China
Aiguo Ma
Qingdao University Medical College, Institute of Human Nutrition, Qingdao, China
- 2 2002 / Efficacy of multiple micronutrients supplementation in improving micronutrient status among anaemic adolescent girls in Bangladesh
Faruk Ahmed
University of Queensland, School of Population Health, 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 / Effects of an additional meal fortified with multiple micronutrients on the nutritional and micronutritional status of Vietnamese children
Nguyen Quang Dung
National Institute of Nutrition, Basic Nutrition Department, Hanoi, Vietnam
- 5 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
Cornell University, Division of Nutritional Sciences, Ithaca, USA
- 6 2003 / Effect of zinc supplementation and its interaction with vitamin A on child immune responses and morbidity rate
Martha I Kartasurya
University of Queensland, School of Population Health, Brisbane, Australia
- 7 2003 / Usefulness of ferrous fumarate and ferric pyrophosphate as food fortificants for infants and young children in developing countries
Shafiqul Sarker
ICDDR,B, C. for Health and Population Research, Dhaka, Bangladesh
- 8 2003 / Zinc homeostasis in and zinc requirements of young Chinese children
Xiaoyang Sheng
Shanghai Jiao Tong University, Department of Child and Adolescence Healthcare, Shanghai, China
- 9 2004 / Effect of iron fortification of nursery complementary food on iron status of infant
Kim Su Huan
Institute of Child Nutrition, Pyongyang, Korea, Dem. Rep.
- 10 2004 / Effects of multi-vitamin and multi-mineral supplementation on pregnant women and their infants in Chongqing, China
Ting-Yu Li
Chongqing University of Medical Sciences, Children's Hospital, Chongqing, China

- 11 2004 / Investigation of blood, hair lead and manganese levels in children with different degrees of iron deficiency in Karachi
Mohammad Ataur Rahman
University of Karachi, Centre for Molecular Medicine & Drug Research, Karachi, Pakistan
- 12 2004 / Vitamin A value of spirulina carotenoids in humans
Guangwen Tang
Tufts University, Human Nutrition Research Center on Aging, Boston, USA
- 13 2004 / Study on the causes of anemia in the elderly women in China
Jian Zhang
National Institute of Nutrition and Food Safety, Department of Elderly Nutrition, Beijing, China
- 14 2005 / Environmental supplementation of iodine by iodination of irrigation water in the Ferghana Valley
Maksuda Abidjanova
Association of Endocrinologists, Kokand City, Uzbekistan
- 15 2005 / Stability and efficacy of vitamin A fortified cooking oil on nutritional status of Vietnamese children 36-60 months
Cao Thi Thu Huong
National Institute of Nutrition, Department of Micronutrient Research & Application, Hanoi, Vietnam
- 16 2006 / Improvement of iron status of preschool children in rural communities of Sokoto State Nigeria by the use of iron rich food sources : a social mobilization approach
LS Bilbis
Usmanu Danfodiyo University, Biochemistry Department, Sokoto, Nigeria
- 17 2006 / Vitamin A status of households according to the seasonal availability of vitamin A and beta-carotene rich foods
Romain Dossa
University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
- 18 2006 / Effect of psychosocial stimulation on development of iron-deficient anemic infants: a randomized controlled trial
Jena D. Hamadani
ICDDR,B, C. for Health and Population Research, Dhaka, Bangladesh
- 19 2006 / Assessment of iron status of children in rural communities in Abia State, Nigeria
Ignatius Onimawo
Michael Okpara University of Agriculture, Dpt. of Human Nutrition and Dietetics, Umudiike, Nigeria
- 20 2006 / Efficacy of multiple micronutrients supplementation on anaemia in 6-23-months-old rural Burkina children
Hermann Ouedraogo
Inst. de Recherche en Sciences de la Santé, Ouagadougou, Burkina-Faso



BREASTFEEDING

21 2001 / Validation of a model to predict the need for supplementing breastfeeding in premature infants

Nathalie Charpak
Fundacion Canguro, Bogota, Colombia

22 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
Kenyatta University, Department of Nutrition,
Nairobi, Kenya

23 2001 / Oral rehydration solution containing amylase resistant starch in severely malnourished children with watery diarrhea due to *Vibrio cholerae*

Nur Haque Alam
ICDDR,B, C. for Health and Population Research,
Dhaka, Bangladesh

24 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
Université Cheikh Anta Diop, Equipe de Nutrition,
Dakar, Senegal

INFANT AND CHILD NUTRITION

25 2003 / Comparison of the efficacy and acceptability of three types of micronutrient supplements added to complementary foods for infants in Ghana

Anna Lartey
University of Ghana, Department of Nutrition and Food Science, Legon, Ghana

26 2005 / Food-based approach for the control of stunting among preschool children

Chineze Agbon
University of Agriculture, Department of Home Science & Management, Abeokuta, Nigeria

27 2006 / Step I : Complementary feeding-based approach to alleviate linear growth retardation and nutrient deficiencies in infants aged 6 to 12 months in the south of Benin

Romain Dossa
University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin

28 2006 / Promoting breastfeeding: a formative research among women and their husbands having infant aged 0-6 months in urban households

Judhiastuty Februhartanty
University of Indonesia, SEAMEO-TROPED RCCN, Jakarta, Indonesia

29 2001 / Cognitive performance of iron deficient, non-anemic Peruvian infants

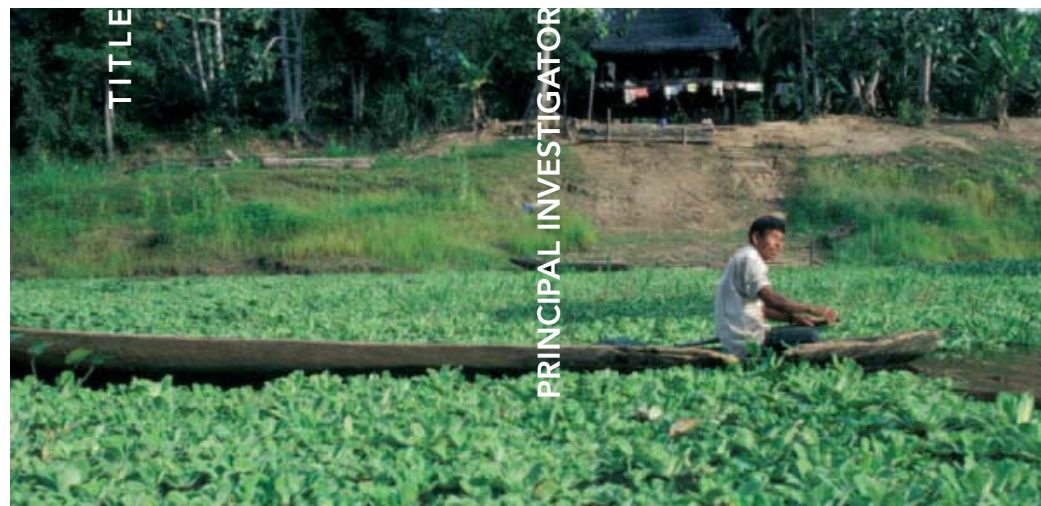
Theodore Wachs
Purdue University, Department of Psychological Sciences, West Lafayette, USA

30 2005 / Development of term low birth weight infants at 6 years, and the benefits of early stimulation

Susan Walker
University of the West Indies, Tropical Medicine Research Institute, Kingston, Jamaica

CHILD BEHAVIORAL DEVELOPMENT

REHABILITATION FROM MALNUTRITION





TITLE

PRINCIPAL INVESTIGATOR

NUTRITION, IMMUNE DEFENSE AND INFECTION

- 31 2002 / Nutrition assessment of children orphaned from HIV/AIDS
Judith A Ernst
Indiana University, Indiana University School of Health & Rehabilitation Sciences, Indianapolis, USA
- 32 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
Tran Thanh Do
National Institute of Nutrition, Hanoi, Vietnam
- 33 2004 / Molecular and biochemical analysis of intestinal microflora in malnourished children with cholera treated with oral rehydration solution with and without amylase resistant starch
Motiur Rahman
ICDDR,B, C. for Health and Population Research, Dhaka, Bangladesh

- 34 2003 / Assessing physical activity of obese children by a clinical score
Claude Godard
INTA, Unidad de Endocrinología Infantil, Santiago, Chile
- 35 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

EPIDEMIOLOGIC TRANSITION

BONE HEALTH

- 36 2002 / Genetic, pubertal and nutritional determinants of peak bone mass accretion in adolescence
Heather Greenfield
University of Sydney, Department of Animal Science, Sydney, Australia
- 37 2002 / Determinants of nutrition-related rickets in Chinese children and associated health outcomes
Mark A Strand
University of Colorado, Health and Behavioral Sciences, Denver, USA
- 38 2003 / Heritability, nutrition and adolescent bone health
Ghada El-Hajj Fuleihan
American University of Beirut, Calcium Metabolism & Osteoporosis Program, Beirut, Lebanon
- 39 2004 / Effects of parathyroid hormone on bone metabolism in older people in China
Bo Zhou
Shenyang Medical College, Department of Preventive Medicine, Shenyang, China

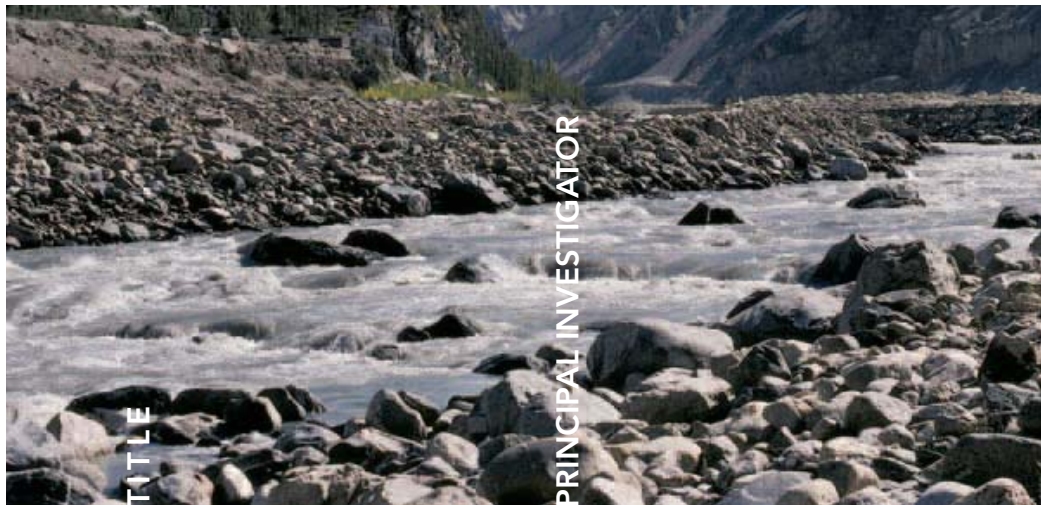
NUTRITION INTERVENTIONS

- 40 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
National Institute of Nutrition, Planning Department, Hanoi, Vietnam
- 41 2003 / School-based nutrition intervention pilot program
Dien N Le
Nutrition Institute, Ho-Chi-Minh City, Vietnam
- 42 2005 / A community-based randomized controlled trial of complementary feeding strategies in a squatter settlement of Karachi
Zulfiqar Ahmed Bhutta
Aga Khan University Medical Center, Department of Paediatrics and Child Health, Karachi, Pakistan



TITLE

PRINCIPAL INVESTIGATOR



TITLE

PRINCIPAL INVESTIGATOR

NUTRITION EDUCATION

43 2006 / Satellite Medical & Nutrition Education Program (SMNEP): A contribution to reduction of malnutrition and improvement of health. A pilot study

Mohamed Ag Ayoya
Cornell University, Division of Nutritional Sciences,
Ithaca, USA

44 2006 / Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand

Rhona M. Hanning
University of Waterloo (UW), Department of Health Studies and Gerontology, Waterloo, Ontario, Canada

45 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 - BA, Brazil

OTHER RESEARCH AREAS

PUBLICATIONS

Chu K, Jiamton S, Pepin J, Cowan F, Mahakkanukrauh B, Suttent R, Robinson NJ, Deslandes S, Frost E, Chaisilwattana P, Suthipinittharm P, Grosskurth H, Brown D, Jaffar S. Association between HSV-2 and HIV-1 viral load in semen, cervico-vaginal secretions and genital ulcers of Thai men and women. *Int J STD AIDS* 2006;17:681-6.

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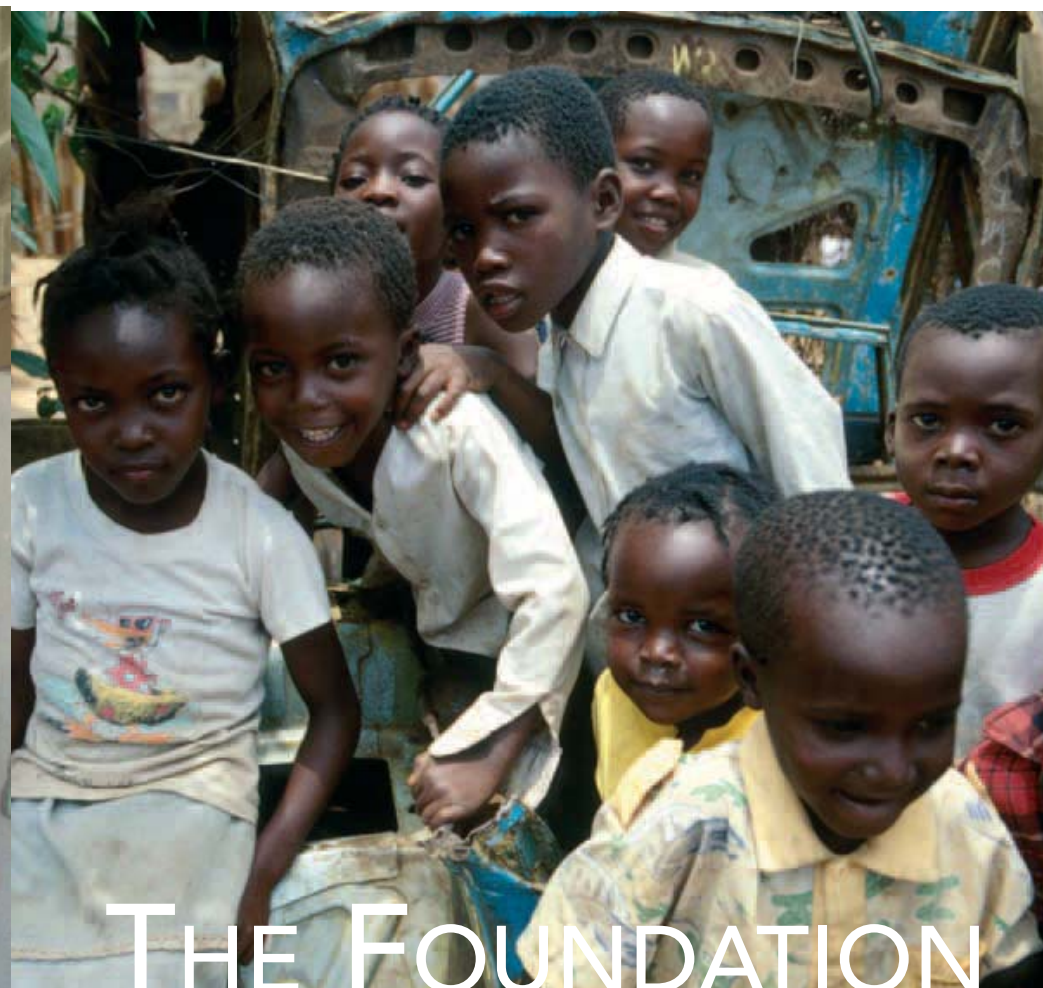
Miller MF, Stoltzfus RJ, Iliff PJ, Malaba LC, Mbuya NV, Zimbabwe Vitamin A for Mothers and Babies Project (ZVITAMBO) Study Group; Humphrey JH. Effect of maternal and neonatal vitamin A supplementation and other postnatal factors on anemia in Zimbabwean infants: a prospective, randomized study. *Am J Clin Nutr* 2006;84:212-22.

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Sacco LM, Caulfield LE, Gittelsohn J, Martinez H. The conceptualization of perceived insufficient milk among Mexican mothers. *J Hum Lact* 2006;22:277-86.

Zhu K, Zhang Q, Foo LH, Trube A, Ma G, Hu X, Du X, Cowell CT, Fraser DR, Greenfield H. Growth, bone mass, and vitamin D status of Chinese adolescent girls 3 y after withdrawal of milk supplementation. *Am J Clin Nutr* 2006;83:714-21.

The publications are available free of charge upon request.



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 low-income countries (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 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 low-income 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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