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UNITED STATES ARMY
ENVIRONMENTAL HYGIENE
AGENCY
ABERDEEN PROVING GROUND, MD 21010

TOPICAL HAZARD EVALUATION PROGRAM OF CANDIDATE INSECT REPELLENTS
A13-37432a, A13-20827c, A13-37435a, A13-37444a, A13-37446a,
AND A13-34960b
US DEPARTMENT OF AGRICULTURE PROPRIETARY CHEMICALS
STUDY NOS. 75-51-0135-79, 75-51-0136-79, 75-51-0137-79, 76-51-0145-79,
75-51-0147-79, AND 75-51-0149-79
SEPTEMBER 1978 - JUNE 1979

Approved for public release; distribution unlimited.
Topical Hazard Evaluation Program of Candidate Insect Repellents A13-37432a, A13-20827c, A13-37435a, A13-37444a, A13-37446a, and A13-34960b were performed by means of laboratory studies using New Zealand White rabbits. The technical grade compounds caused severe corneal and conjunctival irritation. Compounds A13-37432a, A13-37435a, A13-37446a, and A13-34960b were particularly severe, causing corneal damage which persisted at 7 days in all rabbits.

A summary of the pertinent findings and recommendations of the inclosed report follows:

Hazard evaluations of candidate insect repellents A13-37432a, A13-20827c, A13-37435a, A13-37444a, A13-37446a, and A13-34960b were performed by means of laboratory studies using New Zealand White rabbits. The technical grade compounds caused severe corneal and conjunctival irritation. Compounds A13-37432a, A13-37435a, A13-37446a, and A13-34960b were particularly severe, causing corneal damage which persisted at 7 days in all rabbits. It was recommended that all six compounds not be approved for further testing as candidate insect repellents. If, however, any of these compounds should show pest repellent properties which are a significant improvement over currently available compounds, it is suggested that they be resubmitted in their proposed use formulations and/or concentrations.

FOR THE COMMANDER:

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Director, Laboratory Services
TOPICAL HAZARD EVALUATION PROGRAM OF CANDIDATE INSECT REPELLENTS
A13-37432a, A13-20827c, A13-37435a, A13-37444a, A13-37446a, and A13-34960b

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1. AUTHORITY.
   a. Letter, US Department of Agriculture - Agricultural Research Service,
      Southern Region, Insects Affecting Man and Animal Research Laboratory,
   a. Memorandum of Understanding between the US Army Environmental Hygiene
      Agency; the US Army Health Services Command; the Department of the Army,
      Office of The Surgeon General; the Armed Forces Pest Control Board; and the
      US Department of Agriculture, Agricultural Research, Science and Education
      Administration; titled, Coordination of Biological and Toxicological Testing

2. REFERENCE. Toxicology Division Procedural Guide, USAEHA, 1972, revised
   1976.

3. PURPOSE. The purpose of this study is to provide guidance for further
   entomological testing of the candidate insect repellents A13-37432a,
   A13-20827c, A13-37435a, A13-37444a, A13-37446a, and A13-34960b.

4. SUMMARY OF FINDINGS. Hazard evaluations of the candidate repellents
   A13-37432a, A13-20827c, A13-37435a, A13-37444a, A13-37446a, and A13-34960b,
   USDA Proprietary Chemicals, were conducted by this Agency using New Zealand
   White rabbits for eye studies. A tabular presentation of animal toxicity
   data developed in this Agency follows:**

   * In conducting the studies described in this report, the investigators
     adhered to the "Guide for the Care and Use of Laboratory Animals," US
     Department of Health, Education, and Welfare Publication No. (NIH) 74-23,
     revised 1978.
   † The experiments reported herein were performed in animal facilities, fully
     accredited by the American Association for the Accreditation of Laboratory
     Animal Care.

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EYE IRRITATION STUDIES

<table>
<thead>
<tr>
<th>Test</th>
<th>Results</th>
<th>Interpretation</th>
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**Rabbits**

- Single 24-hour application of 0.1 ml technical grade compound to one eye of each of six rabbits. Eyes are examined and graded at 24, 48, and 72 hrs, and again at 7 days.

- Compounds AI3-20827c and AI3-37444a produced moderately severe corneal and conjunctival irritation and damage in 6 of 6 rabbits which persisted at 72 hours. Irritation was not apparent at 7 days.

- Compounds AI3-37435a and AI3-37446a produced moderately severe corneal and conjunctival irritation and damage in 6 of 6 rabbits which persisted at 72 hours. Corneal ulcers or scars were present in 4 of 6 rabbits for both compounds at 7 days.

- Compounds AI3-37432a and AI3-34960b produced severe corneal and conjunctival irritation and damage in 6 of 6 rabbits which persisted at 72 hours. Corneal ulcers and damage was present in 6 of 6 rabbits at 7 days for compound AI3-37437a. Compound AI3-34960b caused rupture of the anterior chamber in 2 of 6 rabbits by 7 days, damage being irreversible.

USAHA Category E (ref Appendix)

USAHA Category F (ref Appendix)

5. CONCLUSIONS. The candidate insect repellents AI3-37432a, AI3-20827c, AI3-37435a, AI3-37444a, AI3-37446a, and AI3-34960b caused moderately severe to severe corneal and conjunctival damage and do not qualify as nonhazardous insect repellents.

6. RECOMMENDATIONS. Under the provisions of the Memorandum of Understanding (paragraph 1b), it is recommended that AI3-37432a, AI3-20827c, AI3-37435a, AI3-37444a, AI3-37446a, and AI3-34960b not be approved for further testing as candidate insect repellents. Although the skin irritation studies were not performed, the severity of the ocular irritation reactions warrant the recommendation given. If, however, any of these compounds should show a significant improvement in pest repellent properties over currently available compounds, it is suggested they be resubmitted in their proposed use formulation and/or concentrations.

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APPENDIX

TOPOCAL HAZARD EVALUATION PROGRAM
DEFINITIONS OF CATEGORIES OF COMPOUNDS BEING
CONSIDERED FOR ACUTE SKIN APPLICATION

CATEGORY I - Compounds producing no primary irritation of the intact skin or
no greater than mild primary irritation of the skin surrounding an abrasion.
(INTERPRETATION: No restriction for acute application to the human skin.)

CATEGORY II - Compounds producing mild primary irritation of the intact skin
and the skin surrounding an abrasion. (INTERPRETATION: Should be used only
on human skin found by examination to have no abrasions or may be used as a
clothing impregnant.)

CATEGORY III - Compounds producing moderate primary irritation of the intact
skin and the skin surrounding an abrasion. (INTERPRETATION: Should not be
used directly on the skin without a prophetic patch test having been
conducted on humans to determine irritation potential to human skin. May be
used without patch testing, with extreme caution, as clothing impregnants.
Compound should be resubmitted in the form and at the intended use
concentration so that its irritation potential can be reexamined using other
test techniques on animals.)

CATEGORY IV - Compounds producing moderate to severe primary irritation of
the intact skin and of the skin surrounding an abrasion and, in addition,
producing necrosis, vesiculation, and/or eschars. (INTERPRETATION: Should be
resubmitted for testing in the form and at the intended use concentration.
Upon resubmission, its irritation potential will be reexamined using other
test techniques on animals, prior to possible prophetic patch testing in
humans, at concentrations which have been shown not to produce primary
irritation in animals.)

CATEGORY V - Compounds impossible to classify because of staining of the skin
or other masking effects owing to physical properties of the compound.
(INTERPRETATION: Not suitable for use on humans.)

EYE CATEGORIES:

A. Compounds noninjurious to the eye. INTERPRETATION: Irritation of
human eyes is not expected if the compound should accidentally get into the
eyes, provided it is washed out as soon as possible.

B. Compounds producing mild injury to the cornea. INTERPRETATION:
Should be used with caution around the eyes.

C. Compounds producing mild injury to the cornea, and in addition some
injury to the conjunctiva. INTERPRETATION: Should be used with caution
around the eyes and mucosa.

D. Compounds producing moderate injury to the cornea. INTERPRETATION:
Should be used with extreme caution around the eyes.

E. Compounds producing moderate injury to the cornea, and in addition
producing some injury to the conjunctiva. INTERPRETATION: Should be used
with extreme caution around the eyes and mucosa.

F. Compounds producing severe injury to the cornea and to the
conjunctiva. INTERPRETATION: Should be used with extreme caution. It is
recommended that use be restricted to areas other than the face.