A review of human carcinogens - Part F: Chemical agents and related occupations

In October 2009, 23 scientists from 6 countries met at the International Agency for Research on Cancer (IARC) to re-assess the carcinogenicity of a number of chemical compounds, complex mixtures and occupational exposures previously classified as *carcinogenic to humans* (Group 1) and to identify additional tumour sites and mechanisms of carcinogenesis. These assessments will be published as the sixth and last part of Volume 100 of the *IARC Monographs*. A few highlights are given below.

Dioxin (2,3,7,8-TCDD), which in 1997 was classified in Group 1 based on strong mechanistic evidence, now has sufficient evidence in humans. This highlights the ability of mechanistic information to provide robust evidence of carcinogenicity and suggests that preventive actions can be taken without waiting for cancers to be observed in exposed humans. The same mechanistic events involved in dioxin carcinogenesis have also been established for other dioxin-like compounds, and the Working Group extended the Group-1 classification to 2,3,4,7,8-pentachlorodibenzofuran and 3,4,5,3',4'-pentachlorobiphenyl, which are indicator chemicals for a larger class of dioxin-like chlorinated dibenzofurans and dioxin-like polychlorinated biphenyls (PCBs).

Formaldehyde, which in 2004 was classified in Group 1, was confirmed as carcinogenic to humans. There is sufficient evidence in humans of nasopharyngeal carcinomas, and the Group 1 classification is also supported by strong mechanistic evidence. In addition, the epidemiological evidence on leukaemia has become stronger, and new mechanistic studies support a conclusion of sufficient evidence in humans. This highlights the value of mechanistic studies, which in only 5 years have replaced previous assertions of biological implausibility with new evidence that formaldehyde can cause blood-cell abnormalities that are characteristic of leukaemia development.

Painting entails exposures that are carcinogenic to humans, causing mesothelioma and cancers of the urinary bladder and lung. Due to the diversity and complexity of the exposures, it is difficult to identify causal agents or a causal mechanism, although there is strong evidence that the exposures are genotoxic. The Working Group found limited evidence of an association between maternal exposure to painting before and during pregnancy and an increased risk of childhood leukaemia in the offspring. These findings confirm those of a previous Working Group (2007).