



## Titanium Dioxide: From Old Friend To Toxic Hazard?

Titanium dioxide ( $\text{TiO}_2$ ) is a familiar material in industrial applications, where it is frequently used as a pigment in paints, cosmetics, sunscreen and pharmaceuticals. It has traditionally been viewed as a benign material and is often used in large quantities with little concern for safety. But new toxicity data has led to its rating by the International Agency for Research on Cancer (IARC) as “possibly carcinogenic to humans” (Group 2B).

This change in IARC rating was based mainly on reports of pulmonary noncancerous tumors in rats and mice given very high inhaled doses ( $250 \text{ mg/m}^3$  where the TLV is  $10 \text{ mg/m}^3$ ). Animal studies by other routes of exposure were negative for cancer.

A series of research studies suggest that these tumors may be related to inflammatory effects of very small particles rather than a direct chemical interaction.

- Other compounds without toxic effects at larger particle size (like carbon black and inorganic salts) have been shown to have inflammatory effects at smaller particle size, and in direct proportion to the surface area and not the mass.
- Much research attention has been directed at the inflammatory effects of air pollution particles smaller than 10 microns ( $\text{PM}_{10}$ ) and so-called nanoparticles smaller than 0.1 microns.  $\text{PM}_{10}$  air pollution has been shown to correlate with rates of asthma, bronchitis and cardiovascular deaths, with the presumption of a common inflammatory mediator.
- The research on diesel exhaust particulates suggest that even  $\text{PM}_{10}$  is not so much the source of the toxic effect but rather a component of much smaller nanoparticles.

This suggests that the particle size has more impact on causing respiratory inflammation than the chemical composition for otherwise inert materials. So it may be that inhaled  $\text{TiO}_2$  is a cause for concern for its inflammatory effects at large doses, but the evidence is yet to show a direct cancer effect for humans.

Should we stop using cosmetics and sunscreen with  $\text{TiO}_2$ ? Studies demonstrate that intact skin is an effective barrier against inflammatory effects.

For more information about  $\text{TiO}_2$  or BarnesCare BioPharma Support Services, 314-747-5846.



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