



One of five key areas to sustainable development where progress is possible with the resources and technologies at our disposal today.

Improving Human Health

Good health is an essential requisite for sustainable human development. Despite encouraging progress made to date, however, in many parts of the world, poor nutrition and disease-causing pathogens continue to be significant barriers to achieving good health, particularly for children. The problems are diverse; the consequences can be devastating, not just to individuals, but to the societies affected as well.

- Almost 800 million people are not getting enough food to lead normal, healthy, and active lives.
- Lack of access to clean water and proper sanitation increases the likelihood of diarrhoeal diseases. In the year 2000, some 1.3 million children under five in developing countries died of diarrhoeal diseases as a result.
- Malaria kills about 1 million people a year, over 70 per cent of them children under five. Almost 90 per cent of fatal malaria cases occur in sub-Saharan Africa. It is estimated that malaria causes economic losses in Africa in excess of \$12 billion per year.
- Every year, some 8.8 million people develop active tuberculosis (TB) and 1.7 million die of the disease. Ninety-nine per cent of all TB sufferers live in developing countries. Most are poor and between 15 and 54 years of age.
- In 2000, over 3.5 million people died from cancer in less developed countries, some 400 000 in Africa alone.

The International Atomic Energy Agency (IAEA) is building capabilities of developing Member States to address these important health problems using nuclear techniques. In many instances, these techniques offer unique and cost effective means to prevent, diagnose, and treat a wide variety of diseases and conditions that affect health.

Radiation Medicine

Diagnosing disease

- radiopharmaceuticals are used as tracers to study organ functions
- computerized tomography scans (CT) produce cross sectional images of parts of the body
- radioactive isotopes are used in laboratory tests

Treating disease

- radiation therapy kills cancerous cells
- radioactive iodine is used to treat hyperthyroidism

Sterilization

- radiation is used to sterilize tissue grafts and medical equipment

Meeting Nutritional Needs

Good nutrition depends not just on having enough food to eat, but also on the proper amount of essential nutrients. Micronutrient deficiency is a major public health problem. According to global estimates, some 2 billion people in more than 100 developing countries suffer from micronutrient deficiency, such as iron and Vitamin A.

The IAEA applies nuclear and isotopic techniques to solving nutritional problems that are prevalent in developing countries. Through research and technical co-operation projects, the Agency provides assistance and training to Member States wishing to use these techniques to address nutritional problems specific to their country.

National nutrition programmes in Brazil, Chile, Cuba, and Mexico use nuclear science and technology to monitor and evaluate their effectiveness. Roughly 80 million rural and urban people in Latin America are covered to some degree by national nutrition programmes costing billions of dollars. Yet without monitoring the body's intake and use of vitamins and minerals, the effectiveness of the programmes remains unknown. The data acquired with these nuclear tools are being used to review national policies and, for the first time, to set nutrition guidelines tailored to local conditions and needs. In Chile, for example, the data resulted in the government deciding to modify its preschool children nutrition intervention programmes; the net result was a reduction in anaemia from 30% to 5% in one year.

Young children are particularly vulnerable to illness and death when they do not receive adequate nutrition. The impact of nutritional supplementation on the quality of breast milk in nursing mothers was studied using stable isotopes in Senegal with support from the IAEA, the World Bank, the World Food Programme and others. The project has shown that the supplemented food being provided through Senegal's community nutrition project significantly improves not only the nutritional quality of breast milk, but also the rate of infant growth in the first three months of life.

Combating Drug Resistant Diseases

Drug resistance is a growing challenge in efforts to control the spread of some infectious diseases like malaria and tuberculosis (TB). Malaria is a serious, and sometimes, fatal disease, caused by a parasite, spread when a parasite-infested mosquito bites a human. Although a variety of drugs have been used to control malaria for many decades, in many regions where malaria occurs the parasite has become resistant to many of these drugs. TB remains one of the world's most serious infectious diseases. Caused by the bacteria-like mycobacteria, it can be spread from person to person through coughing. Although treatable with antibiotics, multiple drug resistant strains of TB are thwarting efforts to control its spread in some regions of the world.

Effective control of malaria and TB depends on finding the right drug treatment. Conventional methods can take up to 28 days to characterize drug resistance for malaria and several weeks for TB. The IAEA has developed molecular methods that look for the genetic changes that cause resistance. These methods use radioactive isotopes to "tag" the genetic material in the disease-causing organism, allowing scientists to determine these changes and identify drug resistance in only a matter of hours.

A three-year technical co-operation project in Kenya, Mali, Sudan, Tanzania, Zambia, Zimbabwe, and Uganda is introducing these molecular methods to help fight drug resistant malaria in these countries. In 2001, the rapid results produced by molecular methods helped guide treatment efforts during a malaria outbreak in Mali. A similar project is

also underway in seven African countries (Kenya, Mali, Sudan, South Africa, Tanzania, Zambia, and Zimbabwe) with the objective of identifying drug resistant TB strains in patients undergoing treatment.

Treating Cancer

Cancer can be cured in approximately 45 per cent of patients with access to the best current treatment. Radiation therapy, one of the earliest medical applications of radiation, remains a major part of cancer treatment. Used to complement surgery and chemotherapy, effective use of radiation therapy requires trained specialists, equipment, and infrastructure so that radiation can be used safely.

The IAEA promotes the safe and effective use of radiation therapy by providing assistance to developing Member States in applying international standards for measuring radiation doses and quality assurance techniques for radiation therapy machines as an integral part of their activities.

Through its technical co-operation programme (TC), the Agency not only transfers important nuclear technology to improve health, but also strives to build capacity that can sustain this technology regionally. In 2001, \$16.9 million was provided through TC projects related to health.

In Latin America, a bi-national project has been established between Ecuador and Peru to improve access to cancer radiotherapy for people living in the border regions of these countries. Regional centres for calibration, maintenance, and repair of radiotherapy equipment have been set up in Brazil, Cuba, and Mexico with support from the Agency. Some 75 radiotherapy units have been repaired to date, resulting in significant cost savings for cancer programmes in the region. The Agency is also assisting Costa Rica create a national institute against cancer.

With its wide range of activities and expertise in nuclear science and medicine, the IAEA is helping Member States use nuclear techniques, where they offer an advantage over conventional methods, to address important health problems at the heart of the sustainable development challenge.

More information is available on the Agency's WorldAtom website:

<http://www-naweb.iaea.org/nahu/external/default.asp>