



WORLD HEALTH ORGANIZATION
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans

Volume 2

Some Inorganic and Organometallic Compounds

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Last Updated: 16 March 1998

ASBESTOS

VOL.: 2 (1973) (p. 17)

5. Summary of Data Reported and Evaluation

5.1 Animal carcinogenicity data

Injection of asbestos into the pleural cavity has demonstrated that all major commercial forms can produce mesotheliomas. Experiments suggest that this is probably not due to contaminants such as oils and waxes or heavy metals. It is more likely that the size and shape of the particles are the main factors. Thin, long fibres (less than 0.5 µm diameter and more than 10 µm in length) seem to be most active in producing tumours. Fine glass fibres of similar diameter can also produce mesotheliomas. The carcinogenicity decreases as the materials are pulverised. Inhalation experiments in rats, guinea-pigs and monkeys can produce fibrotic lesions in the lung and pleura similar to those found in man. By inhalation, mesotheliomas and lung carcinomas have been produced in a small proportion of rats exposed to the four commercial types of asbestos.

5.2 Human carcinogenicity data

There is substantial evidence that the risk of lung carcinoma and mesothelioma is small in workers in chrysotile mines and mills, and the same is possibly true for amosite. Some crocidolite mining areas and mills have been associated with a higher risk of mesothelioma. Communities in the neighbourhood of these mines have had, in some instances, an appreciable exposure to asbestos dust. Mesotheliomas have been observed in these populations.

Industrial exposures to asbestos have usually been to mixed types of fibre, especially where manufacturing and application are undertaken, for example, textiles, insulation and asbestos cement, and have also occurred in the immediate vicinity. Mesotheliomas have occasionally been diagnosed among families of asbestos workers.

An important excess risk of lung cancer has usually resulted from past heavy exposures. The differences in risk between the several parts of the industry cannot be ascribed to one factor. The type of fibre, past dust levels, the form of dust produced by the process and the length of exposure are all relevant. The risk of lung carcinomas seems to be related to asbestosis.

In manufacturing and application industries mesotheliomas have been caused by exposure to crocidolite, and less frequently to amosite and chrysotile. The period between first exposure and development of tumours is long, usually more than 30 years. The tumours can occur in the absence of other asbestos-related disease.

At the present time, there is no evidence that exposure of the general population to past levels of asbestos dust in the ambient air or in beverages, drinking-water, food or pharmaceutical preparations increased the risk of cancer.

Cigarette smoking enhances the risk of lung carcinoma in asbestos workers to a much greater degree than in the rest of the population.

Subsequent evaluations: [Vol. 14 \(1977\)](#); [Suppl. 7 \(1987\)](#)

ARSENIC AND INORGANIC ARSENIC COMPOUNDS

VOL.: 2 (1973) (p. 48)

5. Summary of Data Reported and Evaluation

5.1 Animal carcinogenicity data

Many studies have given essentially negative results, but most of them are not referred to in this monograph because of inadequacies in the experimental design (e.g., too few animals, too short a duration, poor survival, too low a level of exposure).

Adequate oral studies on arsenic trioxide in the mouse and on lead arsenate, calcium arsenate, sodium arsenate, arsenic trioxide and sodium arsenite in the rat gave negative results.

The studies designed to detect cocarcinogenicity to mouse skin by potassium arsenite, sodium arsenate or arsenic trioxide gave negative results.

The two recent preliminary reports suggesting possible carcinogenic effects in mice exposed to sodium arsenate, potassium arsenite and arsenic trioxide by subcutaneous, intravenous, oral and transplacental routes are difficult to interpret on the basis of the findings presented, and the results await confirmation.

5.2 Human carcinogenicity data

The available studies point consistently to a causal relationship between skin cancer and heavy exposure to inorganic arsenic in drugs, in drinking-water with a high arsenic content, or in the occupational environment.

The risk of lung cancer is clearly increased in certain smelter workers who inhale high levels of arsenic trioxide. However, the causative role of arsenic is uncertain, since the influence of other constituents of the working atmosphere cannot be determined. An increased relative frequency of deaths from lung cancer has been found in other occupational groups exposed to high levels of inorganic arsenic compounds (e.g., sheep-dip workers, certain mining and vineyard workers).

Cases of lung cancer occurring after the medicinal use of inorganic arsenic compounds, and of liver haemangioendothelioma following various kinds of exposure to arsenic have been reported, but these may be chance associations.

No evidence exists that other forms of cancer occur excessively with heavy arsenic exposure.

Subsequent evaluations: [Vol. 23 \(1980\)](#); [Suppl. 7 \(1987\)](#)

TETRAETHYL- AND TETRAMETHYLLEAD

VOL.: 2 (1973) (p. 150)

5. Summary of Data Reported and Evaluation

5.1 Animal carcinogenicity data

The Working Group was not aware of any adequate inhalation study on TEL or TML.

The Working Group could not evaluate the significance of the development of lymphoma in female Swiss mice given TEL s.c. shortly after birth, because this type of tumour occurs spontaneously and in variable incidence in this strain of mouse.

5.2 Human carcinogenicity data

Accidental exposure to toxic doses of TEL or TML may occur during their addition to gasoline. No studies to assess the cancer experience of exposed individuals have been reported.

Subsequent evaluations: [Vol. 23 \(1980\)](#); [Suppl. 7 \(1987\)](#)

Last updated: 12 March 1998

IRON-CARBOHYDRATE COMPLEXES

VOL.: 2 (1973) (p. 161)

CAS No.: 9004-66-4

Chem. Abstr. Name: Iron-dextran complex

CAS No.: 9004-51-7

Chem. Abstr. Name: Iron-dextrin complex

CAS No.: 1338-16-5

Chem. Abstr. Name: Iron-sorbitol-citric acid complex

CAS No.: 8047-67-4

Chem. Abstr. Name: Saccharated iron oxide

5. Summary of Data Reported and Evaluation

5.1 Animal carcinogenicity data

Repeated i.m. or s.c. injections of iron-dextran induced local sarcomas in the mouse, rat, rabbit and hamster; tests of relatively short duration in squirrel monkeys gave negative results. No conclusive evidence of tumour formation at sites distant from the injection site has been obtained in animals. It would appear that the carcinogenic activity of certain iron macromolecular complexes after i.m. or s.c. injections into rodents is a property of the complex itself, since neither the iron nor the carbohydrate component alone induces sarcomas. The severity of the early tissue changes at the injection site, which is increased by iron overloading, probably increases the risk of sarcoma development at that site.

Neither s.c. nor i.m. injections of iron-sorbitol-citric acid complex induce local sarcomas in rats or mice. It has been suggested that the negative results obtained with this complex are due to its more rapid removal from the injection site as compared with other iron macromolecular complexes which produce sarcomas. The Working Group noted that this compound could not be tested at higher doses than those employed, on account of the toxic effects produced.

Both iron-dextrin complex and saccharated iron oxide produce local sarcomas in mice after repeated s.c. injections. Iron-dextrin also produces local sarcomas in rats after repeated i.m. injections.

5.2 Human carcinogenicity data

Iron-dextran was first introduced for clinical use during the 1950s, and other iron macromolecular complexes intended for parenteral administration were introduced subsequently. A single case of sarcoma at the site of repeated injections of iron-dextran has been described, but it is not known if the sarcoma was caused by the treatment. There is no other evidence to suggest that any of these agents under conditions of clinical use constitute a risk of cancer in man. The period since the introduction of parenteral iron therapy may, however, be too brief for sarcomas to have developed. No epidemiological studies have been reported.

Subsequent evaluation: [Suppl. 7 \(1987\) \(p. 226: Iron-dextran complex - Group 2B\)](#); (p. 64: Iron-dextrin complex - **Group 3**, Iron-sorbitol-citric acid complex - **Group 3**; p. 71: Saccharated iron oxide - **Group 3**)

For definition of Groups, see [Preamble Evaluation](#).

Synonyms for Iron-dextran complex

- Dextran iron complex
- Iron dextran injection
- Ironorm injection

Synonyms for Iron-dextrin complex

- Dextriferron
- Dextriferron injection
- Iron carbohydrate complex
- Iron dextrin injection

Synonyms for Iron-sorbitol-citric acid complex

- Glucitol iron complex, compound with citric acid
- Iron sorbitol
- Iron sorbitex
- Iron sorbitol citrate

Synonyms for Saccharated iron oxide

- Feojectin
- Ferric oxide, saccharated
- Ferric saccharate-iron oxide mix.
- Iron saccharate
- Iron sugar