National Toxicology Program

Headquartered at the
National Institute of Environmental
Health Sciences NIH-HHS

Cobalt and Cobalt Compounds That Release Cobalt Ions In Vivo

What is cobalt and how is it used?

Cobalt is a naturally occurring metallic element that can be present in different forms. It is mixed with other metals to make cemented carbides, bonded diamonds, and alloys that can be used to make durable industrial products, such as military and industrial equipment.

Rechargeable batteries, some surgical orthopedic joint implants, and pigments used to make a rich blue color for glass, tiles, and ceramics are some of the products made with cobalt.

Cobalt nanoparticles can also be used in other medical applications, such as sensors and magnetic resonance imaging devices.

Many of the new green energy products coming on the market, such as solar panels, car batteries for electric vehicles, and wind and gas turbines, are made with some forms of cobalt.

How are people exposed to cobalt?

Cobalt may enter the environment from both natural and human activities. Industrial plants can release cobalt and cobalt compounds into the air and soil. Individuals who work in the hard metal industry producing cobalt powder, working with diamond cutting wheels, or polishing diamonds are at potentially high risk for exposure from inhalation of dust and fumes. The general population can be exposed to low levels of cobalt by consuming food or water that may be contaminated with cobalt. Also, people with cobalt-containing hip or other surgical implants, especially those which fail due to excessive wear or corrosion, may be exposed to higher levels of cobalt than the general public.

Key Points

- *Reasonably anticipated to be a known carcinogen*
- *A naturally occurring element used to make metal alloys and other metal compounds, such as military and industrial equipment, and rechargeable batteries*
- *Highest exposure occurs in the workplace and from failed surgical implants*

14th Report on Carcinogens

What evidence is there that cobalt exposure causes cancer?

Cobalt and some cobalt compounds are being listed as *reasonably anticipated to be carcinogens*, because there is sufficient evidence in animal studies and supporting data from mechanistic studies, or studies of biological changes, showing cobalt can contribute to the development of some cancers.

The human data on these compounds, including data on patients with surgical implants, are inadequate to evaluate. It is not possible to determine the extent of the carcinogenic risk from cobalt ions released from surgical implants.

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For the animal studies, both rats and mice exposed to cobalt metal or cobalt compounds got tumors at different tissue sites — lungs, adrenal glands, pancreas, and immune system — and through different routes of exposure, including inhalation.

The biological data indicate that the release of cobalt ions into the body is a key event that can lead to cell death, DNA damage, and cancer. This is one of the reasons the NTP listing for cobalt is for a class or group of different types of cobalt compounds that release ions in the body or in vivo.

Cobalt in the form of vitamin B12, which helps produce red blood cells and maintain the body's nervous system, is not included in this listing, since it does not release cobalt ions in the body.

What are some things I can do to reduce exposure to cobalt?

Workers and employers should practice good occupational health behaviors, which may include wearing protective gear and properly using respirators, and reducing exposure time to cobalt compounds. Children living near waste sites containing cobalt should wash their hands frequently and before eating.

Where do I go for more information?

National Toxicology Program
http://ntp.niehs.nih.gov/ntp/roc/content/profiles/cobalt.pdf

Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/toxprofiles/TP.asp?id=373&tid=64

National Institute for Occupational Safety and Health
http://www.cdc.gov/niosh/topics/cobalt/

U.S. Environmental Protection Agency
https://www3.epa.gov/airtoxics/hlthef/cobalt.html

National Toxicology Program
U.S. Department of Health and Human Services

The Report on Carcinogens is prepared by the National Toxicology Program, an interagency group coordinated by the U.S. Department of Health and Human Services.
The full report is available at http://ntp.niehs.nih.gov/go/roc14.