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The Effects of Cobalt Exposure on the Mammalian Reproductive System (November 2006)

Exposure to cobalt can occur through inhalation, oral or dermal (skin) routes. Mammals, including humans, are exposed to natural sources of cobalt in their food, water and air. In addition to naturally occurring forms in the environment, cobalt substances may also be present in certain occupational settings and in some consumer products.

Cobalt in the chemically distinct form of Vitamin B₁₂ is essential for humans. While humans require Vitamin B₁₂, mammals such as deer, moose and elk, as well as domestic farm ruminants such as cattle and sheep, directly require the bioavailable cobalt (II) ion for reproductive health. It is common veterinary and agricultural practice to provide cobalt salt supplements to ensure a sufficient source of bioavailable cobalt (II) ion for animal health. Agricultural and veterinary experiences with bioavailable cobalt indicate there are “safe” doses which can maintain beneficial levels of cobalt in the animal. Doses of cobalt in diets that are too low (deficient) or too high (over-exposure) have been reported to have harmful effects. Cobalt-deficient diets are associated with a “wasting disease” in farm ruminants, deer, elk and moose where the animals fail to thrive and their reproductive output is significantly decreased. Over-exposures are associated with decreased reproductive output in farm ruminants.

Over-exposure to water-soluble cobalt salts (and thus the cobalt II ion) has been shown to cause damage to testicular tissue in male rats and mice. The effects are reported by oral exposure to cobalt chloride and by inhalation exposure to cobalt sulphate and they appear to be dose-dependent. These studies also reported sperm number and motility were affected. The oral and inhalation studies reported a threshold level (exposure dose) below which no adverse effects were observed for testicular tissue, sperm motility and sperm number. At the highest oral doses studied, fertility in male mice was significantly reduced (measured as the percentage of fertilised ova). A threshold level was also found for the adverse effects on fertility in male mice. It is unclear whether fertility in male mice is restored after the cessation of oral exposure.

Similar reproductive studies with female mice as well as other rodents and animals have not been found in the literature. In addition, no studies have been found with respect to the impact on the human reproductive system of exposure to elemental cobalt or cobalt substances

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