

COMMITTEE ON TOXICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

COT statement on the use of toxicogenomics data in risk assessment

The term “toxicogenomics” refers to the production of large quantities of biological information about the regulation of genes, proteins and metabolism in cells, in a way that can be applied in toxicology. It is an area of science that has been developing rapidly. As part of the COT’s remit to advise on new scientific advances that bear on the understanding of toxic risks from chemicals, this statement reviews important developments in toxicogenomics since the last COT statement on the topic in 2009, and considers the aspects of risk assessment to which toxicogenomics might contribute.

In recent years, there has been major expansion in the use of laboratory techniques that produce large quantities of information about the function of cells and organisms. These techniques have been used to investigate a large number of different diseases and the biological consequences of chemical exposures. In parallel with this, there has been improvement in the availability and quality of analytical software that can be used to discern meaningful patterns in such data. The ways in which toxicogenomic findings are interpreted have also changed to take a greater consideration of how different genes and metabolic pathways relate to one another.

Most progress within the field of toxicogenomics has been made where it has been applied to measuring changes in gene activity. As a result, the conclusions of the COT on the use of toxicogenomics in risk assessment are largely based on such studies. In the future, those conclusions may be applicable to toxicogenomic studies applied to other material such as proteins and metabolites.

Possible uses of toxicogenomics in risk assessment for chemicals include:

- To help characterise the biochemical processes by which a substance produces toxic effects
- To provide information on differences between species in their response to chemical exposures, enabling better assessment of the implications for human health of toxicological findings in laboratory animals
- To help develop reliable ways of assessing aspects of chemical toxicity that avoid the use of laboratory animals
- To identify and understand the effects of chemicals at doses below those which produce overt toxicity, which may be relevant for assessing the risk of human exposure to low levels of a chemical

- To improve understanding of when toxicological findings for one substance are likely to apply to another with similar chemical structure
- To identify chemicals in body fluids that can be measured as markers of exposure to a chemical or of its effects on the body (known as “biomarkers”)

As yet, there are few examples of toxicogenomics being applied for such purposes, most published data having been generated for other reasons, and not to answer specific questions in risk assessment. However, the potential is there, provided that findings are sufficiently reproducible within and between laboratories, and can be linked with required confidence to specific biochemical pathways that are relevant to toxic effects.

The COT will continue to monitor developments in this rapidly evolving field.

The full COT statement can be found at:

<http://cot.food.gov.uk/pdfs/cotstatementtgxinra201202.pdf>

Lay Summary to COT Statement 2012/02

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