Thus, micronutrient deficiencies have major health consequences in early life as adequate micronutrient status is essential for normal growth and development.

One of the priority areas for the IAEA in human nutrition is to combat micronutrient deficiencies, in particular in infants and young children.

Full-term breastfed infants generally have adequate iron status during the first 6 months of life but after this time, when body stores have been depleted and requirements are high due to rapid growth and development, iron has to be provided by the diet. Therefore, the amount and bioavailability of iron in complementary foods are of special concern. Iron bioavailability, i.e. the fraction of iron absorbed and utilized by the body, from cereals and legumes is usually low due to the presence of phytic acid, the major phosphorus storage compound of these staple foods.

However, this inhibitory effect can be overcome by vitamin C, a potent enhancer of iron absorption present in fruits and vegetables, especially citrus fruits. The importance of adding vitamin C to a traditional, homemade complementary food to enhance iron absorption was recently demonstrated in Pakistani infants within an IAEA Coordinated Research Project supporting Ph.D. students in developing countries.

Iron absorption was measured by a stable isotope technique, based on the incorporation of iron stable isotopes into red blood cells in healthy infants consuming a traditional complementary food based on rice and lentils. The results demonstrated that iron absorption can be increased 2–3 fold by the addition of vitamin C and thus indicated how simple dietary modifications can improve the nutritional value of homemade complementary foods.

The child cannot wait . . .

The urgent need for effective nutritional interventions to combat undernutrition during early life cannot be more elegantly – or more forcefully – summarized than by the Nobel Prize laureate, Gabriela Mistral:

‘Many things we need can wait, the child cannot. Now is the time his bones are being formed. His blood is being made, his mind is being developed. To him we cannot say “tomorrow”. His name is “today”.’

The IAEA’s activities in human nutrition contribute to the achievement of MDG #4 by providing technical support to Member States in the application of stable isotope techniques to optimize nutritional interventions to improve health and well-being of infants and young children in resource poor areas.

The results demonstrated that iron absorption can be increased 2–3 fold by the addition of vitamin C and thus indicated how simple dietary modifications can improve the nutritional value of homemade complementary foods.

The child cannot wait . . .

The urgent need for effective nutritional interventions to combat undernutrition during early life cannot be more elegantly – or more forcefully – summarized than by the Nobel Prize laureate, Gabriela Mistral:

‘Many things we need can wait, the child cannot. Now is the time his bones are being formed. His blood is being made, his mind is being developed. To him we cannot say “tomorrow”. His name is “today”.’

The IAEA’s activities in human nutrition contribute to the achievement of MDG #4 by providing technical support to Member States in the application of stable isotope techniques to optimize nutritional interventions to improve health and well-being of infants and young children in resource poor areas.

Based on The Early Years: Keys to Child Nutrition and Health by Lena Davidsson. IAEA Bulletin 47/1, 2005

The importance of adequate nutrition during early life cannot be underestimated as infants and young children have high requirements of energy and nutrients due to rapid growth and development.
During the first few years of life, children are particularly vulnerable to the negative health effects of undernutrition. In addition, poor health and undernutrition often overlap in young children; the relationship between undernutrition and morbidity is complex as illness often results in undernutrition and undernutrition increases susceptibility to disease. Children living in resource poor settings are thus often caught in a vicious cycle of undernutrition and infectious disease.

Stable isotope techniques to move the nutrition agenda forward

The IAEA is assisting Member States in their efforts to combat undernutrition by providing technical expertise in the use of stable isotope techniques in the development and evaluation of nutritional interventions.

Stable isotope techniques have been used as research tools in nutrition for many years, however, the application of these techniques in programme development and evaluation is a relatively new approach where the IAEA has a unique opportunity to contribute assistance to Member States. As only stable (non radioactive) isotopes are used, the techniques can be applied in the most vulnerable population groups, i.e. infants and children.

Nutrition during early life

Exclusive breastfeeding for 6 months, followed by the introduction of appropriate complementary foods and continued breastfeeding, as recommended by the World Health Organization, are cornerstones in infant nutrition. However, only limited information is available on the quantities of human milk consumed and the time of introduction of other foods into the infants’ diet in many settings.

The conventional technique to estimate intake of human milk is based on weighing the baby before and after each feed. This methodology is obviously time consuming and difficult to use in settings where infants are nursed frequently, including during the night.

By using a stable isotope technique, the deuterium-oxide turnover method, these practical problems can be overcome and the total volume of human milk, consumed by the baby during 14 days, is measured.

The method is non-invasive as the dose of deuterium-oxide is consumed orally by the mother and only samples of urine or saliva are collected for analysis.

This method, elegant in its simplicity, has been developed by independent researchers and is currently used in IAEA Member States.

Important steps in making this technique more widely available include capacity building by training staff as well as by procurement of laboratory equipment.

With support from the IAEA’s Technical Cooperation Programme, the deuterium-oxide turnover technique has been used to measure intake of human milk in breastfed infants to develop and evaluate nutritional interventions, based on local conditions in Ethiopia, Senegal, Ghana, Chile and Brazil. In addition, information about lactating mothers’ body composition has also been collected.

For example, data from Senegal demonstrated that although human milk intake was not higher in infants born to mothers benefiting from a supplementary feeding program during pregnancy, there was a significant increase in muscle mass in mothers who received supplementary food for more than 60 days. It is noticeable that no difference could be detected by conventional techniques used to evaluate nutritional status, based on body weight and height.

Although the benefits of exclusive breastfeeding during the first 6 months of life are widely recognized, mothers often introduce other fluids and/or foods at an early age.

In many settings, infants are given water, tea or honey very early in life and are therefore unfortunately exposed to bacteria and viruses resulting in diarrhoea and other infectious diseases.

In addition to information about human milk intake, data based on the deuterium-oxide turnover technique can also provide information about whether an infant is exclusively breastfed or if he/she is consuming water from other sources.

For example, results from Brazil and Ghana demonstrated that by providing counselling and education about the benefits of exclusive breastfeeding to lactating mothers, the introduction of other foods and fluids into the diet of infants before 6 months of age can be delayed and/or the amounts can be minimized.

Hidden hunger

The prevalence of micronutrient deficiencies – also called ‘hidden hunger’ – is very high in many developing countries, in particular during early life.

Some of the most serious consequences of micronutrient deficiencies during infancy include adverse effects on psychomotor and mental development due to iron deficiency, as well as blindness and increased morbidity and mortality due to clinical vitamin A deficiency.

Less severe, but much more common, vitamin A deficiency results in increased morbidity and poor growth in children. Sub-optimal zinc status also limits children’s growth and increases morbidity.