

P79

CARCINOGENIC TRAITS OF ALUMINIUM

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Aluminium is the most abundant metal and, after oxygen and silicon, the third most abundant of all elements in the Earth's crust. Highly reactive, aluminium is rarely found in nature in its free state. This could be one reason why this element is not part of any known physiological process and therefore not essential for life.

Because of its abundance, chemical versatility, and low cost, aluminium is extracted from its natural sediments and used in numerous industrial products and procedures, including cosmetics, food additives and drinking water purification procedures. As a result of chronic exposure, aluminium accumulates in certain organs such as the liver, bone, or mammary gland. Aluminium is recognized as a neurotoxin when it reaches very high concentrations in the body (e.g., in chronic renal insufficiency). Apart from this specific situation, it is considered essentially harmless. With respect to cancer, epidemiological studies investigating potential associations between aluminium exposure and cancer incidence are scarce and provided conflicting results.

Published work from our research group shows that at concentrations in the range of those measured in human organs, aluminium, in the form of $AlCl_3$, enters mammalian cells within one hour and induces chromosome abnormalities – mainly DNA double strand breaks – upon 24 hours exposure in a dose-dependent manner. Part of these data were obtained with V79 cells, frequently used in human regulatory toxicology for the assessment of chemical carcinogens. Prolonged exposure to the same concentrations of aluminium consistently makes normal mammary epithelial cell models capable of forming aggressive tumors in immunodeficient and immunocompetent mouse models. Our results unveil a carcinogenic potential of aluminium and warrant a reappraisal of its postulated innocuity.

Keywords:

Aluminium; breast cancer; chromosomal instability; chemical carcinogenesis.