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Cobalt Exposure and Red Blood Cells (April 2006)

Cobalt is known to stimulate the production of red blood cells. A cobalt-iron medication was once used to treat specific types of anaemia. In clinical situations where decreased numbers of red blood cells were associated with anaemia, ingestion of inorganic cobalt (cobalt +2 ion in the form of cobalt chloride) stimulated an increase in the production of red blood cells (polycythemia or erythrocytosis). Typical adult doses were administered daily in the range of 50-100 milligrams of cobalt (0.7-2.0 milligrams cobalt per kilogram body weight).

Clinical treatments for sickle cell anaemia in children, utilizing higher cobalt doses (in the range of 3 to 4 milligrams per kilogram body weight), were associated with thyroid effects (decreased iodine uptake, e.g. goiter) in addition to the desired polycythemia. The thyroid and polycythemic effects were reversible upon cessation of oral cobalt treatment. Doses lower than 3 milligrams per kilogram body weight were not reported to induce thyroid effects in children. Currently, the clinical use of cobalt for the treatment of anaemia has been replaced by the use of synthetic erythropoetin, a hormone that induces the production of red blood cells.

Environmental cobalt exposures have been associated with altitude-induced polycythemia and Mountain Sickness* in some residents of a Peruvian mining village located 4300 meters above sea-level. High altitudes may also induce polycythemia in humans due to decreased oxygen levels. One study group of villagers, none of whom currently worked in the mine, with polycythemia (induced by high altitude) and significantly increased levels of cobalt measured in their blood (>1 microgram per litre), had greater frequency of Mountain Sickness when compared to villagers with polycythemia and normal cobalt blood levels.

Two occupational exposure studies have assessed the presence of polycythemia in cobalt-exposed workers. One study was conducted in a cobalt refinery and the other was conducted in a factory where cobalt dyes were used to paint porcelain plates. Both studies reported slight but non-significant decreases in red blood cells of workers. The prevalence and clinical significance of polycythemia in occupational cobalt exposures is not known.

References:

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Raffn, E; Mikkelson, S; Altman, DG; Christensen, JM. Groth, S. Health effects due to occupational exposure to cobalt blue dye among plate painters in a porcelain factory in Denmark. *Scan J Work Environ Health* 14:378-384, 1988.

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*Mountain Sickness: Polycythemia (erythrocytosis) usually develops at high altitudes due to lowered ambient oxygen levels. If the polycythemia is severe enough headache, dizziness, weakness, mental confusion, shortness of breath, decreased oxygen saturation, and death may occur. For review see:

Monge CM. Life in the Andes and chronic mountain sickness. *Science* 94:79-84, 1942.

DISCLAIMER

This summary is intended to provide general information about the topic under consideration. It does not constitute a complete or comprehensive analysis, and reflects the state of knowledge and information at the time of its preparation. This summary should not be relied upon to treat or address health, environmental, or other conditions.