Are halonitromethanes in water disinfection by-products potential human tumoral agents?

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Disinfection by-products (DBPs) are formed during the process of water disinfection and represent a wide variety of chemical groups. Over the years DBPs exposure has been linked to a number of health effects, including an increased risk of bladder and colon cancer, reproductive failure and respiratory symptoms. Some DBPs species have been regulated in many countries; however, several chemical species with mutagenic capacity which potentially can affect human health remain unregulated.

Halonitromethanes (HNMs) represent one of the most abundant non-regulated groups. In contrast with previous studies conducted with these chemicals, which analyzed their genotoxic potential in short exposure periods, we determined the carcinogenic potential of two HNMs, bromonitromethane (BNM) and trichloronitromethane (TCNM), using a battery of *in vitro* genotoxicity assays in cells chronically exposed to these compounds.

Inhalation has been proven to be one of the main DBPs exposure routes. Thus, BEAS-2B pulmonary cells were exposed for 8 weeks to subtoxic concentrations of the two HNMs, to resemble a more realistic exposure. Different cell transformation markers were assessed throughout the exposure period, such as cell proliferation and morphological changes, anchorage-independent cell growth, and secretion of matrix metallo-proteinases (MMPs).

Long-term exposure to low concentrations of BNM and TCNM showed no cell-transforming ability in BEAS-2B cells, as indicated by the absence of morphological changes, no effects on cell proliferation, no increased levels of MMPs secretion, nor increased anchorage-independent cell growth capacity. Further, we assessed the capacity of long-term exposed cells to enhance tumor growth directly and indirectly by the stimulation of cells from the lung stroma. In both cases there were no changes in the growth of tumor cells.

These results suggest that BNM and TCNM are not responsible for the increased cancer risk associated to DBPs exposure, and therefore further experiments analyzing other DBPs species are necessary to determine the groups behind the observed health effects.