Challenges and potential risks for human health of nanotechnologies in food sector

Isabella DE ANGELIS - *ISS*

Nanotechnology involves manipulation of materials with size range at the nanometer scale. Reduction of material size to nano-dimension may change their physicochemical properties compared to the same material at larger-size scales, such as a much larger surface to mass ratio, enhanced surface reactivity or increased ion release.

Nanomaterials (NMs) and nanotechnology have the potential to bring many benefits to the food sector. They can provide localization, sensing, reporting, and remote control of food items improving efficiency and security and minimization of food-wastage. NMs can also be used to enhance taste, flavour, and availability of nutrients in food. Apart these beneficial uses, NMs interaction with the food system raises a concern about human and animal health.

There are also concerns about unforeseen side effects. Transfer of active ingredients or excipients from nanoparticle incorporated in food products or under nanomaterial-based packaging into tissues may cause undesired effects, as acute toxicity, lesions of liver and kidney, oxidative damages and gastrointestinal inflammation, as well as potential harmful effects to the environment.

The EU Novel Foods Regulation (EC 258-97) addresses provisions for nanofood and/or nanofood ingredients including requirements for placing them on the EU market. In general, NMs have to be approved and authorized by EFSA scientific panels before being used in food/feed products.

Concerning safety assessment of ingested NMs peculiar aspects need to be considered as the influence of food matrix and modifications in the gastrointestinal tract which may require development of specific experimental tools. In this respect, ISS is involved in establishing conceptual framework and procedures for determining NMs fate in a simulated *in vitro* intestinal environment. The approach combines in a sequential way NMs fate in simulated gastrointestinal fluids along the different compartments of the digestive tract and digested NMs internalization/ translocation through an *in vitro* advanced model of intestinal barrier.