

Effects of Polyvinyl Chloride Ingestion by Dogs

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SUMMARY

Polyvinyl chloride (PVC) acrylic thermoplastic sheeting was fed to 6 dogs to determine whether ingestion during periods of normal transit of military working dogs would be toxic and thus affect the safety of this material for construction of shipping containers. The test dogs were fed PVC acrylic (0.125 g/kg of body weight; by gelatin capsule) twice each day for 5 days: for 2 dogs, the test material was in a shredded form; for 2 dogs, the material was diced; and for 2 dogs, it was powdered. Two other dogs were used as controls.

Dogs were observed for clinical signs, and feed consumption and body weights were recorded. Blood and urine samples were examined. All animals were necropsied approximately 10 days after the feeding was stopped.

Clinical or pathologic indication of a toxic effect of PVC was not seen within the time limits of the study.

Information on the effects of polyvinyl chloride (PVC) acrylic material ingested by military working dogs was needed, since construction of shipping containers with this material was under consideration.

Review of Literature

Vinyl chloride toxicity in animals has been reviewed.¹ The primary concern of most investigations has been the possible carcinogenesis and other toxic reactions

from exposure to the airborne monomer of vinyl chloride which is used as an aerosol propellant in a variety of household and cosmetic products. Vinyl chloride gas was actively toxic for mice, rats, guinea pigs, and rabbits, with congestion of internal organs being the predominant lesion.²

Vinyl chloride has a local irritating effect on skin and mucous membranes; however, chronic feeding (2 years) of 1.5 to 14% vinyl chloride-vinyl acetate copolymer to rats produced no observable toxic effects.³

Severe fibroblastic reactions in muscle tissue were produced by implantation of vinyl chloride plastics in rabbits and guinea pigs.³

Determination was not made, however, whether the reaction was produced by monomer, polymer, plasticizer, or other additives.

Results of tissue culture experiments in vitro indicated a toxic potential occurs from materials migrating from PVC.⁴ Tissue culture medium exposed to PVC tubing caused chicken embryo heart cells to show blistering and granularity, and caused the heart to stop beating.⁵

An aqueous extract of PVC resin given orally to rats retarded weight gains and decreased blood catalase activity.⁶

The polymers of vinyl chloride contain unreacted monomer and other additives.⁷ However, to date, no extensive research has been accomplished to determine the oncogenic and toxicologic potentials of plasticizers, antioxidants, and unreacted monomers contained in PVC otherwise deemed as safe.

Materials and Methods

Test Animals—Eight dogs were used; they were active, adult males of uniform size, outwardly healthy, and free of external parasites.

Test Phases—Pretest Holding and Acclimation—All animals selected for the experiment were held in the test area for 7 days after clinical examination to acclimate them to the environment and feeding regimen. Test animals were treated for minor clinical abnormalities or nematode infestations. Results of blood, urine, and fecal examinations were within normal limits.

Test Period—The 2 control animals were fed a normal diet, and the 6 test dogs were given PVC acrylic (0.125 g/kg of body weight; in 3 forms, by gelatin capsule) twice each day for 5 days. Two of these animals were fed the PVC in the form of 6-mm squares of test material (diced); 2 animals were fed test material shredded on a milling machine, and 2 animals were fed test material which had been ground into powder.

Dogs were dosed at 8:00 AM and 4:00 PM and fed a commercial dog food⁸ at 12 noon daily. Drinking water was provided free choice at all times.

Dogs were observed each day for clinical signs, and body weight and feed consumption were recorded. Blood and urine samples were obtained 2 days apart during this phase, and values for hematologic examinations, serum alanine aminotransferase, serum blood urea nitrogen, and routine urinalyses were obtained.

Postfeeding Period—The feeding trial was terminated at the end of 5 days. Since clinical signs were not seen during the feeding period, dogs were continued under observation for 10 days and then were euthanatized and necropsied.

Blocks of tissue were fixed in 10% buffered formalin, embedded in paraffin, cut at 6 μ m, and stained with hematoxylin and eosin.

Results

With the exception of occasional soft feces, abnormal clinical signs were not seen. The test material was observed to pass through the digestive system of all animals unchanged. Results of hematologic examination, blood chemical analyses, and urinalyses were within normal values in all dogs throughout the testing periods. Gross and microscopic lesions attributable to the test material were not seen.

Discussion

Incompatibilities resulting from short-term ingestion of PVC acrylic

⁸ Purina Laboratory Canine/Dog Chow, Ralston Purina Company, St. Louis, Mo.

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thermoplastic were not seen in the dogs, and lesions attributable to this compound were not discovered. There was apparently little absorption, and there was no evidence of hematogenous dissemination of particles, as has been previously reported.⁸ This may be due to difference in particle size, total amount, or some other difference in experimental method. There is now no rationale to indicate that serious problems would evolve in dogs that might ingest PVC acrylic thermoplastic used in the construction of shipping containers for short-time transit of dogs. An attempt was not made to estab-

lish the statistical validity of the results, since the goal was to obtain an overview of any incompatibilities that would evolve as a result of ingestion of this material.

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