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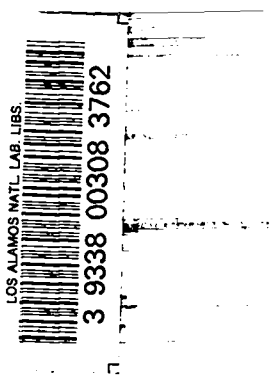

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A TOXICOLOGICAL STUDY OF THE HIGH EXPLOSIVE FORMULATION X-0298

by

J. E. London and D. M. Smith, D.V.M.

ABSTRACT

The acute oral LD_{50} values for the high explosive formulation X-0298 for mice and rats is greater than 5 g/kg. According to classical guidelines, the mixture would be considered only slightly or practically nontoxic in both species. Skin application studies in the rabbit with X-0298 demonstrated that it was cutaneously nonirritating. This material was also nonirritating in rabbit eye application studies. The sensitization study in the guinea pig did not show X-0298 to be deleterious in this regard.

I. INTRODUCTION

As part of the Toxicology (LS-1) Group's applied program, X-0298 (97.5 wt% HMX/1.12 wt% KRATON-G/1.38 wt% Hyvac Oil) was examined to define its toxic properties with the following tests: (1) acute oral toxicity, (2) primary skin irritation, (3) skin sensitization, and (4) eye (conjunctival) instillation. This material is used as a main charge explosive.

II. EXPERIMENTAL PROCEDURES

A. Source of Material

The test material was supplied by M-1 (Los Alamos National Laboratory) in proper amounts and desired dilutions for each of the planned tests. One gram (dry) was received for the rabbit eye procedure. The material was stored at 25°C in the provided containers in a locked file safe.

B. Single-Dose Acute Oral Toxicity (LD_{50}^{30} Days)

1. Rats. Thirty young adult (∿76 days) Sprague-Dawley male rats, weighing 280-356 g each, were used in the test group. The compound was administered to ether-sedated rats as a suspension in corn oil; corn oil controls were made previously. This vehicle was used to solubilize the mixture in an innocuous medium. The dose was given intragastrically with a ball-tipped needle and syringe.

After treatment, all animals were observed daily for 30 days for aberrant physiological and behavioral responses.[1,2] The results of preliminary work are not presented herein, but the data are on file at the Los Alamos National Laboratory (Compound LS-1 #20).

2. Mice. The procedure for single-dose oral toxicity in the mouse was identical to that for the rat. Thirty young adult CD-1 (∿66 days) mice, weighing 27-32 g each, were used. Corn oil controls were done previously. As in the rat study, all animals were observed daily after treatment for 30 days.

C. Primary Skin Irritation

The Draize test[3] was used to assess primary skin irritation. Five New Zealand white rabbits, weighing 2.3-2.6 kg each, were used in this test group. The back of each rabbit was electrically clipped free of hair 24 h before application of the compound. Two sites were abraded and two left unabraded. The compound was applied as a paste consisting of 500 mg in corn oil to each location. The test sites were covered with a gauze pad, and the entire back was covered with an adhesive plastic drape. Each rabbit was then placed in a rabbit jacket (Alice King Chatham, Los Angeles, California). After 24 h, the wraps were removed, and each test site was visually scored for erythema and edema. Readings were recorded for 24, 48, and 72 h. The final irritation score is an average for the 24- and 72-h readings.

D. Eye Irritation

Six New Zealand rabbits, weighing 2.1-2.6 kg each, were used in this facet of the study. Both eyes were checked for abnormalities before instillation. The compound was instilled in 100-mg quantities into the conjunctival envelope of the left eye of each rabbit; the right eye served as a control. Two of the rabbits had the compound washed from the eye 30 seconds after instillation; two, 5 min after instillation; and two did not have the compound washed from the eye. Each eye was graded for ocular lesions at 1 and 4 h on the day of the application and again at 24, 48, and 72 h. Of particular interest was whether the

cornea, iris, and conjunctiva became inflamed. The procedure and grading system were taken from the Draize test.

E. Skin Irritation

Six female guinea pigs, weighing 730-893 g each, were used in the treatment group. The animals were housed individually and fed commercial laboratory stock diet ad libitum supplemented by daily lettuce, cabbage, or apples because of their need for vitamins.

The test compound was diluted to a concentration of 0.1% with corn oil. Corn oil controls were done previously. The compound was administered in a series of ten "sensitizing" injections into the lower back and flanks of the guinea pigs. Before each injection, the test sites were clipped free of hair with electric small-animal clippers. Injections were made randomly over the test area via a 1-cc tuberculin syringe fitted with a 25-gauge needle. The volume of the first injection was 0.05 mL, and that of the other nine was 0.10 mL. At 24 h after injection, the reaction was scored for erythema (redness), height, and diameter. Redness and height were scored as described by Landsteiner and Jacobs;[4] the diameters of the reactions were measured in millimeters using micrometer calipers.

Two weeks after administration of the tenth sensitizing injection, the lower back and flanks of each guinea pig were clipped free of hair, and a challenge injection of 0.05 mL was administered. The reaction of each animal was graded 24 h later and compared with those from the sensitizing injections.

III. RESULTS AND DISCUSSION

A. Single-Dose Acute Oral Toxicity (LD_{50}^{30} Days)

1. Rats. In general, all rat behavioral and physiological responses after administration appeared normal. The LD_{50}^{30} value was greater than 5 g/kg.

2. Mice. All mouse behavior and physiological responses after administration appeared normal. The LD_{50}^{30} value was greater than 5 g/kg.

B. Primary Skin Irritation

X-0298 caused no edema or erythema on the unabraded sites; two rabbits had erythema on the abraded site. The primary irritation index was 0.1 with any index less than 2 considered negative.

C. Eye Irritation

All animals exhibited a negative reaction to the test substance with mild redness only for the first 24 h.

D. Skin Sensitization

Review of the data collected for each guinea pig in the treatment group indicates that all challenge injection reactions were within the limits of the reactions recorded during the sensitizing period. The guinea pig skin sensitization study did not show X-0298 to be a sensitizer.

REFERENCES

1. T. A. Loomis, Essentials of Toxicology (Lea and Febiger, Philadelphia, 1974), p. 19.

2. L. J. Casarett and J. Doull, Toxicology: The Basic Science of Poisons (MacMillan, New York, 1975), p. 24.

3. J. H. Draize, G. Woodard, and H. O. Calveny, "Methods for the Study of Irritation and Toxicity of Substances Applied Topically to the Skin and Mucous Membranes," J. Pharm. Exp. Therap. 82, 337-390 (1944).

4. K. Landsteiner and J. Jacobs, "Studies on the Sensitization of Animals with Simple Chemical Compounds," J. Exp. Med. 61, 643-656 (1935).

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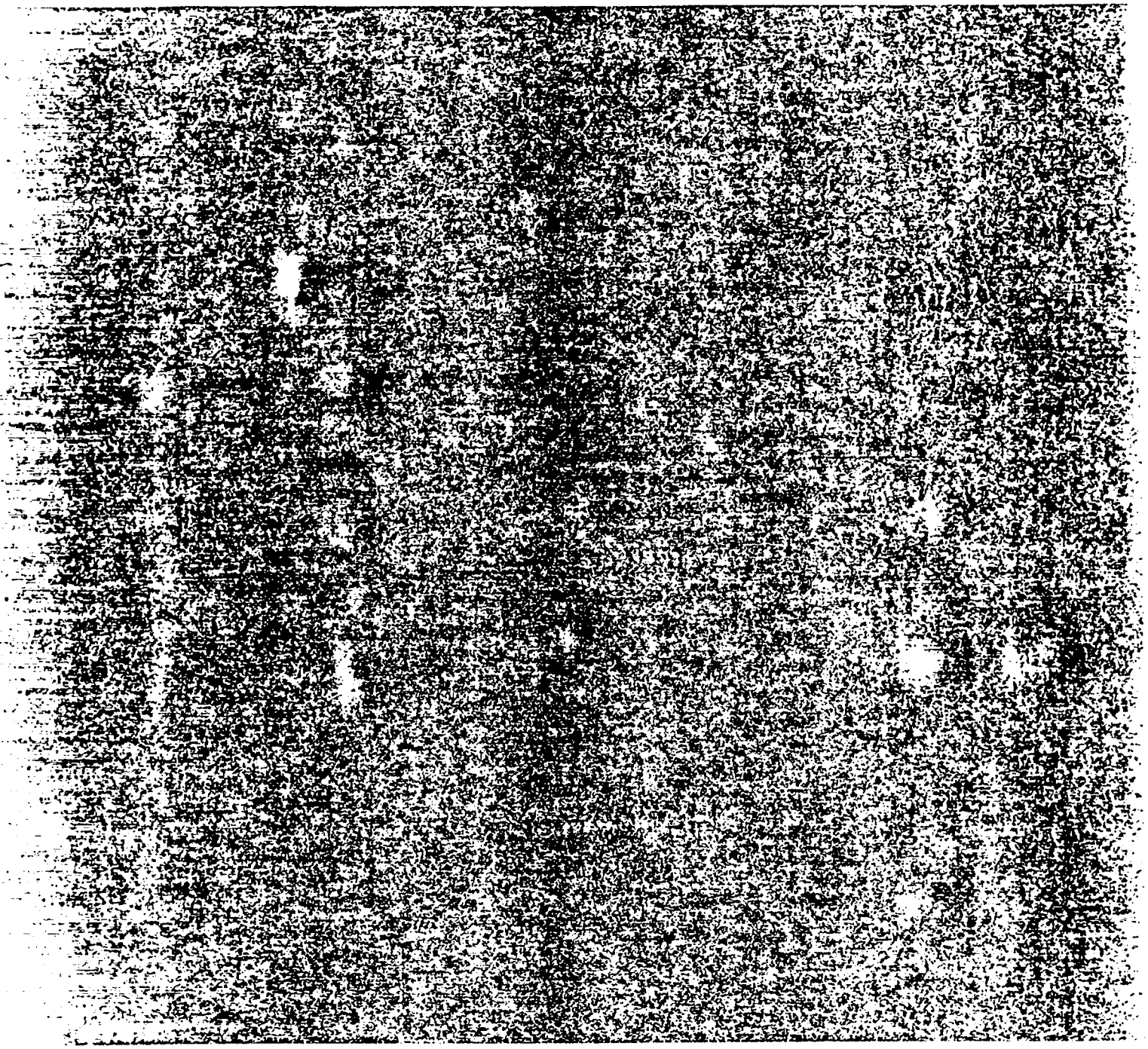

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