Toxicity assessment of carbon nanotubes and other manufactured nanomaterial

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It is natural to considered that the materials with new properties may lead to novel biological effects including unpredicted adverse health effects. Hazard information of a new material while its exposure is not widespread, would be informative to the manufacturers who are producing or planning to produce new products by such materials. Since 2005, we have been running multiple projects funded by the Ministry of Health, Labour and Welfare, Japan, for the development of methods for the hazard identification of the manufactured nanomaterials. In the projects, in vivo experiments (mainly focusing on long-term health implication) has been conducted on multi-walled carbon nanotube (MWCNT; long fiber-type), fullerene (C60), and titanium oxide, which were chosen as first three materials to be tested of their high production volume. Here, we summarize the data generated to date, and introduce some of our current studies and setups for the near future studies, some in conjunction with OECD and other international activities on nanomaterial safety.

In the field of risk assessment and risk management, PCB (polychlorinated biphenyl) has long been a model for highly persistent and highly bioaccumulative chemical, and the initiator of a group of chemicals known as POPs (persistent organic pollutants). Based on the disaster of PCB, highlighted by its chronic/long-lasting and embryonic toxicity, the current Japanese “Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc.” shows primarily concerns on biopersistency and bioaccumulativity of a newly registered chemical before consideration of its toxicity. The basic concept is that, once spilled there is no easy control of exposure and no easy way to cleanup from the living environment. If a nanomaterial fits with this category, i.e., highly persistent and highly bioaccumulative, it is highly prudent for us to establish a system to limit/avoid human exposure (both producers and consumers) until the data on VSD (virtually safe dose) or NOEL/NOAEL are generated and reasonable risk assessment became possible.