Talc is a soft clay mineral which has been widely used in health and beauty products for hundreds of years. Mixed with corn starch it’s a common form of baby and adult powders, used to dry the skin and prevent rashes. Talc varies in purity and can be contaminated by fibrous particles, which has been a major topic in a forty-year-long debate around its potential links with cancer.

Dutch researcher Dr Paul Borm, an expert in particle toxicology, has reviewed the existing evidence with a view to updating the ongoing classification of this widely used mineral.

Talc–cancer link?

Talc is associated with the damaging effects of microscopic asbestiform fibres which typically form near it and can cause contamination – you are likely familiar with asbestos, a substance once widely used for its flame-retardant properties but now with proven links to cancer in humans. Fibres found in talc are typically 1μm, the equivalent of 0.001mm – about the same size as a common bacterium. These fibres can pose a problem to humans when breathed into the lungs or otherwise absorbed into the body. The main association is with lung cancer, but other kinds of cancer have also been investigated; for example, as talcum powder is often used by women for intimate hygiene it has been investigated for potential links to ovarian and endometrial cancer.

Talc regulation and classification

The use of talc in commercial products is regulated and research on the potential risks posed to humans is monitored by national authorities and international expert groups such as the International Association for Research on Cancer (IARC) which is part of the World Health Organization (WHO). IARC currently classifies talc that contains asbestos as ‘carcinogenic to humans’; talc not containing asbestos as ‘not classifiable’ as regards carcinogenicity in humans; and the use of talc-based body powder on genital areas as ‘possibly carcinogenic to humans’.

In a newly published review, Borm assessed more than 170 animal and human studies of talc inhalation carried out over a span of 40 years, focusing on effects in the lung. In particular, he aimed to assist the future classification of talc in the Specific Target Organ Toxicity assessment following Repeated Exposure (STOT-RE). STOT-RE 1 (‘danger’) means definitely toxic to humans or having a toxic effect determined in animal experiments after repeated exposure. STOT-RE 2 (‘warning’) means presumed to be toxic after repeated exposure in animal studies.

Several factors confound the evidence for the toxic effects of talc on humans.

Talc inhalation in rats

Borm found that many of the animal studies were conducted according to out-of-date standards. He found only nine studies conducted up-to-current standards and of these only one that met current requirements for STOT-RE classification. A further significant issue relates to the large quantity of talc the rats were typically exposed to. This results in lung overload which causes persistent inflammation and downstream pathology. Although the rats did sometimes develop cancer after talc exposure, it was concluded that this could be a secondary effect of lung overload rather than a direct result of talc toxicity.
### Study | Period/Location | Size | Lung cancer N Cases: relative risk (CI) | MT
---|---|---|---|---
Fordyce et al | 1940–1975 / Vermont (US) | 427 | 32: SMR 1.44 (0.98–2.03) | 0
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Overview of lung cancer and pleural mesothelioma mortality in the most recent updates of five cohorts highly exposed to talc. (Update taken from Buffing et al. N: number of deaths from lung cancer; SMR: standardised mortality ratio; CI: 95% confidence intervals; MT: number of mesothelioma cases observed. Adapted from Borm, PJA. (2023) Talc: inhalation and human health assessed on the basis of available evidence. J Occup Environ Med 65(2), 152–159. Study references can be found in the original.)

As Borm notes, since this research began the guidelines for inhalation studies on animals have been updated and the observed effects of lung overload are now widely acknowledged. The relevance of these studies for human health impacts is still being debated, however, as Borm highlights, a series of 30-year-old rat studies are still used as the benchmark for reports including the EU’s chemical safety regulations.

### Talc inhalation in humans

Several factors confound the evidence for the toxic effects of talc on humans. While commercial products use pure talc free from asbestiform, human epidemiological research (looking at patterns of disease) has focused on millers and miners of talc ore and those otherwise involved in its processing.

In a series of follow-up studies of talc miners at Val Chisone in Northern Italy, a site evaluated as low in asbestiform fibres and other contaminants such as quartz and radon, no deaths were reported from lung cancer though increased deaths from non-malignant respiratory diseases (NMRDs) but not for talc with asbestiform fibres.

The relevance of animal studies for human health impacts is still being debated.

When the variation in presence of asbestiform fibres was accounted for, one IARC assessment concluded there is sufficient evidence for the carcinogenic effects on humans of asbestiform fibres, but not for talc with no asbestiform fibres.

A call for better classification

Borm’s review highlights the inconsistencies in results and the confounding factors that have affected studies on talc inhalation in humans and animals over past decades.

While researchers today look at physiological processes more closely to assess how the body deals with toxic substances, current classification and labelling harmonisation (CLH) seeks to classify based on hazard and not on real risk. Therefore, he raises the question whether we should classify a substance like talc as a carcinogen based on poorly conducted animal studies, or on well-conducted negative human epidemiological studies.

This new review reassessed existing studies for quality and suitability to contribute to future classifications, including STOT-RE. "The human data clearly show an increased mortality due to NMRD but not to lung cancer in workers who have been continually exposed to high levels of talc dust over many years," says Borm. "This evidence … seems to indicate a STOT-1 classification for respiratory talc powder might be appropriate." Further research is needed to understand whether the evidence for lung tumours in rats is relevant to humans given the impacts of lung overload.

#### Wisania et al 1946–2020 / Italy

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Borm’s review highlights some confounding factors affecting studies on talc inhalation in humans and animals.

A Norwegian study did find an increase in cancer deaths over time, including a non-statistical increase in lung cancer. Other studies found no increased incidences of lung cancer in talc workers unless they had been exposed to other carcinogens.

Borm’s review highlights the inconsistency in results and the confounding factors that have affected studies on talc inhalation in humans and animals over past decades.

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