



Nutriview 2003/4

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■ **Nutriview** is a quarterly newsletter on the role of micronutrients in nutrition and health. It is published by DSM Nutritional Products/Roche Vitamins Europe, Basel, Switzerland, as a service to health-care professionals and science communicators. The findings, interpretations and conclusions expressed in **Nutriview** are those of the authors, and are not necessarily shared by the Publisher. Contributions and correspondence, as well as requests for additional copies, may be sent to Dr Max Blum at the address shown below. Unless otherwise stated, information in **Nutriview** may be reproduced without permission provided that proper credit is given.

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■ Editorial:

Improving nutrition: challenges for the next decade

What is the greatest development in the world of nutrition over the past decade? This can be endlessly debated, but one candidate that deserves to be shortlisted is the change in nutritionists' attitudes towards chronic diseases of lifestyle.

In this final guest editorial of the Nutriview anniversary year, Dr Nelia P Steyn (Chronic Diseases of Lifestyle Unit, MRC, Cape Town, South Africa) and Professor Norman J Temple (Athabasca University, Athabasca, Alberta, Canada) discuss some of the urgently needed measures to improve public health in developing countries.

Although undernutrition and micronutrient deficiencies are still acknowledged as major determinants of poor health in the developing world, there is an increasing awareness of the importance of 'overnutrition' as seen by the rapidly increasing prevalence of overweight and obesity in low-income countries. This has been highlighted by the World Health Organization in its publications 'Obesity: Preventing and Managing the Global Epidemic' [1] and 'Diet, Nutrition and the Prevention of Chronic Diseases' [2].

The focus in recent years has widened from only preventing and treating undernutrition to also preventing overnutrition at all stages of the lifecycle. The nineties saw a surge of cross-sectional studies that evaluated the prevalence of the chronic diseases of lifestyle in the developing world. Now is the time for action. How will we as nutritionists tackle the ever-increasing global epidemic of chronic diseases, which are exacerbated by urbanization and relative affluence?

The scope for nutrition as part of a healthy lifestyle needs to be part of interventions aimed at promoting health in diverse sectors of the population. This is, of course, a major challenge needing a collaborative effort of all stakeholders. In particular, healthy interventions need the support of the food and beverage industry with its resources to plan interventions on a scale that health educators can only dream of.

Perhaps this is a good time to reflect on the Ottawa Charter and what it symbolizes for health promotion [3]. No more should we, as agents of change, struggle with the increasing resistance to nutrition education and its victimizing attitude. This decade should be one where the principles of the Ottawa Charter are embraced, namely:

1. Building healthy public policy
2. Creating supportive environments
3. Strengthening community action
4. Developing personal skills
5. Reorienting the health services

These are the key actions required to develop successful interventions for coming generations. Perhaps the most effective and far-reaching activity will be that of developing healthy public policy. The introduction of compulsory iodation of salt and fortification of staple foods in many countries illustrates the potential for healthy public policy to bring about improved nutritional status and health of the population. Another excellent example of public health policy has been legislation regarding advertising for tobacco products and alcohol; in South Africa there is also a ban on smoking in public places. Such legislation achieves great benefits. This is especially the case when compared with decades of health education to individuals.

In which areas do we need to build public policy? At all costs, we need to

harness the pervasive influence of the media, which has become firmly entrenched in all homes, from the richest to the poorest. The media, experts at creating desire for even the most unhealthy foods and beverages, could be a useful ally in achieving our goals. We need professionals who can make wholesome and healthy traditional foods appear fashionable and desirable. We also need to teach the public how to read labels on foods and how to make the right food choices, even while leading a busy lifestyle. Then, we need to convince affluent people that they will be healthier and live longer if they eat and drink wisely, and undertake physical activity.

Perhaps the most important public policy should be aimed at protecting young people from dishonest and inaccurate information in the mass media, particularly television and the Internet. Children and adolescents could learn a great deal about nutrition and health from these sources. However, this will need strict legislation to control advertising.

Healthy public nutrition policy should also embrace the types of foods and drinks offered at schools and other institutions where children spend much of their time. Furthermore, consumption of a healthy diet should be ingrained in the education system in an integrated manner together with other components of a healthy lifestyle.

Nutriview publisher has a new name

On September 30, 2003, the Roche Vitamins and Fine Chemicals Division was taken over by the Dutch company, DSM. Its business activities (as well as the publication of Nutriview) continue under the new name of 'DSM Nutritional Products'.

DSM was formed in 1902 as the nationalized coal company 'De Nederlandse Staatsmijnen' (Dutch State Mines). In the early years, the company thrived with the sale of products derived from the processing of coal (coal gas, and ammonia for fertilizers). Later, chemicals and fertilizers comprised the company's chief activity. In the 1970s and 1980s DSM underwent major reorganizations, and diversified into high-quality plastics and fine chemicals. The company was privatized and publicly listed in 1989. With its 'Vision 2005' strategy DSM is transforming into a producer of high quality biotechnological and chemical products for life science applications. Following acquisition of the Roche vitamins division, DSM has become the world's leading supplier of services, products and ingredients to the life science industry.

For more information, please see the DSM web site at: <www.dsm.com>.

Another key action with great potential for improving nutrition is the strengthening of community action. Empowering communities to work towards solving their own health problems has become a priority. Long gone are the times when nutrition educators merely told people what to eat and what not to eat. Now, essentially, we need to help communities develop personal nutrition and health

skills that allow for ownership and control of their own destinies.

This coming decade therefore provides nutritionists with great challenges. Not only do their clients need to be empowered but also nutritionists need to develop new life skills and attitudes to deal with the realities of today's world of nutrition. ■

References

1. WHO Technical Report (No.894). Obesity: Preventing and managing the global epidemic. Geneva: WHO, 2000.
2. WHO Technical Report (No.916). Diet, nutrition and the prevention of chronic diseases. Geneva: WHO, 2003
3. WHO Technical Report. Ottawa charter for health promotion. Journal of Health Promotion. 1986, 1: 1-4.

■ Feature:

Central Asia addresses nutrition crisis with food fortification

Following the break-up of the Soviet Union and the collapse of the system for producing and distributing iodized salt, Central Asia saw a sharp rise in mentally retarded and stunted babies as a result of iodine deficiency disorders (IDD). Salt iodization is considered the best way to eliminate IDD, but less than one household in four in the region has access to iodized salt. This is the lowest consumption rate in the world. The project: 'Improving Nutrition for Poor Mothers and Children in Central Asia', backed by the Asian Development Bank (ADB), which was initiated two years ago, is changing all this.

(For further information, please visit <www.cark-nutrition.kz>)

An ambitious project

At the Almaty (Kazakhstan) Forum in October 2001, the governments of Azerbaijan, Kazakhstan, Kyrgyz Republic, Mongolia, Tajikistan and Uzbekistan forged a landmark subregional agreement to boost production, distribution, and consumption of iodized salt and enriched wheat flour. The effort is backed by a partnership of international advisors (ADB, UNICEF) and the Kazakh Academy of Nutrition (KAN). It is financed by a grant from ADB's Japan Fund for Poverty Reduction (JFPR).

The project's ambitious scope includes significant institution building of the private and public sectors, and includes a quality control system, support for legislation, food safety and trade regulations, incentives for fortification, and promotion of an active civil society to

monitor the quality of fortified food in the market.



Heading towards a better future for Central Asian children suffering from micronutrient deficiency.

In the two years since its launch, the project has made significant progress:

- Three of the six countries now have universal salt iodization legislation, and the other three have drafted legislation for discussion in parliament;
- All six countries have started flour fortification to reduce mineral and vitamin deficiencies, including anemia; in most of the countries, the public and private sectors will share the costs;

- All countries except Tajikistan have plans for a quality assurance system;
- Major progress has been made in public information campaigns and social mobilization in all countries except Azerbaijan and Uzbekistan;
- Kazakhstan and the Kyrgyz Republic have introduced regulations to ensure that wheat flour provided to public social service entities such as hospitals and schools is fortified;
- KAN has completed the first round of blood sampling in all countries.

Fulfilling a promise

At a recent project review meeting in Bishkek, Kyrgyz Republic, Dr Nevin Scrimshaw, Professor Emeritus of the Massachusetts Institute of Technology, noted that progress is significant even by global standards. "After overcoming many political, technical and logistic obstacles, substantial progress toward implementation has been achieved in all countries and the pace toward full implementation is accelerating", he said. "By providing leadership and approximately US\$1 million per country in the region plus Mongolia, legislation requiring iodization of salt and multiple fortification of wheat flour has been approved and both procedures are being implemented in all participating countries".

The meeting concluded that more effort is needed to implement the quality assurance system, grant tariff and tax exemption on fortificants and fortification equipment, and monitor and evaluate outputs and outcomes of activities.

Evaluation studies to determine the impact of the project will be carried out next year. "We expect this will show a significant reversal of past trends", said ADB social protection specialist Rie Hiraoka. One expected trend, due to the folic acid added to the flour along with iron, is a decline in the rate of infants

with neural tube defects and of deaths from cardiovascular disease.

At one time, half of Central Asia's women of reproductive age and 70% of its children under three were affected by iron deficiency anemia. But now Central Asia is steadily closing the gap with most of the world in the move toward universal salt iodization and flour fortification.

"This will address a promise made at the United Nations General Assembly Special Session on Children in 2002 to bring lagging regions where children face a nutrition crisis back into the global community", said ADB's health and nutrition advisor Joseph Hunt. – *Ian Gill, Asian Development Bank*

■ Conference report:

Zimbabwe chooses staple food fortification to reduce malnutrition

On July 11, 2003, representatives from the Zimbabwean Government, the University, the food industry, consumer organizations, donor agencies and other interested groups met in the capital Harare to discuss ways to reduce the burden of 'hidden hunger' in the country.

Malnutrition problem recognized

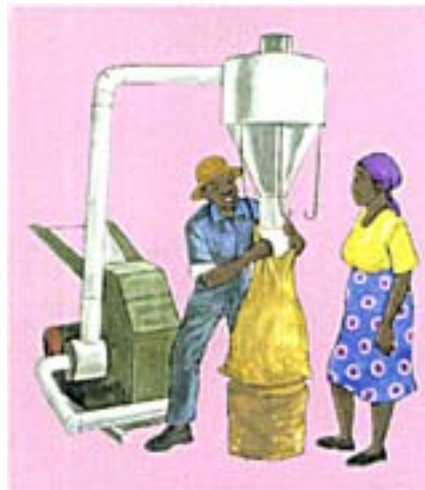
Micronutrient malnutrition is a serious health problem in Zimbabwe. Deficiencies of vitamin A, B-complex, iron zinc and selenium are widespread. A survey conducted by the Ministry of Health and Child Welfare in 1999 found that more than a third of children aged 1–6 years and a fifth of all pregnant women were vitamin A deficient, while iron deficiency anemia affected at least 20% of the population. Since then, economic hardships and the HIV/AIDS pandemic have surely exacerbated the situation.

Judith Mutamba (nutrition consultant) reported on a survey conducted in 2001 in Malawi, where conditions are said to be similar to those in Zimbabwe. Almost 60% of infants and young children were vitamin A deficient, and more than 80% had iron deficiency anemia. Anemia was also found in 25–48% of women of childbearing age. The meeting participants therefore agreed that strategies need to be put in place to solve the problem.

A sustainable solution

For more than 80 years, the fortification of commonly consumed foods has proved to be a cost-effective and safe way to virtually eliminate vitamin and mineral deficiencies. Zimbabwe's neighbors

Zambia and South Africa have already introduced fortification legislation, proving that partnerships between the public domain and private industry are possible.



Zimbabwe already has experience with small-scale fortification of maize meal (extract from a poster promoting Care's NICA project – see Nutriview 2001/2).

Mr A. Chigumbu (National Environmental Health Coordinator, Ministry of Health and Child Welfare) was confident that mandatory food fortification with all micronutrients could have a sustainable effect in the country. The success of the universal salt iodation program, with legislation now in place, and partnerships with industry established, paves the way. Standards exist for all staple foods, and these could be modified to incorporate the addition of micronutrients.

The success of the program, he said, will depend on reaching all affected individuals, choosing the right vehicles and level of fortification, ensuring communication between government and key stakeholders, and effective monitoring of the process. This implies that every implementer and stakeholder understands his/her role, and that the end product is affordable. Mr Chigumbu assured everybody that the Ministry of Health is committed to forming partnerships with the key stakeholders, and that his department would take on the monitoring to ensure that consumers get the right levels of micronutrients.

Development of a program

Mrs Rufaro C. Madzima (Head of Nutrition, Ministry of Health and Child Welfare), listed the challenges for Zimbabwe, which are:

- to determine the actual prevalence of micronutrient deficiencies, and identify target groups;
- to choose suitable food vehicles based on food consumption patterns using data from national surveys and other studies;
- to develop an appropriate strategy for a sustainable food fortification program that will ultimately benefit those most at risk;
- to ensure high quality and efficient distribution of the foods through proper legislation and monitoring.

Most of the data on micronutrient intakes in the country are outdated, so there is need for more research. Information on consumption patterns is needed to identify which foods should

be fortified and to determine which levels of micronutrients should be added.

According to a survey conducted in 2001, about two-thirds of Zimbabweans consume maize meal and wheat flour. However, differences between urban and rural populations, and the special needs of young children and pregnant women (the groups most vulnerable to the effects of malnutrition) also need to be considered. It will also be important to learn more about how the foods chosen for fortification are processed, stored and cooked before deciding on the type and level of fortificants to use.

Marketing and distribution plans are needed to ensure that the fortified foods are available even in isolated areas, while advertising, promotion and labeling, in accordance with local regulations, is essential to increase consumer awareness. Proper legislation, with adequate quality control and monitoring, is needed to ensure compliance and sustainability.

Recommendations

To achieve the desired results, a national task force will be set up (with the Ministry of Health and Child Welfare acting as secretariat). Among its main tasks will be to establish a national data base, includ-

ing the levels of fortification currently used in the country, and enact appropriate legislation. They should also address the fortification of food aid, and seek harmonization of standards in Southern Africa. The institutional capacity and capability of stakeholders should be developed, and the media encouraged to educate the public and create a demand for fortified foods.

The report of the consultative meeting will be used to advocate for a comprehensive food fortification policy in Zimbabwe. *Based on a report by Heidi-Lee Robertson, VIC, South Africa*

■ Conference report:

Millers' support for flour fortification grows

The International Grains Council (IGC) Conference, which was held in London on June 25, 2003, brought together some of the world's most influential members of the wheat trading industry. True to the conference theme 'Connecting with consumer needs—Rising to the challenge', speakers urged participants throughout the day to take up the mission of flour fortification and make it their own. Even the IGC Chairman, Mr G Denis, stated in his opening remarks that the growth and stability of international trade in grains and grain products are increasingly tied to the success of developing countries in achieving their own objectives of economic growth and food security.

Grains industry has important role

Adrian Measner, President of the Canadian Wheat Board, took a strong position behind the universal application of the Flour Fortification Initiative (FFI). He also remarked on the importance of communication and political activism as basic criteria for moving this initiative forward. The same sentiments were also expressed by Kirk Miller, General Sales Manager in the United States Department of Agriculture, who confirmed the importance of global fortification.

Kul C Gautam, Deputy Executive Director of the United Nations Children's Fund (UNICEF), voiced the chal-

lenge strongly. He proclaimed that, by combining efforts and energy, we can make an extraordinary impact in the global fight against poverty, illiteracy, disease and malnutrition in ways that few of us have imagined possible. He acknowledged the important role the grains industry has played in nourishing the world, but reminded everyone that its work is not yet done. Hidden hunger is still a considerable problem, and must be eliminated.

Phillip Purnama, Chief Commercial Officer of Bogasari Flour Mills in Indonesia, elaborated on the necessity of flour fortification with a special call for help in Asia. He told millers how easy it is to implement such a program, and strongly urged them to follow his own example for the benefit of the general population. Referring to the cost of fortification, which many people focus on as a major obstacle, he remarked that, for the price of one cigarette, which maybe gives joy for one or two minutes, five people in Indonesia can have their flour fortified for a whole year.

Besides speaking on behalf of fortification, Andrew Lindberg, President of AWB (Australian Wheat Board) Ltd, also reiterated the role of the milling industry in the multisector movement towards fortification. He affirmed that flour fortification needs to be supported and

expanded globally on an accelerated basis through stronger collaboration between the private, public and civic sectors. Millers can demonstrate that they care about consumers, and create a proposition that provides great benefits at a very low cost.

At the end of the meeting, there was a consensus that flour fortification is an important issue for the future, and should have a consistent place in the IGC agenda.

A good beginning

The IGC conference was followed on June 26 by the International Grain Industry Forum (theme: Meeting the challenges—industry's role in expanding flour fortification). It was hosted by AWB Ltd, US Wheat Associates, American Ingredients and the Wheat Foods Council with support from the Micronutrient Initiative, the Centers for Disease Control and Prevention, and UNICEF. Senior managers of grain trading and milling organizations from many countries participated.

Everyone agreed that flour fortification to improve national health and prosperity should be actively pursued wherever feasible. To advance the FFI, a unique blend of industrial and governmental collaboration is required, something that is only possible if all sectors are willing to share responsibility and maintain open channels of communication and cooperation. Because progress

is made in mills, the support of suppliers to and buyers from milling companies can be instrumental to the success of the initiative. Governments should be encouraged to create a legislative environment to support millers who fortify.

In the next twelve months, it will be important to identify and communicate opportunities in countries, to combine leverage as organizations, and to work with others, including national governments and local industry, on demonstrating success through a new cooperative approach. Participants recognized that the Forum represented only a fraction of

the people and organizations needed to achieve these goals, but felt it was a good beginning for industrial and governmental movement in the right direction.

This report is based on the FFI brief of August 7, 2003, by Professor Glen Maberly, Professor of International Health, Rollins School of Public Health, Emory University, Atlanta, Georgia, USA.

At its May 2003 Board Meeting, the International Association of Operative Millers (IAOM) passed a resolution to support the FFI. It has formed a technical training and support group and, with the assistance of FFI, is compiling a list of milling schools and technical institutes interested in adding a flour fortification component to their education program. Further information about this project can be obtained from the coordinator Jeff Gwartz (jeff@jagsi.com) or from Ashok Sarkar at the Canadian International Grains Institute (www.cigi.ca). ■

■ News in brief:

Early vitamin A saves infant lives

When is the best time to give vitamin A to reduce mortality in the first six months of life? As trials of supplementation to mothers during pregnancy, or to infants along with immunization were not very encouraging, researchers have now found a more effective strategy: supplementation immediately after birth.

Rahmathullah et al [1] gave two doses of 24000IU vitamin A or a placebo in the first 48 hours of life to 11619 infants from two rural districts in southern India. In the group supplemented with vitamin A, mortality in the first six months was reduced by 22%. The greatest impact occurred in the first three months, mainly in males, and was confined to infants with a birth weight less than 2500g. ■

1. Rahmathullah L, Tielsch JM, Thulasiraj RD et al. Impact of supplementing newborn infants with vitamin A on early infant mortality: community based randomized trial in southern India. *Brit Med J* 2003; 327; 254–257.

Vitamin C with meals improves iron absorption

One of the ways suggested to improve iron status at the community level is for people to eat local foods rich in ascorbic acid together with meals that contain nonheme iron. To test the efficacy of this approach, Diaz et al [1], compared

absorption of labelled iron isotopes (added as ferrous sulfate) from typical meals with and without added vitamin C (as limeade) in 15 nonpregnant, iron-deficient women from a rural area of Mexico.

Mean iron absorption increased from $6.6 \pm 3\%$ to $22.9 \pm 12.6\%$ after the women consumed limeade containing 25 mg ascorbic acid with breakfast and lunch for 14 days. The authors therefore concluded that drinking limeade with meals could improve the iron status of these women. ■

1. Diaz M, Rosado JL, Allen LH, et al. The efficacy of a local ascorbic acid-rich food in improving iron absorption from Mexican diets: a field study using stable isotopes. *Am J Clin Nutr* 2003;78:436–40.

Are farmers ready for 'Golden' rice?

A lot of people hope that Golden rice, a genetically modified strain of rice rich in provitamin A, will help to solve the problem of vitamin-A deficiency in the rice-eating populations of the world. On the other hand, there is considerable resistance to the introduction of transgenic crops from many quarters.

In a letter to the Editor of Nature, Chong [1] describes the outcome of a survey among 32 village leaders in the leading rice-growing region of the Philippines. He found that only three of

them had ever heard of Golden rice, and only one knew what a transgenic crop is (even though the Philippine Rice Research Institute had tested such a crop in the region two years earlier). This suggests that the biotechnology debate is still mainly restricted to the urban elite.

Asked what would make them adopt or reject a new variety of rice, the rice farmers' leaders said it must produce higher yields or reduce production costs. Long-term environmental risks were of secondary importance. Thirty of them said they would be willing to plant this new yellow rice if it proved to be high yielding, safe for human consumption, and accepted by consumers.

From this, it seems that lack of knowledge is not a significant barrier for the acceptance of Golden rice by rice farmers. ■

1. Chong M. Acceptance of golden rice in the Philippine 'rice bowl'. *Nature* 2003; 21: 971–972.

UN supports new biotechnologies

Biotechnology presents unique opportunities for developed and developing countries and small and large enterprises. It is in the interest of humanity that safe biotechnology applications are used as widely as possible. This would require the development and implementation of science and technology policies that

would encourage the adoption, use and development of innovations in developing countries. This is the gist of the United Nations 58th General Assembly Report of the Secretary General distributed in May 2003.

The report entitled "Impact on New Biotechnologies, with Particular Attention to Sustainable Development, Including Food Security, Health and Economic Productivity" provides the following information:

- Global development goals and the biotechnology revolution
- Factors affecting technology transfer to developing countries
- Current biotechnology status in developing countries
- Proposals for biotechnology development and technology of biotechnology
- Proposed role of the United Nations.

According to the report, policies governing biotechnology have to be harmonized so that they do not disadvantage developing countries and countries with economies in transition. It concludes that "unless developing countries keep up with advances in biotechnology, they may lose out again. The cost of leaving some countries behind may be higher than the cost of empowering them to become players in mastering and benefiting from biotechnology." – *Crop Biotech Update, September 5, 2003.* ■

Holistic approach to malnutrition needed

Is the nutrition community misguided in its efforts to correct deficiencies of single nutrients in underprivileged populations? According to Johns [1], dietary diversity is essential for health, while simplification of the diet to a limited number of high-energy foods associated with urbanization and socioeconomic change is one of the factors responsible for the increase in such diseases as diabetes, hypertension and cancer.

In many African countries, for example, there has been a significant decrease in the past forty years in consumption of traditional cereals (millets and sorghum), fresh fruits and vegetables, and an increased dependence on deep-fried starchy foods (cassava, potatoes) and exotic cereals (wheat, rice, maize).

Taking vitamin A deficiency as an example of nutritionists' preoccupation

with single nutrients, Johns points out that food-based strategies to increase intake of fat, preformed retinal from animal foods, and orange fruits and vegetables offer the greatest likelihood of alleviating the condition. In a practical sense, success would most likely come from increasing dietary diversity, which itself is highly dependent on alleviation of poverty. Conventional interventions (supplementation, food fortification, agricultural technology) often offer imperfect solutions, because malnutrition is a symptom of profound dietary, socioeconomic and ecological factors that must be addressed before the problem can be resolved. Among the limitations of single nutrient strategies, he reminds us that:

- responses may occur at the expense of addressing multiple, usually more cryptic, deficiencies and fail to provide the balance necessary for long-term health;
- complex interactions between that nutrient and other food ingredients affect absorption and the relationship between nutrition and disease;
- focus on a single health issue (xerophthalmia in the case of vitamin A deficiency) ignores other nutritional causes of poor health;
- by limiting dietary diversity, biofortification (including GMO crops such as Golden rice) stands to skew the diet in ways that have a potential cascade of adverse effects.

Johns' conclusion: Initiatives that emphasize single nutrients and/or a limited number of foods limit the functional diversity of diets, and may fail or produce adverse consequences in the long run. On the other hand holistic approaches offer the potential to raise peoples' nutritional and health status in a sustainable way. ■

1. Johns T. Plant biodiversity and malnutrition: simple solutions to complex problems. *AJFAND* 2003; 3: 45–52

French men benefit from antioxidant supplements

A French study involving 13'017 healthy men and women aged 35–60 years who took an antioxidant supplement (daily dose: 6 mg beta-carotene, 120 mg vitamin C, 30 mg vitamin E, 20 mg zinc, 100 µg selenium) or placebo for eight years has shown that supplementation

can significantly lower mortality and morbidity rates. In men who took the supplement, cancer incidence and mortality rate were reduced by 31% and 37% respectively. However, supplementation appeared to have no effect on women (who probably had a better nutritional status at the start of the study) or on cardiovascular disease risk.

By extrapolating their findings to the total male population of France, the authors conclude that, if everybody ate a healthy diet with ample intakes of fruit and vegetables, there would be between 12'000 and 40'000 fewer cases of cancer in the country every year. This would save millions of Euros in healthcare costs. – *SU.VI.MAX Study. Press release, June 21, 2003.* ■

'Nutriview' in the supermarket

If you see the name 'Nutriview' when you visit the supermarket next time, please note that it has nothing to do with our newsletter! 'Nutriview' is the name chosen by Access Information Systems of Mumbai, India, for its new database of nutrition information on food items sold in supermarkets.

Its aims are to attract customers to the store, help them to select food items based on nutritional values, ingredients and specific tastes, and to provide recipes and nutrition education.

If you are interested to see how this database works, go to the Access homepage (www.accesshomepage.com), click on 'products' and select 'Nutriview'. From there, you can download a Power-Point presentation and a brochure. ■

Erratum:

In our 'News in brief' article on the effects of food fortification on neural tube defects in Costa Rica (*Nutriview* 2003/3) we showed the incidence of NTD incorrectly (both in the text and in Table 1). Mean rates were 9.7/10'000 live births in the period 1996–1998, and 6.3/10'000 live births in the period 1999–2000 (ten times less than shown). We have corrected the PDF file on our web site, and apologize for the inconvenience.

Micronutrients and pregnancy outcome

Numerous factors (Table 1) can increase the risk for complications during pregnancy and childbirth, and/or reduce the chances of the offspring to survive and develop normally. One of the ways to lower the risk of an adverse pregnancy outcome is to ensure that mother and offspring are adequately nourished.

Table 1: Main pregnancy risk factors

A. Biological

Young age, small stature, low prepregnancy body mass index, close spacing of pregnancies, genetic or physical defects, metabolic disorders, high blood pressure, infections, malaria.

B. Environmental

Heavy workload, emotional stress, smoking, drugs.

C. Nutritional

Poor nutritional status, low intakes of energy, essential fatty acids and/or micronutrients, high intakes of dietary inhibitors, nutrient interactions.

D. Interactions of all these

Effects of deficiency

Micronutrient deficiencies, whether they occur as a result of a low dietary intake or other factors, have been associated with maternal and fetal/neonatal mortality, intrauterine growth restriction (IUGR), and congenital malformations (Table 2). Prenatal malnutrition may result in lifelong poor health and permanent developmental deficits.

Reliable data on the causes and extent of adverse pregnancy outcomes are extremely limited, because of difficulties in measuring gestational age and micronutrient intakes. In many

countries, stillbirth rates are grossly underreported. Another confounding issue is the relationship between socioeconomic status and pregnancy risk.



Nutrition measures for a healthy pregnancy should begin at an early age

When to intervene

While there is growing support for the use of suitable nutrition-based interventions, further research is still needed to confirm the value of such efforts. Nevertheless, it is unrealistic to expect that chronic undernutrition during some twenty years of life can be overcome with a few months of extra nutrient intake during pregnancy. Ideally, nutrient deficiencies should therefore be corrected during childhood, and at the latest before the woman reaches child-bearing age.

Public health significance

Available data suggest that between 15% and 50% of infants in developing countries are born small for gestational age; more than 10% die in the neonatal period. More than 3% of infants worldwide are thought to be affected by congenital defects. With 5 maternal deaths/1000 live births, the severest of pregnancy complications is still extremely common in developing countries.

The potential cost-effectiveness of antenatal nutrition interventions in the developing world has not undergone formal evaluation; there is, however, compelling evidence that such inter-

ventions could prevent many infant and maternal deaths. Informal analysis indicates that their cost-effectiveness would be comparable (in some cases markedly superior) to the current standard antenatal interventions.

Table 2: Pregnancy complications associated with micronutrient deficiency*

Complication	Associated deficiency
Life-threatening hypertension	B6, B12, folate, C, E, Ca, Mg
Anemia, hemorrhage	Fe, A, folate, Ca, Mg
Severe infection	A, Zn
Nausea, vomiting	B1, B6, B12
Preterm delivery	C, E, Fe, Mg, Ca, Zn
Obstructed labour	Zn
Abortion, stillbirth	Cu, Se
Congenital malformations	A, folate, Zn, Cu
Low birth weight	Zn, Ca, Mg
Impaired cognition/behavior of offspring	Fe, Zn, Cu, I
Impaired cardiovascular/bone health of offspring	Zn, Ca

* Excessive intakes of vitamin A, vitamin D, iron and iodine may also have adverse effects.

Further reading

1. Nutrition as a preventive strategy against adverse pregnancy outcomes. Proceedings of a USAID-Wellcome Trust workshop held in Oxford, UK, in July 2002. *J Nutr* 2003; 133: 1589S-1764S.
2. Food and Nutrition Information Center, USDA. <www.nal.usda.gov/fnic/>