

Schools for Nutrition

by Lena Davidsson

The IAEA Nobel Fund focuses on the nutritional needs of children.

Out of ten children born in developing countries, one will die before his or her fifth birthday, for a disturbing total of more than 10 million young lives lost each year. In more than half of these deaths, undernutrition is an important factor. Clearly, something needs to be done to combat this emergency, and the IAEA is playing its part. With three events held in Africa, the Asia-Pacific region and Latin America during 2006 and 2007, the IAEA has been disseminating information about the usefulness of stable isotope techniques in the developing and monitoring of intervention programs to reduce malnutrition, in particular in infants and children.

Undernourished children have lowered resistance to infections, and they are more likely to die from common childhood ailments like diarrhoeal diseases and respiratory infections. Their plight is largely invisible: three quarters of the children who die from causes related to malnutrition are mildly or moderately undernourished.

Infant mortality is only the tip of the iceberg. Many children who do survive the first year of life will not reach their potential because undernutrition will impair their development. For example, the prevalence of micronutrient deficiencies, also called 'hidden hunger', is extremely high in many developing countries, in particular during early life. Children affected by micronutrient deficiencies have their physical and mental development seriously impaired. In particular, iron defi-

ciency during infancy is known to have adverse effects on psychomotor and mental development, while clinical vitamin A deficiency can lead to blindness, increased morbidity as well as mortality. In a nutshell, poor health and frequent illnesses sap children's nutritional status, locking them into a vicious cycle of recurring sickness and faltering growth.

Conversely, the effects of adequate nutrition on a child's development and the society in which they live cannot be overestimated as well-nourished children perform better in school, grow into healthy and productive adults who in turn give their children a better start in life.

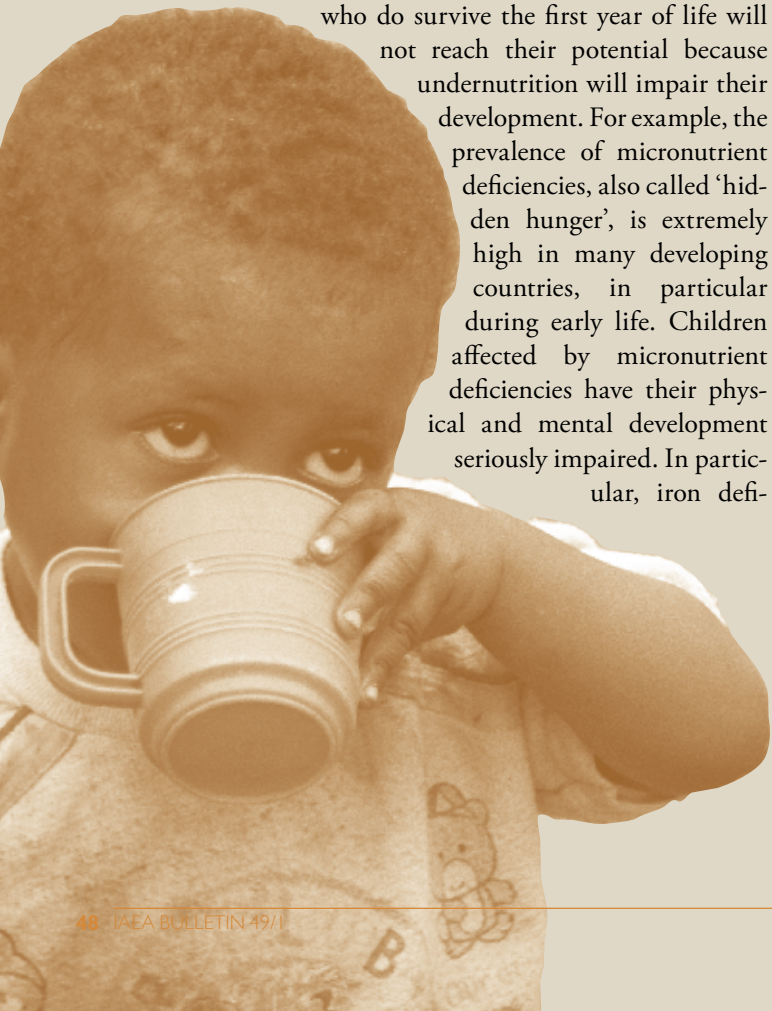
For several years now, the IAEA has been promoting the use of nuclear techniques to combat malnutrition during the earliest years of life. In particular, countries are gaining technical expertise in the use of stable isotope techniques in the development and evaluation of nutritional interventions.

As part of this initiative, the IAEA Nobel Cancer and Nutrition Fund has been partly dedicated to building capacity in the use of nuclear techniques to develop and evaluate interventions that can contribute to improved nutrition and health for children. Fund-supported fellowship awards are targeting young professionals, especially women, from developing countries, through the IAEA's Technical Cooperation Programme.

Alongside such awards, regional events - entitled 'IAEA Nobel Peace Prize Fund Schools for Nutrition' - have been organized in Africa, Asia and the Pacific and in Latin America during 2006 and 2007. The overall aim was to raise awareness of the IAEA's activities in human nutrition, and disseminate information about the usefulness of stable isotope techniques in the development and monitoring of nutrition programs to combat malnutrition, in particular in infants and children. Each event was focused on issues specific to its region.

Latin America: the double burden of malnutrition

The first event was held in Guatemala City, Guatemala, on 2-6 October 2006. Organised by the IAEA in col-



laboration with the Government of Guatemala through the Instituto de Nutrición de Centro América y Panamá (INCAP), the seminar was attended by 38 participants from 20 Member States in the region. They represented the academia, research institutions and governments — almost half of the participants represented ministries of health in IAEA Member States.

Presentations and lectures covered stable isotope techniques, experience with the different techniques in the region, and an overview of capacity building in Latin America. Most lecturers were recruited within the region, representing leading research institutions in human nutrition in Latin America and the Caribbean. A significant amount of time was allocated to discussions to identify priority areas for future cooperation.

The five-day event was focused on one growing problem in the area of nutrition for Latin American countries: the co-existence of under- and overnutrition, the so-called 'double burden' of malnutrition. In addition to the devastating consequences on health, well-being and development due to undernutrition, the rapid changes in diet and life style — the so-called 'nutrition transition' — have resulted in escalating numbers of overweight and obese individuals with increased risk of nutrition-related chronic diseases such as heart disease and diabetes in many settings. As a witness to the complexity of the problem, under- and overnutrition are often found to co-exist within the same communities and even within the same households.

Africa: nutrition and HIV/AIDS

In Africa, the HIV/AIDS epidemic, especially in the sub-Saharan part of the Continent, is often combined with widespread food shortages and high prevalence of undernutrition. Infants and children represent especially vulnerable segments of the population, as HIV-infection is known to impair growth early in life. The aetiology of growth faltering is often multifactorial and includes insufficient food intake as well as frequent episodes of diarrhoeal disease and other opportunistic infections.

The IAEA is helping the international community address the HIV/AIDS emergency in Africa. In particular, it contributes technical expertise in the use of stable isotope techniques in the development of nutrition interventions based on locally appropriate, sustainable food-based strategies, contributing to the overall aim of integrating nutrition into a comprehensive response to HIV/AIDS.

The second School for Nutrition was organised in Kampala, Uganda, under the theme: "Integrating nutrition into the management of HIV/AIDS". Thirty-two participants from academia, research institutions and governments from 22 Member States took part in the event from 4-8 December 2006. Thirteen participants, or 40% of the total, represented ministries of health in African countries.

The IAEA organised the event in collaboration with the Government of Uganda through its Ministry of Health, which

Stable Isotope Techniques

Stable (i.e., non-radioactive) isotope techniques have been used as research tools in nutrition for many years. However, the application of these techniques in nutrition programme development and evaluation is a relatively new approach, one where the IAEA has a great opportunity to contribute.

Stable isotope techniques have an advantage over conventional techniques in that they provide more sensitive and specific measurements. The IAEA has supported numerous activities in infant nutrition where stable isotope techniques have been applied. These include projects to estimate human milk intake in breast-fed infants, muscle mass in lactating mothers, energy expenditure and bioavailability of iron in infants and young children.

Human milk intake in breast-fed infants is assessed through a non-invasive method. A dose of deuterium-oxide is consumed orally by the mother. Briefly after intake, deuterium-oxide becomes mixed with the mother's body

water and ingested by the baby via human milk. By measuring the appearance of deuterium in the baby's urine or saliva, information about the intake of human milk can be obtained. Besides, this method also shows whether the baby is being fed food other than the mother's milk, a practice that often exposes babies to bacteria and viruses that cause infectious diseases. At the same time, by sampling the mother's saliva, her body water content can also be estimated. This allows scientists to estimate the mother's lean body mass (muscle mass), thus providing important information about the nutritional status of the lactating mother.

Iron absorption, on the other hand, is measured through a method based on the incorporation of iron stable isotopes into red blood cells. For example, studies supported by the IAEA have demonstrated that iron absorption in infants can be increased two- to threefold by adding vitamin C to food, thus indicating how simple dietary modifications can improve the nutritional value of food.

was represented at its highest level, including Mr. Stephen O. Malinga, Minister of Health, and Mr. Samuel Okware, acting Director, General of Health Services.

Asia: undernutrition in early life

The last event was held in Dhaka, Bangladesh, on 22-26 April 2007. The 'school' was hosted by the Government of Bangladesh through the International Centre for Health and Population Research and the Bangladesh Atomic Energy Commission.

Twenty-one participants from 14 Member States in the region — including four national participants — took part in the

five-day event. The Government of Bangladesh's strong commitment to the event was demonstrated by the participation of Mr. Shafiqul Islam Bhuiyan, Chairman of BAEC, Mr. S.M. Wahid-Uz-Zaman, Secretary of the Ministry of Science and Technology, and Mr. C.S. Karim, Honorable Adviser to the Ministry of Agriculture and Livestock, in the opening session.

The event focused on the specific theme of 'interventions to combat undernutrition during early life' due to the very high prevalence of infants born with low birth weight and undernutrition among Asian children, especially in South Asia. Thus, there is an urgent need to develop effective nutrition interventions within 'the window of opportunity', i.e., to target young women before pregnancy as well

IAEA and Haiti Seek to Raise Infant Nutrition

Port-au-Prince, Haiti—The faces and cries of malnourished babies take every shape in the bustling children's ward in Haiti's General Hospital. A tiny, hand-sized newborn yawns in its makeshift incubator. A wide-eyed and skinny-ribbed boy wriggles restlessly in his cot. A yellow ribbon hangs from Beaseline Roseus' intricately plaited hair. The 14-month old infant sits on her mother's lap. Her feet and limbs are swollen and puffy. She has Kwashiorkor, a severe form of malnutrition.

Haiti has the highest rates of infant and under-five mortality in the Western hemisphere. Poverty, civil strife and inadequate knowledge of proper diet are root causes of malnutrition in the country.

The IAEA has teamed up with the Haitian Ministry of Health to improve infant nutrition nationwide, using nuclear science. Together they are focusing on using the advantages of breast milk - a healthy and cheap way to feed infants and protect their health. A series of studies that use stable (non-radioactive) isotopes will be run to know more about breastfeeding patterns in Haiti. The findings and recommendations will help the Government to better understand the causes of infant malnutrition in the country and formulate strategies to tackle it.

Dr. Lena Davidsson, Head of IAEA Nutritional and Health Related Environmental Studies Section, says severe malnutrition such as Beaseline's case is a medical emergency. "Many more children in Haiti are undernourished, but not to such a dramatic extent. These cases are the tip of the iceberg. They clearly highlight how vital good nutrition is during early life. The IAEA project focuses on how to improve the imple-

mentation of national policies to encourage exclusive breastfeeding for six months, as recommended by the World Health Organization," Dr. Davidsson said.

Beatrice says she breastfed Beaseline for 11 months, but she also started to feed her porridge from 15 days old, believing she was doing the best thing for her baby. As a newborn, Beaseline was also fed 'the national mixture' called lock on three occasions. Lock is a black liquid made up of olive oil, butter and other ingredients, which many Haitians believe helps the newborn eliminate its first stools.

"Beaseline's case is common," Dr. Joseline Pierre Marhone, Head of Food and Nutrition in the Ministry of Health, and a child nutritionist says. "Culturally, mothers do not believe that breast milk is enough for the baby and they try to introduce foods early like leafy tea, juice, crackers and porridge," Dr. Pierre Marhone says. Inadvertently, this practice exposes the infants to bacteria and viruses causing diarrhoea and other infectious diseases.

"The lock is the worst," Dr. Pierre Marhone says. "When mothers start with the lock, we have diarrhoea and malnutrition."

Marasmus is the other form of severe childhood malnutrition that Dr. Pierre Marhone sees too often. "It's caused by a lack of food and the child becomes emaciated. We usually see in it one to four-year olds," the doctor says.

"The IAEA studies will help us know how many mothers breastfeed exclusively. We will use the results to improve our policy," Dr. Pierre Marhone says. The

as infants and young children during the first two years of life.

Making hunger history

Adequate nutrition is central to the well-being of all children. Four of the eight Millennium Development Goals (MDGs) highlight the importance of adequate nutrition for human health and development, making nutrition one of the key factors in the global fight against poverty.

The IAEA is contributing to the achievement of the MDGs by providing technical support to Member States to combat

nutritional deficiencies. Stable isotope techniques can be used to optimise nutrition interventions for improving nutrition, health and well-being of infants and young children in developing countries.

Perhaps this is one of the best examples of how science and technology can be harnessed to the pursuit of a social goal — to make sure that one day hunger becomes history.

Lena Davidsson is Head of the IAEA Section of Nutritional and Health Related Environmental Studies, Division of Human Health. Email: L.Davidsson@iaea.org

studies will use stable isotopes to monitor, both quantitatively and qualitatively, the breastfeeding process. It is a safe and non-invasive method. Mothers are given a dose of deuterium (also called heavy hydrogen) to drink in a glass of water. This mixes with the mother's body water and is ingested by the baby via human milk. Over the next 14-days saliva samples are taken from the infant and mother. An analysis of the samples will show if the baby is consuming water or food from sources other than the mother's milk, the intake of human milk, and the nutritional status of the lactating mother.

Through the Ministry of Health, the IAEA efforts are combined with other international organizations including UNICEF, the Pan American Health Organization/World Health Organization, US Agency for International Development and the World Food Programme to reduce the infant mortality rate in Haiti.

Over the last 10 years, the IAEA has allocated around US\$1.66 million to support the improvement of several national programmes on nutrition. By 2009, another \$1.6 million is allocated for countries including Afghanistan, Haiti, Iraq, Eritrea, Madagascar and Burkina Faso on training staff and supplementing equipment to target the evaluation and reduction of child malnutrition.

IAEA Deputy Director General for Technical Cooperation, Ana María Cetto, says that Haiti, as one of the least-developed countries in the region, has special needs. "We know their needs are much larger than we can ever offer. So we have to be very strategic in finding how best to support them in their develop-



IAEA Deputy Director General for Technical Cooperation, Ana María Cetto, says that Haiti, as one of the least-developed countries in the region, has special needs. Photo:IAEA

ment needs. Child nutrition is a key area," Ms. Cetto said.

Dr. Davidsson says results of similar projects in Brazil and Ghana have shown that by providing counseling and education about the benefits of exclusive breastfeeding to lactating mothers, the introduction of other foods and fluids into the diet of infants before six months can be delayed or minimized.

Fortunately, the prospects for Beasline are positive, Dr. Pierre Marhone says. A good quality diet will help her to recover quickly and develop normally. So too for the wide-eyed little boy affected by Marasmus. "He needs good food and plenty of love," Dr. Marhone says, giving him a gentle cuddle.

—Kirstie Hansen, IAEA Division of Public Information