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Feature:

IUNS from Durban to Bangkok

Four years have passed since we met at the International Conference of Nutrition (ICN) in Durban. I am pleased to inform you that the IUNS officers and council members have worked hard since then to meet their commitments. The first formal council meeting following my election to the IUNS presidency was held at the time of the 33rd Standing Committee on Nutrition (SCN) session in early March 2006, in Geneva. At this meeting we approved the global strategic plan and the respective regional action plans, and set six priority targets for the next quadrennium. As you can read below, we have been reasonably successful in our efforts.

1. Improve communication

Our first priority was to improve communication with adhering bodies, and to promote regional collaboration and network development. We have invested much effort to update and enhance the content of the IUNS website, and look forward to hearing from you how well we have succeeded. A step in the right direction has been the move towards a professional administration of the IUNS. We will discuss this move at the IUNS General Assembly on 6 October in Bangkok, before the new council and officers are elected. This mode of working should start under the mandate of the next President, Ibrahim Elmadfa.

To enhance communication with the membership comprised by the adhering bodies, and to increase our dialogue with the broad international nutrition community, we participated in meetings organized by the respective regional societies (SLAN, Florianopolis, Brazil, in 2006; FANUS, Ouarzazate, Morocco, in 2007; FENS, Paris, France, in 2007; FANS, Taipei, Taiwan, in 2007; ASN, New Orleans, USA, in 2009). At these meetings one or more IUNS officers, council members or I met with the society's leadership.

At the First World Congress of Public Health Nutrition in Barcelona (October 2006), we met with the broader international nutrition community, with the result that the newly founded World Association for Public Health Nutrition has requested to be an affiliated body of the Union. At the SCN annual meetings in Geneva (2006), Rome (2007) and Hanoi (2008) we met with representatives of UN agencies, bilateral agencies and NGOs. We are honored that the SCN has chosen Bangkok for its annual meeting in 2009. Several IUNS officers or task force members were part of the evidence-based review of maternal and childhood malnutrition published in the *Lancet* in 2008; I was directly involved in the paper that reviewed why we had made insufficient progress in addressing malnutrition, and examined the functionality of the international nutrition system. This series of papers should be required reading for all nutrition scientists.



IUNS participation at regional meetings (here at the 2007 Asian Congress of Nutrition in Taipei) enhances communication with the membership

A challenge we are presently confronting is how to become more results oriented, and how to get more effective action. We need to concentrate more on “how to get things done” rather than on “what to do and why”. On 3 October in Bangkok, we, in partnership with the UN University Food and Nutrition Program (FNP) at Tufts, and the International Nutrition Foundation (INF), will review the progress in capacity building for effective nutrition action since the Manila 1996 UNU/IUNS meeting. As this is a key aspect of the permanent IUNS agenda, there will be a special session in the ICN program on this topic.



IUNS officers Lindsay Allen, Suzanne Murphy and Ricardo Uauy attended the Innocenti technical consultation on harmonization of criteria used to define nutrient-based dietary recommendations in Italy

2. Assess taskforce quality

Our second priority was to review and assess the scientific quality of ongoing taskforces, and to establish new ones based on needs. Reports of the existing IUNS task forces, and their plans for the next 4 years are on the IUNS website. We have been able to provide each task force with a modest budget to facilitate their work. The International Malnutrition Task Force (www.imtf.org) that was launched in Durban in 2005 has contributed towards standardizing the management of child malnutrition, and also managed to integrate the theory and practice of community and hospital-based treatment. Progress was achieved thanks to a close collaboration with WHO/IAEA/UNICEF. Two new task forces that were approved in 2006 (Prevention and Control of Severe Malnutrition, and Redefining Quality of Diets for Lifelong Health) initiated activities immediately. I thank the Chair and the members of the task forces for their work, and look forward to hearing about their progress at the ICN in Bangkok.

3. Strengthen leadership training

Despite the limited funding available, the IUNS supports efforts to strengthen and consolidate leadership skills in food and nutrition as an essential component for national development. In 2006, we contributed to nutrition leadership courses in Mysore, India, and Florianopolis, Brazil; we are also involved in the one to be held in Rio Maipo, Chile, in November 2009. In Africa, we supported the Epidemiology meetings in Ghana (2006) and Cairo (2008), as well as the African Nutrition Leadership Program (NLP) for francophone Africa in Ouarzazate (2007). In 2007 and 2008, IUNS nutrition leadership workshops were conducted in Zhejiang and Fudan (China), Hyderabad (India), Seoul (Korea), and Hsin Chu (Taiwan) in collaboration with the national nutrition societies. More than 20 Asian countries participated in the Korean session. IUNS, in collaboration with the regional societies and the INF, also supported NLP workshops at the SLAN, FANUS and FANS meetings.

The IUNS co-sponsored a special initiative involving a food and nutrition communication channel that was launched by the alumni of the European NLP. Fundraising efforts are in progress to materialize a business plan for this initiative. The European NLP effort, initiated in the early 1990's by Jo Hautvast, has sparked numerous other regional and national NLPs over the past decade. A summary of the NLP activities is available on the IUNS website. Part of this year's pre-ICN capacity-building workshop will be dedicated to reviewing the NLPs and discussing the need for a global NLP committee. This committee will define a minimum curriculum to serve as a common base for training, and provide the necessary support to allow organizers to comply with it. The concept behind a global committee is to encourage the extension of NLPs within a framework that accepts regional and cultural differences, but shares the basic requirements of what NLPs should deliver to all participants independent of

place, language, culture and background. The European NLP organizers, in conjunction with the IUNS, have secured funding from the private sector for the establishment of this committee.

4. Develop fundraising efforts

A further IUNS objective was to develop fundraising efforts with clear objectives and strategy, and to increase the visibility of IUNS at all levels. We have collaborated with the INF and others to develop a funding base that will strengthen institutions in developing countries, and promote participation from such countries in major scientific meetings. We signed a memorandum of understanding (MOU) with the INF in 2006 to increase the synergies between us. This agreement has been extended until 2012. We also signed a MOU with the nutrition division of the WHO; its plan for 2006–2008 included working together on technical issues, such as a reexamination of the role of carbohydrates and fats in health and disease, and supporting the dissemination of major WHO reports related to nutrition, such as the new growth standards. A new work plan for 2009–2011 is being finalized. We have expanded the IUNS guidelines concerning relationships with the private sector, and have specified that IUNS officers may collaborate as technical advisors to industry, but will not receive personal payment for this. Funds generated from consultancies to industry by IUNS officers will go to a special fund for capacity development that will be disbursed after the term of the present council has been completed.

Earlier this year the IUNS signed its first collaboration agreement with a representative of the private sector. We agreed on the following points:

1. To disseminate sound scientific information about food and nutrition amongst professionals and the general public in actionable ways, in order to promote



Ricardo Uauy with Kraissid Tontisirin (former Director of FAO Nutrition Division and 2009 ICN President), Denise Coitinho and Chizuru Nishida (WHO Nutrition Division) at the FAO/WHO Carbohydrates in Human Nutrition Scientific Update meeting in Geneva

and advance nutritional improvement focusing on the quality of diets.

2. To collaborate with the food industry in translating nutritional recommendations into food guidelines (taking into account food composition, dietary patterns, claims, marketability and technical feasibility).
3. To promote optimal nutrition for children around the world based on exclusive breastfeeding up to the age of six months, to be followed by appropriate complementary feeding.
4. To establish mechanisms to enhance and align leadership and networking seminars aimed at assisting the development of future leaders in the area of human nutrition and health, and facilitating interactions between nutrition leaders around the globe.

5. Ensure scientific quality

Our fifth priority was to ensure the scientific quality and integrity of the program for the next ICN and other meetings sponsored by the IUNS. The President of the 2009 ICN, Kraissid Tontisirin, who returned to Thailand after completing his tenure at the FAO nutrition division, has set up a website providing detailed information on the scientific and social program. We have worked closely with him and the local organizing committee to make the Bangkok meeting a great success. Over the past four years, we sponsored meetings on virtually all continents, and participated in joint sessions of the International Union of Food Science & Technology (IUFoST) and other bodies related to the International Council for Science. We have worked with the United Nations University on both the scientific aspects of nutrition work, as well as in capacity development efforts.

The debate about relationships between scientists and the private sector has recently resurfaced. The IUNS has contributed to the SCN statement on this issue. We have also formulated our own policies to better define the limits of conflict of interests, and to obtain greater transparency and full disclosure. Regarding the topic of scientific integrity, we asked Barrie Margetts to examine present policies and practices, and suggest ways to ensure zero tolerance in terms of preventing gaps in the integrity of our science. We have decided that sessions on conflict of interest and on scientific integrity are needed at all major international meetings sponsored by IUNS.

6. Strengthen governance and participation

The IUNS General Assembly in Durban made it plain that we need to better define the timing/staging of the nomination process and selection of candidates for IUNS officers and council. This is to ensure that the norms conform to the bylaws, and are clear to all before the Assembly meets. The Vice Presidents and the Secretary General defined the norms and procedures to be followed in the future; the IUNS council and

the national adhering bodies subsequently approved and ratified them. These norms and procedures will secure due process and prevent confusion within the limited time of the IUNS General Assembly.

The council, in close consultation with the Spanish Nutrition Society (Granada, Spain was chosen as the venue for the 2013 ICN), reviewed the organizational aspects of the ICN bids and selection process of sites. We revised the agreement between the IUNS and the national organizing committees, so that, starting in 2013, the IUNS will receive 50% of the total earnings from the meeting instead of 10% of the registration income. Furthermore, the organizers of the 2013 ICN are contemplating working with a professional congress organizer. This will be selected through competitive bidding, and should optimize the administrative process and financial outcome, leaving the organizers more time to concentrate on the program. We invite the regional nutrition societies representing Ibero-America to work closely in partnership with the IUNS to learn from this process. We have seen that it needs greater coordination in the international activities of the nutrition community. At the very least, a global coordination of meetings will permit a better participation and greater impact. It is time for the IUNS and its adhering bodies to set up a well-structured global organization; and we need to act jointly and immediately.

Thanks for your support

I take this opportunity to thank my fellow IUNS officers and council members for their friendship and support over the past 4 years. What I report here is only a fraction of what has been done. It is the fruit of the labor of all, working as a team in terms of thinking and doing. I also thank my wife and family for their patience; and I thank the many others who have helped to make the challenge of leading the IUNS a rewarding experience. The vote of the IUNS General Assembly in Vienna that named me president-elect for 2006-2010 was a turning point in my career; this call to duty demanded taking a broader look at what I was doing. In part this led me to take a part-time position in London that enabled me to have a greater global presence. It has been an exciting four years, in which I have worked hard. However most of what has been achieved is directly related to the support of the IUNS membership and the strength of the IUNS mission.

The ICN theme "Food Security For All" draws attention to a crucial issue at a time when global recession, twinned with high food prices, is affecting all continents, but especially the billion or more people who live on less than a dollar a day, many of them in Asia. This, the largest continent, with the greatest number of inhabitants, and with many different cultures with long-standing traditions, will surely prove itself as a memorable site for nutrition scientists and practitioners from around the world to meet. I look forward to seeing you in Bangkok.



For further details on IUNS activities and the ICN program, see the IUNS website (www.iuns.org).

Ricardo Uauy, President of the International Union of Nutrition Societies (IUNS) 2006–2010

Feature:

2008 Innovation in Nutrition Award

On May 27, 2009, during the GAIN Business Alliance Global Forum in Amsterdam, the Global Alliance for Improved Nutrition (GAIN) and the International Business Leaders Forum (IBLF) awarded the 2008 GAIN Business Award for Innovation in Nutrition to DSM for its efforts in rice fortification. The GAIN Business Award for Innovation in Nutrition was established in 2008 to recognize companies displaying outstanding innovation in the development of new products and services to fight malnutrition, improve public health and promote sustainable development. The award will be presented annually. The 2008 Award had over thirty entries from all over the world.

After a thorough screening of all the applications, the international panel of eight judges was unanimous in their selection of DSM. They were particularly impressed with the innovative features of NutriRice®. “In the past, rice fortification efforts have not been very successful due in part to cultural and dietary preferences,” said Panel Chair Will Oulton, Director, Responsible Investment, FTSE Group. “DSM’s work to develop a process, which has made a fortified rice product acceptable across low income communities, is a significant nutritional product innovation.”

The jury also recognized Shijiazhuang Zhenji Brew Group Co Ltd, a Chinese company that successfully markets iron-fortified soy sauce to the vulnerable rural population in China, and Valid International for its approach to addressing acute malnutrition at scale (Community-based Therapeutic Care combined with the production of a range of ready to use foods in developing countries).

At the Award Ceremony, DSM, represented by Mauricio Adade, President Human Nutrition and Health, received a specially commissioned artwork by the young Argentinean entrepreneur, Natalia Bembrive. Natalia was chosen from among numerous candidates by the Youth Business International (YBI) network. YBI gives young people the opportunity to start up in business by providing them with access to credit and mentors.

Ensuring effective rice fortification

Rice serves as the staple food of more than half the world’s population. However, white rice is not a good source of critical vitamins and minerals. To overcome shortfalls in existing rice fortification technology, DSM, in cooperation with the Swiss company Buhler, developed NutriRice®, a product made from broken rice kernels (a by-product of normal rice production) that is indistinguishable from unfortified rice in looks



Mauricio Adade of DSM accepts the 2008 GAIN Business Award

and taste, yet still highly nutritious, even after washing and cooking. The broken rice kernels are milled, a specially formulated premix of vitamins and minerals is added, and the mixture is run through an extruder. The resulting fortified rice kernels can be added to normal rice at a ratio of 1–2% without affecting the taste or color. NutriRice® is produced by a Chinese joint venture called Wuxi NutriRice Ltd.

NutriRice® was a key component of a nutrition project conducted by the Chinese Centre for Disease Control, aimed at improving the nutrition of the children of Chinese migrant workers at Dandelion Middle School near Beijing (see Nutriview 2008/1). The Chinese authorities wanted to examine the impact of improved nutrition on the mental and physical performance of some of the poorest children in the country. Children were fed eggs, fortified soy sauce and vegetable oil as well as NutriRice® over ten months. The results were extremely promising:

Impact of nutrition improvement in Chinese schoolchildren 2007/2008.

- Anemia prevalence fell from 13.7% to 2.5%.
- Vitamin B1 deficiency fell from 24.8% to 4.5%.
- Vitamin B2 deficiency fell from 17.7% to 7.9%.
- Zinc deficiency fell from 33.9% to 14.1%.
- Aerobic and physical strength increased.
- Cognitive and learning performance improved significantly.



NutriRice® simulated rice kernels look exactly like ordinary rice (upper photo). After they are blended with rice and cooked, they are undetectable (lower photo).

Source: GAIN, IBLF and DSM

Feature:

Improving Asians' nutrition with fortified flour

According to the Flour Fortification Initiative (FFI) [1], nearly 2 billion people worldwide have access to fortified wheat or maize flour. Thirty percent of wheat flour from roller mills is currently fortified; up from 18% in 2004. This is because 57 countries mandate fortification of one or more types of flour with micronutrients. Other countries are preparing to adopt similar legislation in the near future.

In the USA, Canada, Chile, Costa Rica and South Africa, the incidence of neural tube defects has fallen significantly following mandatory flour fortification with folic acid (between 23% in the USA and 78% in Newfoundland, Canada). Fortification of maize and wheat flour with iron in Venezuela produced a sustained reduction in the prevalence of iron deficiency (as measured by serum ferritin) from around 36% to around 15% among children from low-income families [2].

In 2008, the world's leading economic experts ranked salt iodization and fortification of staple foods with iron as the third-best investment the world can make to improve the state of the planet [3]. Benefit-cost analyses indicate that flour fortification is highly cost effective.

Flour fortification in Asia makes sense

The staple food of most Asians is rice. It is therefore a common perception that they would not benefit from wheat flour fortification. However, wheat flour consumption in China, India, Malaysia and Mongolia is about the same as in countries that have practised flour fortification successfully for many years (Figure 1). Moreover, flour fortification can still make a significant contribution to micronutrient intakes, even for people who consume very little flour, as shown in Indonesia and the Philippines.

Overall, consumption of wheat flour products, in the form of convenience foods such as sliced bread and instant noodles, is increasing. For example, sales of instant noodles in Indonesia and China have risen by 38% over the past five years, and account for over half of global demand. This is not only due to an increase in the amount consumed per person, but also to a greater proportion of the population that regularly consumes wheat flour products.

Wheat flour fortification can, therefore, be considered as one intervention in a comprehensive package of approaches to reduce vitamin and mineral deficiencies, even in countries where flour is not the main staple. Knowledge of the distribution and consumption patterns for wheat flour products helps to determine where and to what extent flour fortification could have a nutritional impact. This information can be used to

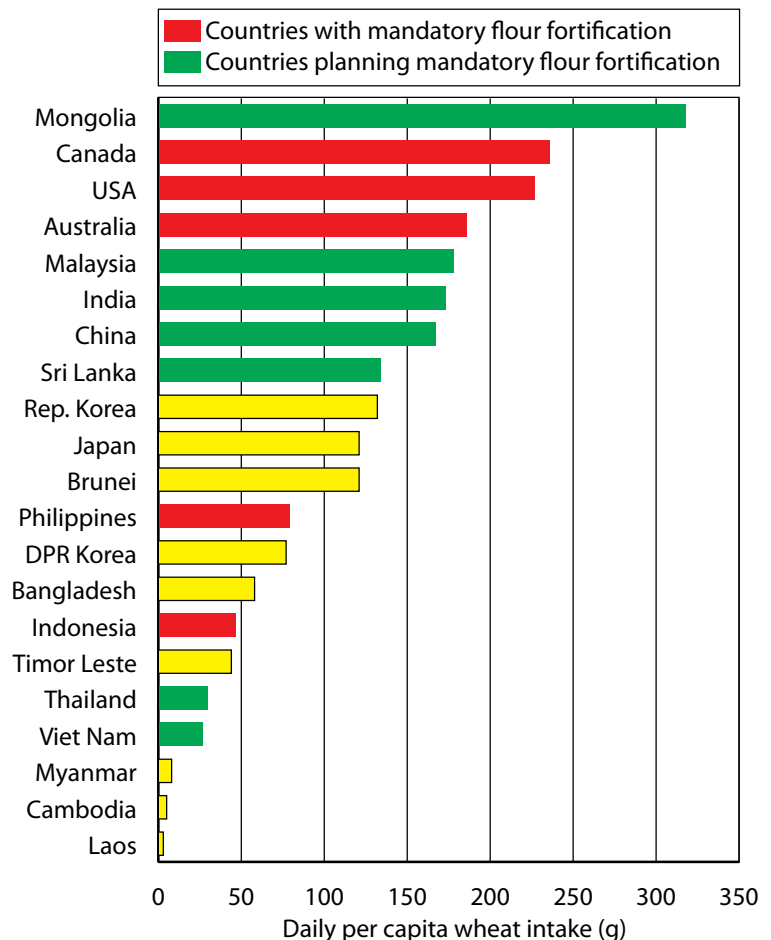


Figure 1. Total wheat consumption (g/capita/day) in selected countries. (FAO Food Balance Sheets 2003: <http://faostat.fao.org/site/609/default.aspx#ancor>)

develop appropriate monitoring strategies, and to decide if additional interventions are needed to reach groups who may not benefit optimally from the additional nutritional value of fortified flour.

The feasibility of national flour fortification depends largely on the structure of the milling industry. In most of the countries in Asia that are currently fortifying flour or are planning to do so, the number of mills is relatively small (Table 1). These mills are all large, highly sophisticated operations, in which fortification and quality control systems are easily implemented.

Status of flour fortification in Asia

China: China has a large number of very small mills that would find it hard to meet quality standards for fortified flour. There are, however, about 1,000 large mills that produce >100 tons/day (about 50% of flour consumed).

India: Voluntary flour fortification started in 1998. More recently, the Government of India expressed its concerns about the consequences of malnutrition for public health, and asked all state governments to adequately address the problem. State governments decide whether to fortify on the basis of their own assessments. Programs have been in operation in Gujarat, West Bengal and Tamil Nadu for several years. Other states have expressed interest to implement flour fortification in the near future. In 2008, key stakeholders, through the Flour Fortification Initiative, formed the India Flour Fortification Network (IFFN) to provide technical advice and joint advocacy for flour fortification. The Micronutrient Initiative is host to the IFFN secretariat in Delhi.

Indonesia: Between 1998 and 2003, the government put into place the necessary legislation and regulations to mandate the fortification of all wheat flour for domestic consumption with iron, folic acid, zinc and some B vitamins. In so doing, it became the first country in the region to adopt mandatory flour fortification. Today all flour imported or locally milled is fortified.

Malaysia: The Ministry of Health of Malaysia, with the support of the Ministry of Industry and the Economic Planning Unit, is currently in the process of submitting a proposal for mandatory fortification of all wheat flour with iron, folic acid and some B vitamins. By the end of 2009, Malaysia is expected to be the third country in the region to adopt mandatory flour fortification.

Mongolia: Mongolia has the highest wheat flour consumption in the region, and fortifies 70% of domestically milled flour. As most of the flour consumed in Mongolia is imported from China and Russia,

Table 1. Number of flourmills in selected Asian countries

| | |
|---|------|
| China (mills producing more than 50 MT daily) | 9800 |
| India (medium-to-large capacity roller mills) | 1050 |
| Indonesia | 9 |
| Malaysia | 13 |
| Mongolia | 28 |
| Philippines | 15 |
| Sri Lanka | 2 |
| Thailand | 8 |
| Viet Nam | 21 |

discussions are now underway to develop legislation to ensure that imported flour is also fortified.

Philippines: The Food Fortification Act, issued in November 2000, mandated the fortification of all wheat flour with iron and vitamin A. It also called for fortification of cooking oil and sugar with vitamin A, and rice with iron. Full implementation was called for by November 2004. So far, only flourmills comply fully with the Act, and all flour produced in the country is fortified.

Sri Lanka: Sri Lankans eat a moderate and increasing amount of flour products in the form of bread and noodles. The country has only two mills that meet almost 100% of domestic demand. Because flour fortification could help to solve the intractable problem of anemia, the government is considering flour fortification as part of a comprehensive strategy.

Viet Nam: The Ministry of Health in Viet Nam is currently pursuing mandatory fortification of all wheat flour. The consumption of flour in Viet Nam is relatively low. However it is increasing, and flour fortification is perceived as a highly feasible way to address at least some of the micronutrient deficiencies that occur extensively in the country.

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Review:

Rice fortification technologies assessed

The industrial fortification of food staples is one of the most cost-effective measures to improve human nutrition and health. Rice is the main staple in many countries around the world. Rice fortification could therefore significantly help to raise micronutrient intakes in the populations of these countries. Although some studies have shown that fortified rice can correct micronutrient deficiencies, very few countries currently implement a rice fortification program. This shows that the introduction of a fortification program does not necessarily follow successful efficacy trials; it also depends on the conditions of food production and trade.

Under a cooperative agreement with the United States Agency for International Development (USAID), the Academy for Educational Development (AED) collaborated with the Institute of Food Technologists (IFT) to assess four methods of rice fortification in China, Costa Rica, the Philippines and the USA. These countries illustrate various contexts for rice fortification, including high versus low per-capita rice consumption, net exporter versus net importer of rice, mandatory versus voluntary fortification, and national scale versus limited scale. The fortificant mix used in each country was similar regardless of the method used. All the countries except Costa Rica included iron, although the source of the iron varied. The Philippines added only iron, whereas the other countries added 4–7 vitamins and minerals.

Two-person teams (an agricultural economist and a food technologist) visited the study countries in 2007 and met with industry and government representatives, as well as other stakeholders. The study aimed to document current rice fortification practices, industrial requirements, the initial investment and recurring costs; it also assessed if rice fortification in developing countries would be technically and economically feasible, and what implications it would have for the population.

The 4 methods of rice fortification studied were:

1. **Hot extrusion.** Dough made of rice flour, fortificant mix and water is passed through a single or twin-screw extruder, and cut into rice-shaped simulated kernels. As the process involves relatively high temperatures (70–110°C), these kernels are fully or partially pre-cooked. Hot extrusion produces grains that closely resemble regular rice kernels in sheen, consistency, transparency and flavor. It is the most expensive of the analyzed methods.
2. **Cold extrusion.** Dough made of rice flour, fortificant mix and water is passed through a simple pasta press, and cut into rice-shaped simulated kernels. It is primarily a low temperature (below 70°C) process, and does not utilize any additional thermal energy other than the heat generated during the process itself. The resulting grains are uncooked,



Rice serves as the staple food of more than half the world's population

opaque and easily differentiated from regular rice kernels.

3. **Coating.** The fortificant mix is combined with ingredients such as waxes and gums. This mixture is sprayed on the surface of the rice grains in several layers to form the fortified rice-premix. Coated kernels can have a distinctive color, smell and taste that some consumers consider objectionable.
4. **Dusting.** The polished rice grains are dusted with a micronutrient premix in powder form. This sticks to the grain surface as a result of electrostatic forces. The micronutrients are easily removed if the rice is rinsed or washed before cooking. It is the least expensive of the four methods.

Hot extrusion, cold extrusion and coating produce a concentrated rice premix that is blended with retail polished rice in a ratio of 1:100 to 1:200. With dusting, the fortificant mix is applied directly to the retail rice.

Recommendations

Based on their assessment and theoretical cost comparisons, the study teams recommend that countries planning to introduce rice fortification should take the following factors into consideration:

- **Consumer preferences.** If consumers are critical about the appearance of the fortified rice, hot extrusion might be the only acceptable method. If they are not so demanding, rice fortified by cold extrusion or coating can be considered.
- **Levels of consumption.** If the target population eats less than 100 g of rice daily (36 kg/year), the

A PDF copy of this report, published in April 2008, can be accessed at the A2Z website (<http://a2zproject.org/pdf/Food-Rice-Fortification-Report-with-Annexes-FINAL.pdf>)



introduction of rice fortification using rice premixes is not worth the investment, because of the high cost of the premix production equipment.

- **Coverage and Cost.** If rice fortification is for a large population, hot extrusion is the preferred technology, because it produces a higher quality product. However, it costs 10% and 25% more than cold extrusion and coating, respectively. For small populations (less than four million persons) or specific programs, cold extrusion and coating could be a practical and less expensive way to get started.
- **Production facilities.** Hot extrusion should only be considered if the estimated annual demand is at least 1,500 MT (metric tons) of rice premix; this is sufficient to fortify 150,000–300,000 MT of retail rice. The initial investment in a factory for hot extrusion is around US\$4 million. Cold extrusion or coating is appropriate when the annual demand is at least 300 MT of rice premix, which is sufficient to fortify 30,000–60,000 MT of rice. The initial investment in a factory of this type is approximately US\$750,000 (for cold extrusion) and US\$300,000 (for coating).
- **Mill size.** Rice fortification by many small mills increases the cost of the program and presents logistical difficulties for delivery of the rice premixes, quality control and governmental inspection. Large, centralized mills are more cost efficient. Rice fortification is practical to implement in mills that produce more than 5 MT/hour (15,000 MT/year).
- **Fortification formula.** It costs more to fortify rice than other types of food, because of the technology involved. However, the number and type of micronutrients in the fortificant mix has little influence on the final cost. Two-thirds to three-quarters of the total cost of hot extrusion, cold extrusion and coating depends on factors associated with manufacturing the fortified rice premix, and investing in equipment and facilities. Therefore, to make the investment worthwhile, it is preferable to consider multiple fortification with the micronutrients that are deficient in the diet.
- **Overall cost.** Independent of the fortification formula and the fortification process, it costs about US\$1 to produce one kilogram of rice premix; the subsequent commercial price is around US\$2/kg. This represents about 90% of the total fortification cost. Consequently, it costs US\$10–20 to fortify a



A machine for hot extrusion of fortified, simulated rice kernels

metric ton of retail rice. This means that people who eat 100 g of rice daily would pay US\$0.36–0.73 more for a year's supply of fortified rice than for unfortified rice; those who eat 300 g daily would pay US\$1.09–2.18 more.

- **Financial sustainability.** Although an increase of 2–4% in the current retail price of rice due to fortification is not a limiting factor with branded rice aimed at the high-end market, it could be a constraint for implementing mass-fortification programs. If this is the case, countries might still consider establishing subsidized social programs targeted at vulnerable groups.

The authors conclude that cold extrusion and coating could be a practical way to introduce fortified rice in developing nations. Hot extrusion produces the best quality product and retains the most nutrients; for high-demanding consumers it might be the only acceptable alternative. However, it is the most expensive method. While dusting is the least expensive method, it is not recommended for countries where the rice is washed before cooking.

Omar Dary, Food Fortification Specialist, Academy for Educational Development, Washington DC, USA

Conference report:

Micronutrient Forum stresses urgent need for life-saving interventions

The second international meeting of the Micronutrient Forum, hosted by the Micronutrient Forum Program Committee and the Chinese Center for Disease Control and Prevention (Chinese CDC), was held in Beijing, China, 12–15 May 2009. The focus of this year's event was the implementation of micronutrient programs in real world settings. Despite heightened alerts on a potential outbreak of pandemic (H1N1) 2009 virus infection in humans, over 650 delegates from more than 70 countries attended. Nutrition specialists from academia, government, nongovernmental organizations and the private sector engaged in discussions on the latest findings in micronutrient interventions, program implementation strategies, partnerships, and commercial initiatives around the world.

In his opening remarks, Alfred Sommer, Chairman of the Micronutrient Forum Steering Committee, noted how the high attendance and interest in the meeting illustrates the value of the Micronutrient Forum in sharing scientific and programmatic ideas on how to reach the poorest of the poor with effective and low cost micronutrient interventions.

In his welcome address, Yin Li, China's Vice Minister of Health, noted that China has made significant progress in controlling micronutrient deficiencies. He shared examples of these best practices, particularly in the areas of salt iodization and food fortification. He also confirmed that much work is still needed to control micronutrient deficiencies and promote economic development around the globe. He considers the Micronutrient Forum as a key opportunity to share information and experiences in an effort to meet these objectives.

It was then the turn of Counselor Brent Christensen (US Embassy in China), Francesco Branca (World Health Organization), Werner Schultink (UNICEF), and Martin Bloem (World Food Program) to welcome the delegates. The inaugural ceremony highlighted the importance of continuing to focus on effective and low-cost delivery of micronutrient programs, ensuring sustainability, and integration with other nutrition, health and development goals.

In the following session, participants were given a synopsis of the findings of the groundbreaking Innocent Micro-nutrient Program Meeting, which was held in Florence, Italy, in September 2008. This meeting had reviewed, discussed and synthesized the evidence on implementation and impact of large-scale programs, worked towards reaching a consensus among global partners for guiding country-level program managers, and made recommendations for the program of the Micronutrient Forum meeting.



Alfred Sommer: “Enlightened leadership and political commitment can move mountains”

Beijing Micronutrient Forum: Plenary session topics

Status of micronutrient programs in China

Vitamin A supplementation programs for children 6-59 months

Universal salt iodization

Maternal iron and folic acid supplementation

Food fortification

Long term effects of early micronutrient exposure

Micronutrient Powders and Spreads

Zinc Treatment for Diarrhea Management and Control

Agricultural-based Programs: Biofortification

Micronutrients and Maternal, Newborn and Child Health: New Research

Micronutrient Program Management and Sustainability

Micronutrient Metabolism

Poverty Alleviation Programs: Maximizing Nutritional Benefits

In addition to the plenary program, the meeting encompassed 16 independent satellite sessions, in which participants discussed a wide range of 'burning' topics. Three of these sessions are described below.

WHO fortification guidelines (FFI)

Sixty people attended the satellite session organized by the Flour Fortification Initiative (FFI) on 13 May to hear about research supporting the World Health Organization (WHO) consensus statement endorsing flour fortification (described in Nutriview 2009/2). Leading experts presented information on the value of iron, folic acid, vitamin B12, vitamin A and zinc, the nutrients included in the WHO statement. The presentations can be viewed at: <http://www.sph.emory.edu/wheatflour/fortguidelines.php> by clicking on the nutrient name in the table showing recommended nutrient levels on that page. Russian and Chinese translations of the guidelines are also posted there; French, Spanish, and Arabic versions are in preparation. FFI will discuss the WHO guidelines again during the International Congress of Nutrition in Bangkok, Thailand. It will also conduct several training courses in East Asia and Africa in 2009/2010.

Implementing zinc intervention programs (IZiNCG)

The speakers at the satellite session organized by the IZiNCG Steering Committee on 14 May presented the findings of the new IZiNCG technical document (http://www.foodandnutritionbulletin.org/downloads/FNB_v30n1_Supplement_izinc.pdf) and reviewed in Nutriview 2009/2).

Christine Hotz (HarvestPlus) gave a brief overview on IZiNCG; Janet King (Children's Hospital Oakland) described strategies and challenges on assessing zinc status; Kenneth H. Brown (University of California Davis) spoke about the impact of preventive zinc supplementation, and Rosalind Gibson (University of Otago) about dietary diversification and modification to improve zinc intake. Marie Ruel (International Food Policy Research Institute) summarized the findings, and identified strategies on how to mainstream zinc into ongoing public health programs. All these presentations are available on the IZiNCG website (www.izincg.org/more.php).

The session concluded that there is substantial evidence available on the beneficial impact of preventing zinc deficiency, and opportunities exist to integrate zinc into nutritional and health programs. Appropriate action is urgently needed to achieve measurable progress.

Criteria for fortification effectiveness (A2Z and DSM)

The satellite session convened by A2Z and the DSM Nutrition Improvement Program on 14 May drew attention to the importance of planning, design, supervision and quality for the success of a food fortification program.

Richard Hurrell (Federal Institute of Technology, Zürich) speaking on behalf of Lindsay Allen (University of California, Davis) presented the biological and scientific issues. The first step when considering food fortification is to provide documented evidence that the micronutrient content of the diet is insufficient, and that fortification could improve micronutrient status or provide a health benefit. For this, it is essential to assess the population's micronutrient status and usual food intakes. In this respect, it is important to realize that reliable, low-cost biochemical assay methods still need to be developed. Dietary assessments should cover diverse subgroups. This shows which food vehicles are most suitable for fortification, and how the impact of specific levels of addition will affect the prevalence of inadequate and excessive intakes of each nutrient. It is also important to monitor the effect of on-going programs. New approaches make it easier to assess the acquisition and retention of iron and vitamin A, and the uptake of zinc. Increased attention should be paid to the functional and health consequences of fortification programs.

In the second presentation of this workshop, Omar Dary (A2Z) described the essential components of a fortification program, emphasizing once again the importance of responding to the assessed need. Fortification should provide deficient micronutrients at such a level that the daily intake of almost all individuals is above the Estimated Average Requirement (EAR), but below the Tolerable Upper Intake Level (UL). When calculating how much of a particular micronutrient to add, it is important to take into consideration the intrinsic level of that nutrient in the unfortified food. Also, standards should be defined as averages. For each food vehicle, an accepted analytical range, process, sampling method and chemical methodology should be determined experimentally.

In the final presentation, Héctor Cori (DSM Nutrition Improvement Program) introduced the DSM "Quality is Essential" initiative. He stressed that the scientific and public policy agendas do not consider quality as prominently as it deserves. The public health benefit that can be achieved with fortification is clearly a function of the quality of the program in general, as well as of the quality of the ingredients used. Listing the technical aspects that constitute quality in food fortification, he showed how the resultant quality is as strong as its weakest link. By paying attention to the quality aspects at all stages of the fortification process, the program will be more effective, have a greater effect on public health, and result in a higher economic return. Finally, he urged all stakeholders to widen the initiative to a global quality dialogue that will establish criteria, guidelines and regulatory frameworks to raise quality standards to a level that maximize the chances for success. (See also: Nutriview 2007/3).

The first morning finished with the launch of the 2009 Global Report on Vitamin and Mineral Deficiencies (Investing in the Future: A United Call to Action on Vitamin and Mineral Deficiencies: reviewed in *Nutriview 2009/2*). This document, supported by seven of the world's leading development agencies, called on governments and other partners around the globe to demonstrate their commitment to children and families in developing countries by increasing investments in life-saving vitamins and minerals (<http://www.unitedcalltoaction.org>).

On the second day, SIGHT AND LIFE inaugurated its Young Investigators' Award, which serves to recognize young researchers for micronutrient research that has scientific, policy or programmatic relevance. It also aims to facilitate interactions between young investigators, leading scientists and researchers. The first recipients of the award were Christine Stewart (USA), Hossain Md Iqbal (Bangladesh) and Sebayang Susy Katikana (Australia/Indonesia).

SIGHT AND LIFE also organized a panel discussion that brought together high-level representatives

from PepsiCo, DSM, Unilever, Interflour Group and Amway to discuss the role of the private sector as a key partner in solving micronutrient malnutrition. The panel issued a declaration urging a united effort to efficiently deliver micronutrients to those at the bottom of the pyramid. For more information, see <http://www.sightandlife.org/images/stories/pageimages/content/News/beijing%20joint%20declaration.pdf>.

In his closing remarks Dr Sommer focused on the incredible progress that the micronutrient community has achieved since the initial meetings of the International Vitamin A Consultative Group (IVACG). "...I was struck, at this meeting," he said, "by how far we've come from that original orthodoxy; by the range of innovative approaches to micronutrient deficiencies now being vigorously pursued. These include everything from centralized fortification schemes using multiple micronutrients, to 'point-of-consumption' fortification with micronutrient powders in the home. Science is easy; implementation is tough! But... enlightened leadership and political commitment can move mountains."

This report is based on information provided by the Micronutrient Forum Secretariat, FFI, Sight and Life, and Christine Clewes, Medical Research Council Collaborative Centre for Human Nutrition Research, Cambridge, UK.

The proceedings of the Forum will be published in the SIGHT AND LIFE Magazine. Reports on a number of satellite meetings and the executive summary of the conference are also featured in issue 2/2009 of the Magazine.

Review:

Moving forward in public health nutrition

The Proceedings of the First World Congress on Public Health Nutrition (I WCPHN) that was held in Barcelona, Spain, on 28–30 September 2006 in association with the VII Congress of the Spanish Society of Community Nutrition (SENC) was published in April 2009 in a special supplement of *Nutrition Reviews* [1].

SENC and the International Union of Nutritional Sciences (IUNS) organized the I WCPHN on the incentive of Lluís Serra-Majem (University of Las Palmas, Gran Canaria) and Javier Aranceta (University of Pamplona/Bilbao Department of Public Health), in awareness of the interrelationship between nutrition and public health, and the lack of opportunities for professionals from both fields to meet. The meeting attracted participants from 79 countries, and led to the founding of the World Association for Public Health Nutrition.

In the introduction to the Proceedings, Dr Serra-Majem calls for alliances and synergies on a global scale among various stakeholders (scientists, governmental and nongovernmental organizations, healthcare professionals, food industry, media, consumers, and regulators). He reminds readers that partnerships are critical to innovatively combine competencies and resources to address persistent global health problems.

A long road

Igor de Garine (Centre National de la Recherche Scientifique, France) and Jose Maria Bengoa (Basque Republic and Venezuela; formerly with WHO, 1955–75)



Congress President Lluís Serra-Majem at the opening session

reflect independently on the long and arduous road taken by public health nutrition since the 1940s. Dr de Garine reviews past relationships between the social sciences and malnutrition, beginning with the provocative statement: "While it is possible to determine who is suffering from malnutrition, identifying the factors responsible for it is another matter." After critically analyzing factors that have influenced what

people eat, he concludes that social scientists can help to detect the causes of malnutrition, and suggest possible solutions.

Dr Bengoa, an early proponent of applying the concept of nutrition to public health in the modern era, shares his odyssey of discovery, highlighting how the initial thrust of UN agency attention to finding new sources of high-protein foods has evolved to a concern for chronic nutrient deficiency characterized by short stature. He agrees that interests are passing from the synergy of undernutrition and infection to the interrelationship of undernutrition and obesity.

Need to unlearn long-held attitudes

My own contribution to the Proceedings defines the concept of developmental origins of health and disease as an emerging paradigm for relating evolutionary biology to contemporary health issues. I consider that the biology behind the Barker hypothesis, which defines the health consequences of intrauterine and infantile programming, spans and links the geographical contexts of rich and poor societies. Scientific insights into a modified aphorism, “you are what your mother eats,” have important implications. We need to challenge the generality of one-size-fits-all solutions, and learn how to translate the relevant evidence into appropriate actions at the community level.

Breaking the poverty/malnutrition cycle

Three papers consider the influence of poverty on malnutrition. Ricardo Sibrian (Food and Agriculture Organization) discusses the causes and indicators of hunger. He describes three major hunger indicators (prevalence of undernourishment, prevalence of critical food poverty, prevalence of child undernutrition) and outlines how they can be used to assess the extent of food insecurity in population groups at all levels.

A consortium of authors from Nigeria, Iran, Morocco and Spain describes factors that are hindering development in Africa and the Middle East, and suggests ways to break the poverty/malnutrition cycle. The paper concludes that inequalities in these regions need to be addressed politically; nutrition solutions need to be found that are adapted to each country's particular circumstances.

The Corporation for Childhood Nutrition (CONIN) founded in Chile in 1975 to assist in the recovery of malnourished children in the first three years of life, provides important social support and health education to families. A team representing the CONIN Evaluation Study Group reports on a retrospective study conducted in Argentina to evaluate the effects of the program. In the development of preventive programs, it says, the challenge to find ways to educate families, and induce them to modify their lifestyle in order to improve health and education continues.

Improving micronutrient intakes

The Proceedings contains at least five papers on the prevention of micronutrient malnutrition. Lindsay



José Mataix (center), recipient of the José Maria Bengoa Award for Outstanding Achievements in Public Health Nutrition, with Ricardo Uauy and Lluís Serra-Majem

Allen (United States Department of Agriculture) discusses the use of current assessment indicators of micronutrient status, and the need for more use and understanding of functional indicators. Cecilio Moron (Former Senior Food and Nutrition Officer, FAO Regional Office for Latin America and the Caribbean) and Fernando Viteri (Children's Hospital of Oakland Research Institute) continue this theme in the specific context of iron and anemia.

Erick Boy (HarvestPlus, IFPRI, Canada) and co-authors from various multilateral agencies discuss the achievements, challenges, and promising new approaches in the control of micronutrient deficiency. They make a call for continued research and advocacy to promote awareness among public-health decision makers of the importance of micronutrient nutrition for health. They also encourage governments, international agencies and private organizations to take appropriate actions to ensure the sustainability of proven interventions.

Folate is a problematic nutrient with public-health relevance for countries of both the North and South. Gregorio Varela-Moreiras (University of San Pablo, Madrid) reviews interactions between cobalamin and folates, and their impact on health. He draws attention to the risk of neuropathy due to masking of cobalamin deficiency as a result of folic acid supplementation. Mark Lawrence (Deakin University, Victoria, Australia) and five other investigators from China, Finland, Ireland, the UK and the USA examined selected national policies toward mandatory fortification with folic acid. They support the view that a policy should take into account national circumstances and a national authority's assessment of the risks and benefits.

Nutrition habits affect long-term health

As might be expected, the IWCPHN had a Mediterranean flavor. This is reflected in the wide attention to diet and preservation of health in general, and the rich experience gained from studying the Mediterranean diet. It is, of course, an uphill struggle to retain the



José Maria Bengoa: “We are going through a process of change, passing from the synergy of undernutrition and infection to the interrelationship of undernutrition and obesity”

elements of traditional cuisines. However, as various papers in the Proceedings show, people who adhere to this diet, and have a high “Mediterranean score” of olive oil, fruits and vegetables, fish, seafood and wine, show better outcomes for survival and long-term health.

Eleven papers are about overweight and obesity, its health consequences, and how it might be prevented or remedied. Adam Drewnowski (University of Washington) notes that groups with the lowest levels of education and income have the highest rates of obesity and type-2 diabetes. As a possible solution, he proposes a combination of agricultural subsidies, pricing policies, regulatory action and consumer education. Javier Aranceta and his colleagues present the strategies currently in place for preventing obesity in Spain. These include nutrition education and enhancement of physical activity in schools and the workplace; activities require the support of government, mass media, catering services and the food industry.

In the experience of another group of Spanish researchers, studying the relationship between physical activity and obesity faces several methodological problems. Affected individuals tend to overestimate their physical activity and underestimate their food intake. In a roundtable symposium that discussed how to prevent childhood obesity, the participants agreed that the worldwide situation is, in itself, sufficient evidence for action. The finding that metabolic syndrome (a cluster of metabolic abnormalities associated with obesity that increases disease and mortality risk) already affects more than a quarter of some Mediterranean populations, supports the need for comprehensive public health lifestyle interventions.

The nutrition transition is a phase of social evolution of low-income societies in which the traditional problems of undernutrition and deficiencies continue, but are joined by the emerging problem of overnutrition and overweight [2]. In a prospective study on the effects of social and economic transformation in China, Zhai Fengying and his collaborators found that, over the past

twenty years, there has been a significant increase in diet-related, non-communicable diseases in the country. Reviewing the manifestations and consequences of the nutrition transition in Mexico in detail, Juan Rivera (National Institute of Public Health, Mexico) concludes that the country’s principle of “research with a mission” has had a positive influence on public health policies and programs.

Looking forward

In a recent article, Gerald T Keusch wrote: “When you reach the fork in the road, take it” [3]. True to this motto, we started planning for the II WCPHN 3 years ago. It is scheduled to take place on 23–25 September 2010, together with the I Latin American Congress of Community Nutrition of the Latin American Community Nutrition Group (GLANC) in Porto, Portugal. Once again, IUNS and SENC are the main sponsors. The central theme, “Moving toward a healthy and sustainable nutrition,” is a dynamic one. It is probably better chosen than we could have imagined three years ago. A deepening understanding of the implication of climate, the surge in food commodity prices and protectionist responses, and the worldwide economy and employment situation have all added new complexity and dimensions to the public health response for ensuring a quality diet for all.

References

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2. Popkin BM. *The nutrition transition in low-income countries: An emerging crisis*. *Nutr Rev* 1994; 52: 285–298.
3. Keusch GT. *When you reach the fork in the road, take it: Science and product development as linked paths*. *Am J Law Med* 2008; 24: 141–149.

Noel Solomons (CeSSIAM, Guatemala) was a Member of the Scientific Committee for the I WCPHN and guest editor of the Proceedings. He is also co-President of the Scientific Committee for the II WCPHN.

Feature:

Vital nutrition: a human right

Micronutrient deficiencies continue to ravage developing countries. About a quarter of the children in those countries are underweight, and one third face a future impaired by the long-term effects of their poor nutrition. Every year, nearly ten million infants die before their fifth birthday, many of them as a result of conditions associated with malnutrition. Simple, low-cost interventions can significantly improve the lives of the world’s poorest, and have a rapid and measurable effect on economic development. For the best results, a long-term investment by national governments and

their partners is desirable. Fortunately, numerous nongovernmental organizations are also dedicated to helping those with the greatest needs.

One of these organizations is Vitamin Angels, a not-for-profit public health agency based in Santa Barbara, California. Founder and President Howard Schiffer established Vitamin Angels in 1994 to provide health assistance for domestic disaster relief. Today, Vitamin Angels works to reduce child mortality in over thirty countries around the world, mainly by supplying micronutrient supplements and deworming





India is one of the countries where Vitamin Angels works to reduce child mortality

tablets to children and mothers in need. In the past year alone, Vitamin Angels has provided over 100 million doses of nutritional supplements worldwide; support worth more than US\$40 million. Its programs and initiatives are funded through generous donations from private individuals, foundations and businesses (mainly the natural products industry). As a grassroots organization, Vitamin Angels is remarkably efficient. Its administrative budget is less than 5% of the total donations received.

To achieve its humanitarian objectives, Vitamin Angels creates innovative distribution models and unique partnerships to deliver life-saving micronutrients. It works with partners who have an intimate understanding of the community being served. In this way, it is able to reach underserved populations with little access to facility-based health care. Project approaches are individualized, and apply local solutions.

Vitamin Angels has two core programs:

1. Operation 20/20 is an international vitamin A campaign that aims to reduce infant mortality, and eliminate childhood blindness resulting from vitamin A deficiency. It stresses that, through the twice-yearly distribution of high-dose vitamin A supplements (costing just 25 cents) to at-risk children during the first five years of life, mortality rates can be reduced by 23%. Operation 20/20 currently

works in 23 countries on three continents, reaching about ten million children and 500,000 pregnant or lactating women annually.

2. Thrive to Five is Vitamin Angels' global multivitamin campaign. This program focuses on providing essential micronutrients, in the form of daily multivitamins, to children under five, and pregnant and lactating mothers. Daily supplements give at risk children the vital first step needed to excel physically and cognitively, rather than simply survive their key developmental years. Expecting mothers receive essential nutrients to improve their health as well as that of their child. Thrive to Five currently distributes around 100 million doses of essential micronutrients annually in 21 countries on four continents, including the United States.

The people at Vitamin Angels believe that everyone has a right to basic nutrition, that vitamin deficiency diseases can be prevented, and that education together with supplementation is the key to long-term health. Their vision is to create a world where pregnant women get the nutrition they need to deliver healthy babies, where not a single child dies due to a simple vitamin deficiency, and where adults and children are free from the easily preventable consequences of deficiency.

Vitamin Angels website: www.VitaminAngels.org.

Vitamin Angels, Santa Barbara, USA

Editorial:

How are we doing?

By distributing this special issue of Nutriview at the 19th International Congress of Nutrition (ICN) in Bangkok, we take the opportunity to communicate face-to-face with nutrition specialists, who are important for the success of our newsletter. Thanks to their support, we are able to make it an interesting and attractive publication, and encourage more countries to introduce nutrition measures that will improve the lives of people living at the base of the pyramid. I therefore look forward to discussing with visitors to the Bangkok meeting what still needs to be done.

Nutriview was created in response to the call for widespread support to eliminate malnutrition at the 1992 WHO/FAO conference held in Rome. Since 1993, Nutriview has regularly informed people who can make an impact on how a country feeds its population about what is happening in nutrition research. As a contribution towards increasing understanding for the role of nutrition in maintaining good health, Nutriview endeavors to update knowledge and eliminate misconceptions about micronutrients, to give practical advice about how to improve nutrition and health, and to provide a forum for discussion on nutritional problems.

The Nutrition Improvement Program of DSM Nutritional Products currently publishes Nutriview four times a year as an electronic newsletter in English, Spanish (since 1996) and Chinese (since 2006). A regular issue has eight pages. Each issue informs about recent efforts by various countries, development

organizations and researchers to eliminate micronutrient malnutrition. It can include reports on significant advances in research and technology, news about successful interventions and important meetings in the field of nutrition, reviews of recent nutrition-related publications, and other nutrition news from around the world. To ensure that the information we publish is a correct interpretation of the science involved, three highly respected and independent nutrition experts serve on the Nutriview Editorial Board as advisors to the Editor. I am especially proud to note that the current President of the International Union of Nutrition Societies (IUNS), under whose auspices the ICN is organized, has been a member of this team since 1994, and two Past-Presidents (Ratko Buzina and Aree Valyasevi) served until the end of 2001 and 2005 respectively.

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- <http://www.nutritionimprovement.com/nutriview.html> or
- <http://www.nutritionimprovement.com.cn/ /publications/?44> (Chinese)

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A. Bowley

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