Safety of sunscreen pigments comes under scrutiny

A new study shows how titanium dioxide nanoparticles used in sunscreens may cause cancer in mice. Although there is no proof that the nanoparticles can cause cancer in humans, the researchers say the study raises concerns about the safety of workers exposed to high concentrations of the nanoparticles in factory settings.

Titanium dioxide is widely used in pigment production – it turns paints, plastics, food colourants and toothpastes white. It is also a key ingredient in UV-protective sun creams. As yet, there is no evidence for titanium dioxide causing cancer in humans. However, animal studies have shown that very fine particles of the chemical, like those often used in sun creams, can cause lung cancer. It has recently been re-classified by the International Agency for Research on Cancer as a potential carcinogen.

In the EU, existing legislation aims to prevent and progressively reduce pollution caused by waste from the titanium dioxide industry. However, there is currently not enough data to establish whether additional regulations are needed to safeguard human health.

The researchers carried out their studies using titanium dioxide particles of around 160 nanometres average size. Their aim was to understand how the particles affected the double-stranded DNA molecules in the cells of the mice – severe DNA damage can cause tumours to develop if the cells survive. They measured different types of DNA damage, including deletions in the DNA code and single- and double-stranded breaks, and found that in each case, mice given titanium dioxide nanoparticles in their drinking water suffered more DNA damage than those given ordinary water.

Damage was spread throughout the body, including in the blood and various organs, and the researchers also noticed that mice exposed to the nanoparticles tended to produce higher levels of factors called cytokines, which are involved in inflammation. Furthermore, mice born to females who had drunk the nanoparticles were more likely to show signs of DNA damage.

According to the researchers, further studies need to be carried out to test whether the same effects could occur in humans. The idea that titanium dioxide nanoparticles could cause carcinogenic effects when ingested is worrying since the nanoparticles are used in foods and toothpastes. As well as limiting the exposure of those working with titanium dioxide nanoparticles in industry, they suggest it might also be wise to limit their consumption in any food or cosmetic product where they are non-essential.


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Theme(s): Chemicals, Environment and health