

Evidence on the Developmental and Reproductive Toxicity of Chromium (hexavalent compounds)

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Hexavalent chromium, or Cr(VI), compounds:
contain the metallic element chromium (Cr)
in its +6 valence (hexavalent) state

Examples include:

potassium chromate

dichromate

sodium chromate

chromium trioxide

lead chromate



Non-DART Toxicities of Cr(VI)

Human Studies

Oral – Toxicity to digestive tract, altered white cell count, kidney toxicity, and death. Possible increased risk for stomach cancer.

Inhalation – Lung cancer and other respiratory effects.

Animal Studies

Oral – Cancer in rats and mice of both sexes.

Inhalation – Anemia, lung and nasal cancers, and other lung effects.



Animal studies of Cr(VI) developmental toxicity

Gestational Exposure

- 5 drinking water studies
- 1 rat, 4 mouse
- Effects on fetal viability, weight, external and skeletal anomalies
- Effective concentrations: 50 – 1000 ppm

Pre-gestational Exposure

- 5 drinking water studies
- 2 rat, 3 mouse
- Effects on fetal viability, weight, external and skeletal anomalies
- Effective concentrations: 250 – 5000 ppm



Animal studies of Cr(VI) female reproductive toxicity

- Eight drinking water studies: 3 in rats, 5 in mice
- Effects included:
 - Ovarian changes
 - Lengthened estrous cycles
 - Decreased mating and fertility indices
 - Decreased embryo-fetal viability
 - Complete pregnancy failure
 - Delayed vaginal opening (♀ F1 offspring)
- Effective concentrations: 5 – 1000 ppm



Animal studies of Cr(VI) male reproductive toxicity (part 1)

- Sixteen studies evaluated
- Species: monkey, rat, mouse, rabbit
- Routes: drinking water, feed, gavage, i.p. injection
- Findings included effects on:
 - Testicular weights and histopathology
 - Male reproductive accessory organs
 - Sperm parameters
 - Testicular hormones and biochemistry
 - Sexual and aggressive behavior



Animal studies of Cr(VI) male reproductive toxicity (part 2)

Effective doses & concentrations of Cr(VI)

- Drinking water
 - Monkeys: ≥ 100 ppm
 - Rats: 1000 ppm
 - Mice: ≥ 2000 ppm
- Feed or gavage
 - Mice: 10 – 60 mg/kg-day, 100 – 400 ppm
 - Rabbits: 5 mg/kg-day
- Injection, i.p.
 - Rats: 0.05 – 4 mg/kg-day
 - Rabbits: 2 mg/kg-day

