



A Coordinated Research Project on the Implementation of Nuclear Techniques to Improve Food Traceability

Russell Frew, Andrew Cannavan, Zora Zandric, Britt Maestroni, and Aiman Abraham
International Atomic Energy Agency, Food and Environmental Protection, Austria (r.frew@iaea.org)

Traceability systems play a key role in assuring a safe and reliable food supply. Analytical techniques harnessing the spatial patterns in distribution of stable isotope and trace element ratios can be used for the determination of the provenance of food. Such techniques offer the potential to enhance global trade by providing an independent means of verifying “paper” traceability systems and can also help to prove authenticity, to combat fraudulent practices, and to control adulteration, which are important issues for economic, religious or cultural reasons.

To address some of the challenges that developing countries face in attempting to implement effective food traceability systems, the IAEA, through its Joint FAO/IAEA Division on Nuclear Techniques in Food and Agriculture, has initiated a 5-year coordinated research project involving institutes in 15 developing and developed countries (Austria, Botswana, Chile, China, France, India, Lebanon, Morocco, Portugal, Singapore, Sweden, Thailand, Uganda, UK, USA). The objective is to help in member state laboratories to establish robust analytical techniques and databases, validated to international standards, to determine the provenance of food. Nuclear techniques such as stable isotope and multi-element analysis, along with complementary methods, will be applied for the verification of food traceability systems and claims related to food origin, production, and authenticity. This integrated and multidisciplinary approach to strengthening capacity in food traceability will contribute to the effective implementation of holistic systems for food safety and control.

The project focuses mainly on the development of techniques to confirm product authenticity, with several research partners also considering food safety issues. Research topics encompass determination of the geographical origin of a variety of commodities, including seed oils, rice, wine, olive oil, wheat, orange juice, fish, groundnuts, tea, pork, honey and coffee, the adulteration of milk with soy protein, chemical contamination of food products, and inhomogeneity in isotopic ratios in poultry and eggs as a means to determine production history. Analytical techniques include stable isotope ratio measurements ($2\text{H}/1\text{H}$, $13\text{C}/12\text{C}$, $15\text{N}/14\text{N}$, $18\text{O}/16\text{O}$, $34\text{S}/32\text{S}$, $87\text{Sr}/86\text{Sr}$, $208\text{Pb}/207\text{Pb}/206\text{Pb}$), elemental analysis, DNA fingerprinting, fatty acid and other biomolecule profiling, chromatography-mass spectrometry and near infra-red spectroscopy.