[illegible] s
[illegible]ental Protection
Agency

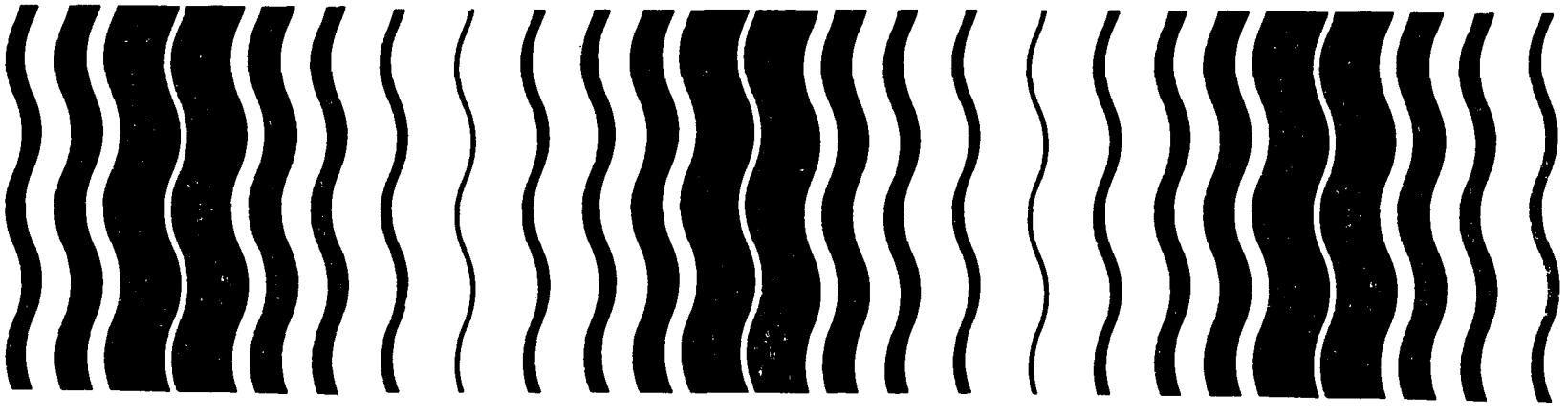
Office of
Pesticides and Toxic Substances
Washington DC 20460

March 1981

EPA

2-Ethyl-1,3-Hexanediol

Pesticide Registration Standard



2-Ethyl-1,3-Hexanediol

Pesticide Registration Standard

I.M. Sunzenauer	Project Manager (SPRD)
Ken Bailey	Science Policy Staff (HED)
Charlotte Blalock	Chemist (HED)
Harry Craven	Wildlife Biologist (HED)
Paul Matthai	Biologist (RD)
Christine Dively	Entomologist (RD)
Linda Garczynski	Writer/Editor (SPRD)
Arthur Schlosser	Environmental Chemist (HED)
Chad Sandusky	Toxicologist (HED)
Joseph Tavano	Technical Product Manager (RD)
Ralph Wright	Project Manager (SPRD)

March 27, 1981

Office of Pesticides and Toxic Substances

Environmental Protection Agency

401 M Street, SW

Washington, D.C. 20460

- TABLE OF CONTENTS -

CHAPTER I: HOW TO REGISTER UNDER A REGISTRATION STANDARD

1. Organization of the Standard
2. Purpose of the Standard
3. Requirement to Reregister Under the Standard
4. "Product Specific" Data and "Generic" Data
5. Data Compensation Requirements under FIFRA 3(c)(1)(D)
6. Obtaining Data to Fill "Data Gaps"; FIFRA 3(c)(2)(B)
7. Amendments to the Standard

1. Organization of the Standard

This first chapter explains the purpose of a Registration Standard and summarizes the legal principles involved in registering or reregistering under a Standard. The second chapter sets forth the requirements that must be met to obtain or retain registration for products covered by this particular Registration Standard. In the remaining chapters, the Agency reviews the available data by scientific discipline, discusses the Agency's concerns with the identified potential hazards, and logically develops the conditions and requirements that would reduce those hazards to acceptable levels.

2. Purpose of the Standard

Section 3 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides that "no person in any State may distribute, sell, offer for sale, hold for sale, ship, deliver for shipment, or receive (and having so received) deliver or offer to deliver, to any person any pesticide which is not registered with the Administrator [of EPA]." To approve the registration of a pesticide, the Administrator must find, pursuant to Section 3(c)(5) that:

> "(A) its composition is such as to warrant the proposed claims for it;
>
> (B) its labeling and other material required to be submitted comply with the requirements of this Act;
>
> (C) it will perform its intended function without unreasonable adverse effects on the environment; and
>
> (D) when used in accordance with widespread and commonly recognized practice it will not generally cause unreasonable adverse effects on the environment."

In making these findings, the Agency reviews a wide range of data which registrants are required to submit, and assesses the risks and benefits associated with the use of the proposed pesticide. However, the established approach to making these findings has been found to be defective on two counts.

First, EPA and its predecessor agency, the United States Department of Agriculture (USDA), routinely reviewed registration applications on a "product by product" basis, evaluating each product-specific application somewhat independently. In the review of products containing similar components, there was little opportunity for a retrospective review of the full range of pertinent data available in Agency files and in the public literature. Thus

the "product by product" approach was often inefficient and sometimes resulted in inconsistent or incomplete regulatory judgments.

Second, over the years, as a result of inevitable and continuing advances in scientific knowledge, methodology, and policy, the data base for many pesticides came to be considered inadequate by current scientific and regulatory standards. Given the long history of pesticide regulation in several agencies, it is even likely that materials may have been lost from the data files. When EPA issued new requirements for registration in 1975 (40 CFR 162) and proposed new guidelines for hazard testing in 1978 (43 FR 29686, July 10, 1978 and 43 FR 37336, August 22, 1978), many products that had already been registered for years were being sold and used without the same assurances of human and environmental safety as was being required for new products. Because of this inconsistency, Congress directed EPA to reregister all previously registered products, so as to bring their registrations and their data bases into compliance with current requirements [See FIFRA Section 3(g)].

Facing the enormous job of re-reviewing and calling-in new data for the approximately 35,000 current registrations, and realizing the inefficiencies of the "product by product" approach, the Agency decided that a new, more effective method of review was needed.

A new review procedure has been developed. Under it, EPA publishes documents called Registration Standards, each of which discusses a particular pesticide active ingredient. Each Registration Standard summarizes all the data available to the Agency on a particular active ingredient and its current uses, and sets forth the Agency's comprehensive position on the conditions and requirements for registration of all existing and future products which contain that active ingredient. These conditions and requirements, all of which must be met to obtain or retain full registration or reregistration under Section 3(c)(5) of FIFRA, include the submission of needed scientific data which the Agency does not now have, compliance with standards of toxicity, composition, labeling, and packaging, and satisfaction of the data compensation provisions of FIFRA Section 3(c)(1)(D).

The Standard will also serve as a tool for product classification. As part of the registration of a pesticide product, EPA may classify each product for "general use" or "restricted use" [FIFRA Section 3(d)]. A pesticide is classified for "restricted use" when some special regulatory restriction is needed to ensure against unreasonable adverse effects to man or the environment. Many such risks of unreasonable adverse effects can be lessened if expressly-designed label precautions are strictly followed. Thus the special regulatory restriction for a "restricted use" pesticide is usually a requirement that it be applied only by, or under the supervision of, an applicator who has been certified by the State or Federal government as being competent to use the pesticide safely, responsibly, and in accordance with label directions. A restricted-use pesticide can have other regulatory restrictions [40 CFR 162.11(c)(5)] instead of, or in addition to, the certified applicator requirement. These other regulatory restrictions may include such actions as seasonal or regional limitations on use, or a requirement for the monitoring of residue levels after use. A pesticide classified for "general use," or not classified at all, is available for use by any individual who is in compliance with State or local regulations. The Registration Standard

review compares information about potential adverse effects of specific uses of the pesticide with risk criteria listed in 40 CFR 162.11(c), and thereby determines whether a product needs to be classified for "restricted use." If the Standard does classify a pesticide for "restricted use," this determination is stated in the second chapter.

3. Requirement to Reregister Under the Standard

FIFRA Section 3(g), as amended in 1978, directs EPA to reregister all currently registered products as expeditiously as possible. Congress also agreed that reregistration should be accomplished by the use of Registration Standards.

Each registrant of a currently registered product to which this Standard applies, and who wishes to continue to sell or distribute his product in commerce, must apply for reregistration. His application must contain proposed labeling that complies with this Standard.

EPA will issue a notice of intent to cancel the registration of any currently registered product to which this Standard applies if the registrant fails to comply with the procedures for reregistration set forth in the Guidance Package which accompanies this Standard.

4. "Product Specific" Data and "Generic" Data

In the course of developing this Standard, EPA has determined the types of data needed for evaluation of the properties and effects of products to which the Standard applies, in the disciplinary areas of Product Chemistry, Environmental Fate, Toxicology, Residue Chemistry, and Ecological Effects. These determinations are based primarily on the data Guidelines proposed in 43 FR 29696, July 10, 1978; 43 FR 37336, August 22, 1978; and 45 FR 72948, November 3, 1980, as applied to the use patterns of the products to which this Standard applies. Where it appeared that data from a normally applicable Guidelines requirement was actually unnecessary to evaluate these products, the Standard indicates that the requirement has been waived. On the other hand, in some cases studies not required by the Guidelines may be needed because of the particular composition or use pattern of products the Standard covers; if so, the Standard explains the Agency's reasoning. Data guidelines have not yet been proposed for the Residue Chemistry discipline, but the requirements for such data have been in effect for some time and are, the Agency believes, relatively familiar to registrants. Data which we have found are needed to evaluate the registrability of some products covered by the Standard may not be needed for the evaluation of other products, depending upon the composition, formulation type, and intended uses of the product in question. The Standard states which data requirements apply to which product categories. (See the third chapter.) The various kinds of data normally required for registration of a pesticide product can be divided into two basic groups:

A. Data that are product specific , i.e. data that relate only to the properties or effects of a product with a particular composition (or a group of products with closely similar composition); and

B. Generic data that pertains to the properties or effects of a

particular ingredient, and thus are relevant to an evaluation of the risks and benefits of all products containing that ingredient (or all such products having a certain use pattern), regardless of any such product's unique composition.

The Agency requires certain "product specific" data for each product to characterize the product's particular composition and physical/chemical properties (Product Chemistry), and to characterize the product's acute toxicity (which is a function of its total composition). The applicant for registration or reregistration of any product, whether it is a manufacturing-use or end-use product, and without regard to its intended use pattern, must submit or cite enough of this kind of data to allow EPA to evaluate the product. For such purposes, "product specific" data on any product other than the applicant's is irrelevant, unless the other product is closely similar in composition to the applicant's. (Where it has been found practicable to group similar products for purposes of evaluating, with a single set of tests, all products in the group, the Standard so indicates.) "Product specific" data on the efficacy of particular end-use products are also required where the exact formulation may affect efficacy and where failure of efficacy could cause public health problems.

All other data needed to evaluate pesticide products concern the properties or effects of a particular ingredient of products (normally a pesticidally active ingredient, but in some cases a pesticidally inactive, or "inert", ingredient). Some data in this "generic" category are required to evaluate the properties and effects of all products containing that ingredient [e.g., the acute LD-50 of the active ingredient in its technical or purer grade; see proposed guidelines, 43 FR 37355].

Other "generic" data are required to evaluate all products which both contain a particular ingredient and are intended for certain uses (see, e.g., proposed guidelines,43 FR 37363, which requires subchronic oral testing of the active ingredient with respect to certain use patterns only). Where a particular data requirement is use-pattern dependent, it will apply to each end-use product which is to be labeled for that use pattern (except where such end-use product is formulated from a registered manufacturing-use product permitting such formulations) and to each manufacturing-use product with labeling that allows it to be used to make end-use products with that use pattern. Thus, for example, a subchronic oral dosing study is needed to evaluate the safety of any manufacturing-use product that legally could be used to make an end-use, food-crop pesticide. But if an end-use product's label specified it was for use only in ways that involved no food/feed exposure and no repeated human exposure, the subchronic oral dosing study would not be required to evaluate the product's safety; and if a manufacturing-use product's label states that the product is for use only in making end-use products not involving food/feed use or repeated human exposure, that subchronic oral study would not be relevant to the evaluation of the manufacturing-use product either.

If a registrant of a currently registered manufacturing-use or end-use product wishes to avoid the costs of data compensation [under FIFRA Section 3(c)(1)(D)] or data generation [under Section 3(c)(2)(B)] for "generic" data that is required only with respect to some use patterns, he may elect to delete those use patterns from his labeling at the time he reregisters his product. An

applicant for registration of a new product under this Standard may similarly request approval for only certain use patterns.

5. Data Compensation Requirements under FIFRA 3(c)(1)(D)

Under FIFRA Section 3(c)(1)(D), an applicant for registration, reregistration, or amended registration must offer to pay compensation for certain existing data the Agency has used in developing the Registration Standard. The data for which compensation must be offered are all data which are described by all of the following criteria:

A. The data were first submitted to EPA (or to its predecessor agencies, USDA or FDA), on or after January 1, 1970;

B. The data were submitted to EPA (or USDA or FDA) by some other applicant or registrant in support of an application for an experimental use permit, an amendment adding a new use to a registration, or for registration, or to support or maintain an existing registration;

C. They are the kind of data which are relevant to the Agency's decision to register or reregister the applicant's product under the Registration Standard, taking into account the applicant's product's composition and intended use pattern(s);

D. The Agency has found the data to be valid and usable in reaching regulatory conclusions; and

E. They are not data for which the applicant has been exempted by FIFRA Section 3(c)(2)(D) from the duty to offer to pay compensation. (This exemption applies to the "generic" data concerning the safety of an active ingredient of the applicant's product, not to "product specific" data. The exemption is available only to applicants whose product is labeled for end-uses for which the active ingredient in question is present in the applicant's product because of his use of another registered product containing that active ingredient which he purchases from another producer.

An applicant for reregistration of an already registered product under this Standard, or for registration of a new product under this Standard, accordingly must determine which of the data used by EPA in developing the Standard must be the subject of an offer to pay compensation, and must submit with his application the appropriate statements evidencing his compliance with FIFRA Section 3(c)(1)(D).

An applicant would never be required to offer to pay for "product specific" data submitted by another firm. In many, if not in most cases, data which are specific to another firm's product will not suffice to allow EPA to evaluate the applicant's product, that is, will not be useful to the Agency in determining whether the applicant's product is registrable. There may be cases, however, where because of close similarities between the composition of two or more products, another firm's data may suffice to allow EPA to evaluate

some or all of the "product specific" aspects of the applicant's product. In such a case, the applicant may choose to cite that data instead of submitting data from tests on his own product, and if he chooses that option, he would have to comply with the offer-to-pay requirements of Section 3(C)(1)(D) for that data.

Each applicant for registration or reregistration of a manufacturing-use product, and each applicant for registration or reregistration of an end-use product, who is not exempted by FIFRA Section 3(c)(2)(D), must comply with the Section 3(c)(1)(D) requirements with respect to each item of "generic" data that relates to his product's intended uses.

A detailed description of the procedures an applicant must follow in applying for reregistration (or new registration) under this Standard is found in the Guidance Package for this Standard.

6. Obtaining Data to Fill "Data Gaps"; FIFRA 3(c)(2)(B)

Some of the kinds of data EPA needs for its evaluation of the properties and effects of products to which this Standard applies have never been submitted to the Agency (or, if submitted, have been found to have deficiencies rendering them inadequate for making registrability decisions) and have not been located in the published literature search that EPA conducted as part of preparing this Standard. Such instances of missing but required data are referred to in the Standard as "data gaps".

FIFRA Section 3(c)(2)(B), added to FIFRA by the Congress in 1978, authorizes EPA to require registrants to whom a data requirement applies to generate (or otherwise produce) data to fill such "gaps" and submit those data to EPA. EPA must allow a reasonably sufficient period for this to be accomplished. If a registrant fails to take appropriate and timely steps to fill the data gaps identified by a section 3(c)(2)(B) order, his product's registration may be suspended until the data are submitted. A mechanism is provided whereby two or more registrants may agree to share in the costs of producing data for which they are both responsible.

The Standard lists, in the third chapter, the "generic" data gaps and notes the classes of products to which these data gaps pertain. The Standard also points out that to be registrable under the Standard, a product must be supported by certain required "product specific" data. In some cases, the Agency may possess sufficient "product specific" data on one currently registered product, but may lack such data on another. Only those Standards which apply to a very small number of currently registered products will attempt to state definitively the "product specific" data gaps on a "product by product" basis. (Although the Standard will in some cases note which data that EPA does possess would suffice to satisfy certain "product specific" data requirements for a category of products with closely similar composition characteristics.)

As part of the process of reregistering currently registered products, EPA will issue Section 3(c)(2)(B) directives requiring the registrants to take appropriate steps to fill all identified data gaps -- whether the data in question are "product specific" or "generic" -- in accordance with a schedule.

Persons who wish to obtain registrations for new products under this Standard will be required to submit (or cite) sufficient "product specific" data before their applications are approved. Upon registration, they will be required under Section 3(c)(2)(B) to take appropriate steps to submit data needed to fill "generic" data gaps: (We expect they will respond to this requirement by entering into cost-sharing agreements with other registrants who previously have been told they must furnish the data.) The Guidance Package for this Standard details the steps that must be taken by registrants to comply with Section 3(c)(2)(B).

7. Amendments to the Standard

Applications for registration which propose uses or formulations that are not presently covered by the Standard, or which present product compositions, product chemistry data, hazard data, toxicity levels, or labeling that do not meet the requirements of the Standard, will automatically be considered by the Agency to be requests for amendments to the Standard. In response to such applications, the Agency may request additional data to support the proposed amendment to the Standard, or may deny the application for registration on the grounds that the proposed product would cause unreasonable adverse effects to the environment. In the former case, when additional data have been satisfactorily supplied, and providing that the data do not indicate the potential for unreasonable adverse effects, the Agency will then amend the Standard to cover the new registration.

Each Registration Standard is based upon all data and information available to the Agency's reviewers on a particular date prior to the publication date. This "cut-off" date is stated at the beginning of the second chapter. Any subsequent data submissions and any approved amendments will be incorporated into the Registration Standard by means of addenda, which are available for inspection at EPA in Washington, D.C., or copies of which may be requested from the Agency. When all the present "data gaps" have been filled and the submitted data have been reviewed, the Agency will revise the Registration Standard. Thereafter, when the Agency determines that the internally maintained addenda have significantly altered the conditions for registration under the Standard, the document will be updated and re-issued.

While the Registration Standard discusses only the uses and hazards of products containing the designated active ingredient(s), the Agency is also concerned with the potential hazards of some inert ingredients and impurities. Independent of the development of any one Standard, the Agency has initiated the evaluation of some inert pesticide ingredients. Where the Agency has identified inert ingredients of concern in a specific product to which the Standard applies, these ingredients will be pointed out in the Guidance Package.

CHAPTER II: REGULATORY POSITION AND RATIONALE

1. Introduction
2. Description of Chemical
3. Regulatory Position
4. Regulatory Rationale
5. Criteria for Registration under the Standard
6. Required Labeling
7. Tolerance Reassessment

1. Introduction

This chapter presents the Agency's regulatory position and rationale based on an evaluation of all registered products containing 2-ethyl-1,3-hexanediol as the sole active ingredient. After briefly describing the chemical, this chapter presents the regulatory position and rationale, the criteria by which applicants for registration of 2-ethyl-1,3-hexanediol products will be approved, labeling considerations, and tolerance reassessment. A summary of data requirements is contained in Chapter III. A discussion of the data upon which this regulatory position is based is presented in each of the disciplinary chapters, IV through IX.

2. Description of Chemical

2-ethyl-1,3-hexanediol, also known as "6-12", is registered as an insect repellent for use on human skin, clothing, and window and door screens, excluding use in commercial food preparation and serving areas. The Chemical Abstracts Service (CAS) Registry number for 2-ethyl-1,3-hexanediol is 94-96-2. The OPP Internal Control Number (EPA Shaughnessy number) is 041001.

3. Regulatory Position

2-ethyl-1,3-hexanediol as described in this Standard may be registered for sale, distribution, reformulation and use in the United States. The Agency has considered the scientific data obtained from the open literature as of January 14, 1981, and those data submitted by the registrants up through the time of publication of this Standard. Based upon the review of these limited data, the Agency finds that none of the risk criteria found in section 162.11(a) of Title 40 of the U.S. Code of Federal Regulations was met or exceeded for 2-ethyl-1,3-hexanediol. The Agency has determined that 2-ethyl-1,3-hexanediol does not appear to cause an unreasonable adverse effect, when used in accordance with proper label directions and precautions. 2-ethyl-1,3-hexanediol products currently registered may be reregistered subject to the conditions imposed for data requirements. New products may be registered under this Standard and are subject to the same requirements.

4. Regulatory Rationale

Limited data are available to support the registration of 2-ethyl-1,3-hexanediol, with the exception of a primary dermal irritation study and efficacy data. All other acute and chronic toxicology studies and product chemistry studies are either not available or not usable by current standards. There are no environmental fate or ecological effects data.

Despite the lack of data, the Agency has concluded that it should continue the registration for this chemical for the following reasons:

A. No valid, adverse effects data of regulatory concern have been uncovered in the review of the studies which have been received. Therefore, the benefits demonstrated by the sale of this product outweigh the known risks, when label directions are followed.

B. Incidents of 2-ethyl-1,3-hexanediol ingestion, as well as eye and other means of exposure have been reported. However, no indication of any resulting problems has been given. (EPA 1980, MRID #GS00200019).

C. In accordance with FIFRA, the Agency's policy is not to cancel routinely the registration of products for which it lacks data or to withhold registration merely for the lack of data. (See Sections 3(c)(2)(B) and 3(c)(7) of FIFRA.) Rather, publication of the Standard provides a mechanism for identifying data needs, and registration under the Standard allows for upgrading of labels during the period in which the required data are being generated. When these data are received, they will be reviewed by the Agency, and the registrability of the chemical will be reassessed.

5. Criteria for Registration Under The Standard

To be subject to this Standard, products must meet the following conditions:

- contain 2-ethyl-1,3-hexanediol as the sole active ingredient,
- bear required labeling, and
- conform to the product composition standard, acute toxicity limits, and use pattern requirements as specified in part A.1., 2., and 3., and B.1., 2., and 3., respectively.

The applicant for registration or reregistration of products subject to this Standard must comply with all terms and conditions described in this Standard, including a commitment to fill data gaps on a time schedule specified by the Agency and, when applicable, offering to pay compensation to the extent required by 3(c)(1)(D) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended, 7 U.S.C. 136(c)(1)(D). As discussed in Chapter I, applicants for registration under this Standard should contact the Agency for specific instructions, including updated information on data requirements and companies whose data must be cited and to whom compensation must be offered.

A. Manufacturing-Use Products

1) Product Composition Standard

To be covered under this Standard, manufacturing-use 2-ethyl-1,3-hexanediol products with any percentage of active ingredient are acceptable with an appropriate certification of limits.

2) Acute Toxicity Limits

Because of the intended use of manufacturing-use 2-ethyl-1,3-hexanediol products, there are no acute toxicity limits.

3) Use Patterns

To be covered under this Standard, manufacturing-use 2-ethyl-1,3-hexanediol must be labeled to allow for formulation only into end-use repellents, which are intended for application to human skin and/or window and door screens, excluding use in commercial food preparation and serving areas.

B. End-Use Products

1) Product Composition Standard

End-use products with any percentage active ingredient with the appropriate certification of limits will be considered under this Standard.

2) Acute Toxicity Limit

Because of the high level of exposure resulting from direct skin application, the Agency will consider the registration of any ready-to-use, impregnated material, or pressurized spray in the following categories:

	Toxicology Category			
	I	II	III	IV
Acute Oral Toxicity	No	No	Yes	Yes
Acute Dermal Toxicity	No	No	Yes	Yes
Acute Inhalation Toxicity	No	No	Yes	Yes
Primary Dermal Irritation	No	No	Yes	Yes

Additionally, end-use products must not be corrosive to the eye (cause irreversible destruction of ocular tissue) or cause corneal involvement or irritation persisting for 21 days or more.

3) Use Pattern

To be considered under this Standard, end-use products must bear directions for use as an insect repellent to be used in direct skin application and clothing application on humans and/or window and door screens, excluding use in commercial food preparation and serving areas.

6. Required Labeling

All manufacturing-use and end-use 2-ethyl-1,3-hexanediol products must bear appropriate labeling as specified in 40 CFR 162.10. The guidance package which accompanies this Standard contains specific information regarding label requirements.

A. Manufacturing-use Products

All manufacturing-use 2-ethyl-1,3-hexanediol products must list on the label the intended end-uses of formulated products produced from manufacturing-use products. All manufacturing-use product labels must bear the following statement:

"For Formulation into End-Use Insect Repellent Products Intended Only for Nonfood Uses."

B. End-use Products

2-ethyl-1,3-hexanediol has been shown to be a skin sensitizer. Unless data on individual products are submitted to the contrary, all end-use 2-ethyl-1,3-hexanediol products must bear the following statement:

"If skin irritation (rash or itching) develops, discontinue use."

Because this product is applied directly to the skin, including hands, the following statement must appear on all end-use labels:

"Wash hands before touching food."

For end-use products presenting claims for insects which might affect public health, the Agency will require registrants to submit or cite data to support these claims. The label on all products or substantially similar products, which claim that 2-ethyl-1,3-hexanediol repels the following pests, must be supported by company data or published literature:

black flies
chiggers
fleas
mosquitoes
sand flies (biting midges)
stable flies
ticks

7. Tolerance Reassessment

The current uses of this chemical are not subject to the requirement to obtain a tolerance under the provisions of the Federal Food, Drug, and Cosmetic Act Therefore, no tolerance reassessment is appropriate for this Standard.

CHAPTER III: SUMMARY OF DATA REQUIREMENTS AND DATA GAPS

1. Introduction
2. Manufacturing-Use Products
3. End-Use Products
4. Footnotes

1. Introduction

Applicants for registration of manufacturing-use and end-use 2-ethyl-1,3-hexanediol products must cite or submit the information identified as required in the tables in this chapter. The tables applicable to end-use products indicate whether the product to be tested is the technical grade or formulation. Data generated on one formulation may be used to satisfy the data requirement for a substantially similar formulation. Information on which product specific data requirements are already met is available in the guidance package.

Before each requirement is listed the section of the Proposed Guidelines which describes the type of data and when the data are required to be submitted [43 FR, 29696 of July 10, 1978; and 43 FR, 37336 of August 22, 1978]. Justification for why the test is required is provided in the Guidelines. A discussion of why data additional to those already submitted are necessary, or why data normally required are not necessary for this chemical, are explained in footnotes to the tables. The data requirements specified are the minimum that will be required. Areas where additional data may be required as the result of tiered testing are indicated.

2-Ethyl-1,3-Hexanediol
Product Specific Manufacturing-Use Products Data Requirements: Product Chemistry (See Chapter IV)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.61-3	Product Identity & Disclosure of Ingredients	yes	Each Product	no1/	1/	yes/1/
163.61-4	Description of Manufacturing Process	yes	Each Product	no	-	yes/1/
163.61-5	Discussion on Formation of Unintentional Ingredients	yes	Each Product	no	-	yes/1/
163.61-6	Declaration & Certification of Ingredients Limits	yes	Each Product	no	-	yes/April, 1982
163.61-7	Product Analytical Methods & Data	yes	Each Product	partially	1/	yes/April, 1982
163.61-8(c)(1)	Color	yes	Technical Grade of Active Ingredient	no	-	yes/1/
163.61-8(c)(2)	Odor	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(3)	Melting Point	yes	Tech. Grade of A.I.	no	-	yes/1/

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol

Product Specific Manufacturing-Use Products Data Requirements: Product Chemistry (See Chapter IV)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.61-8(c)(4)	Solubility	yes	Technical Grade of Active Ingredient	no	-	yes/1/
163.61-8(c)(5)	Stability	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(6)	Octanol/Water Partition Coefficient	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(7)	Physical State	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(8)	Specific Gravity	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(9)	Boiling Point	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(10)	Vapor Pressure	yes	Tech. Grade of A.I.	no	-	yes/1/
163.61-8(c)(11)	pH	yes	Tech. Grade of A.I.	no	-	yes/1/

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Product Specific Manufacturing-Use Products Data Requirements: Product Chemistry (See Chapter IV)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.61-8(c)(12)	Storage Stability	yes	Each Product	no	-	yes/1/
163.61-8(c)(13)	Flammability	yes	Each Product	no	-	yes/1/
163.61-8(c)(14)	Oxidizing/Reducing Action	yes	Each Product	no	-	yes/1/
163.61-8(c)(15)	Explosiveness	yes	Each Product	no	-	yes/1/
163.61-8(c)(16)	Miscibility	yes	Each Product	no	-	yes/1/
163.61-8(c)(17)	Viscosity Coefficient	yes	Each Product	no	-	yes/1/
163.61-8(c)(18)	Corrosiveness	yes	Each Product	no	-	yes/1/

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Environmental Fate (See Chapter V)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.62-7(b)	Hydrolysis	no 2/				
163.62-7(c)	Photodegradation	no				
163.62-8(b)	Aerobic Soil Metabolism	no				
163.62-8(c)	Anaerobic Soil Metabolism	no				
163.62-8(d)	Anaerobic Aquatic Metabolism	no				
163.62-8(e)	Aerobic Aquatic Metabolism	no				
163.62-8(f)	Microbial Metabolism:					
	(2) Effects of Microbes on Pesticides	no				
	(3) Effects of Pesticides on Microbes	no				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Environmental Fate (See Chapter V)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.62-8(g)	Activated Sludge Metabolism	no3/				
163.62-9(b)	Leaching	no				
163.62-9(c)	Volatility	no				
163.62-9(d)	Adsorption/Desorption	no				
163.62-9(e)	Water Dispersal	no				
163.62-10(b)	Terrestrial Field Dissipation:					
	(1) Field & Vegatable Crops	no				
	(2) Tree Fruit & Nut Crop Uses	no				
	(3) Pasture Land Uses	no				
	(4) Domestic Outdoor Parks, Ornamental & Turf Uses	no				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Environmental Fate (See Chapter V)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
	(5) Rights of Way, Shelterbelts & Related Uses	no				
163.62-10(c)	Aquatic Field Dissipation:					
	(1) Aquatic Food Crop Uses	no				
	(2) Aquatic Noncrop Uses	no				
	(3) Specialized Aquatic Uses	no				
163.62-10(d)	Terrestrial/Aquatic (Forest) Field Dissipation	no				
163.62-10(e)	Aquatic Impact Uses:					
	(1) Direct Discharge	no				
	(2) Indirect Discharge	no				
	(3) Wastewater Treatment	no				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Environmental Fate (See Chapter V)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.62-10(f)	Combination & Tank Mix Field Dissipation	no				
163.62-10(g)	Long Term Field Dissipation Study	no				
163.62-11(b)	Accumulation in Rotational Crops	no				
163.62-11(c)	Accumulation in Irrigated Crops	no				
163.62-11(d)	Fish Accumulation	no				
163.62-11(e)	Special Studies Accumulation in Aquatic Noncrop Uses	no				
163.62-13	Disposal & Storage	no				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Product Specific Manufacturing-Use Products Data Requirements: Toxicology (See Chapter VI)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.81-1	Acute Oral Toxicity	yes	Each Product or Substantially Similar Product	no	-	yes/April, 1982
163.81-2	Acute Dermal Toxicity	yes	Ea. Prod. or Substan. Sim. Prod.	no	-	yes/April, 1982
163.81-3	Acute Inhalation Toxicity	yes	Ea. Prod. or Substan. Sim. Prod.	no	-	yes/April, 1982
163.81-4	Primary Eye Irritation	yes	Ea. Prod. or Substan. Sim. Prod.	no	-	yes/April, 1982
163.81-5	Primary Dermal Irritation	yes	Ea. Prod. or Substan. Sim. Prod.	yes	000004881	no
163.81-6	Dermal Sensitization	yes	Ea. Prod. or Substan. Sim. Prod.	yes	000004881	no
163.81-7	Acute Delayed Neurotoxicity	no 4/				
163.82-1	Suchronic Oral Toxicity	no 5/				
163.82-2	Subchronic 21-Day Dermal Toxicity	no 6/				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Toxicology (See Chapter VI)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.82-3	Subchronic 90-Day Dermal Toxicity	yes	Technical Grade of Active Ingredient	no	-	yes/May, 1982
163.82-4	Subchronic Inhalation Toxicity	7/	Tech. Grade of A.I.			conditional
163.82-5	Subchronic Neurotoxicity	no 8/				
163.83-1	Chronic Dermal Toxicity	yes9/	Tech. Grade of A.I.	no	-	yes/Nov, 1985
163.83-2	Dermal Oncogenicity	yes	Tech. Grade of A.I.	no	-	yes/Nov, 1985
163.83-3	Dermal Teratogenicity	yes	Tech. Grade of A.I.	no	-	yes/May, 1982
163.83-4	Dermal Reproduction	yes	Tech. Grade of A.I.	no	-	yes/Nov, 1984
163.84-2 through -4	Mutagenicity	yes	Tech. Grade of A.I.	no	-	yes/May, 1982
163.85-1	Metabolism (Identification of Metabolites)	yes	Tech. Grade of A.I.	no	-	yes/Nov, 1982

All footnotes are located at the end of Chapter III.
These data requirements are current as of September, 1980. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Residue Chemistry (See Chapter VII)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
-	Metabolism in Plants	no				
-	Metabolism in Animals	no				
-	Analytical Methods	no				
-	Residue Data: Crops-	no				
-	Residue Data: Processed Crops-	no				
-	Residue Data: Milk & Meat	no				
-	Storage Stability	no				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Generic Manufacturing-Use Products Data Requirements: Ecological Effects (See Chapter VIII)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.71-1	Avian Single-Dose Oral LD_{50}	no10/				
163.71-2	Avian Dietary LC_{50}	no10/				
163.71-3	Mammalian Acute Toxicity	no				
163.71-4	Avian Reproduction	no				
163.71-5	Simulated and Actual Field Testing for Mammals & Birds	no				
163.72-1	Fish Acute LC_{50}	no10/				
163.72-2	Acute Toxicity to Aquatic Invertebrates	no10/				
163.72-3	Acute Toxicity to Estuarine & Marine Organisms	no				
163.72-4	Embryolarvae & Life-cycle Studies of Fish & Aquatic Invertibrates	no				
163.72-5	Aquatic Organism Toxicity & Residue Studies	no				
163.72-6	Simulated or Actual Field Testing for Aquatic Organisms	no				

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol

Product Specific End-Use Products Data Requirements: Product Chemistry (See Chapter IV)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	May Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.61-3	Product Identity & Disclosure of Ingredients	yes	Each Product	no	-	yes/1/
163.61-4	Description of Manufacturing Process	yes	Each Product	no	-	yes/1/
163.61-5	Discussion on Formation of Unintentional Ingredients	yes	Each Product	no	-	yes/1/
163.61-6	Declaration & Certification of Ingredients Limits	yes	Each Product	no	-	yes/1/
163.61-7	Product Analytical Methods & Data	yes	Each Product	partially	1/	yes/1/

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol

Product Specific End-Use Products Data Requirements: Product Chemistry (See Chapter IV)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.61-8(c)(1)	Color	yes	Each Product	no	-	yes/1/
163.61-8(c)(2)	Odor	yes	Each Product	no	-	yes/1/
163.61-8(c)(3)	Melting Point	no				
163.61-8(c)(4)	Solubility	no				
163.61-8(c)(5)	Stability	no				
163.61-8(c)(6)	Octanol/Water Partition Coefficient	no				
163.61-8(c)(7)	Physical State	yes	Each Product	no	-	yes/1/
163.61-8(c)(8)	Specific Gravity	yes	Each Product	no	-	yes/1/
163.61-8(c)(9)	Boiling Point	no				
163.61-8(c)(10)	Vapor Pressure	no				
163.61-8(c)(11)	pH	yes	Each Product	no	-	yes/1/

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Product Specific End-Use Products Data Requirements: Product Chemistry (See Chapter IV)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.61-8(c)(12)	Storage Stability	yes	Each Product	no	-	yes/1/
163.61-8(c)(13)	Flammability	yes	Each Product	no	-	yes/1/
163.61-8(c)(14)	Oxidizing/Reducing Action	yes	Each Product	no	-	yes/1/
163.61-8(c)(15)	Explosiveness	yes	Each Product	no	-	yes/1/
163.61-8(c)(16)	Miscibility	yes	Each Product	no	-	yes/1/
163.61-8(c)(17)	Viscosity Coefficient	yes	Each Product	no	-	yes/1/
163.61-8(c)(18)	Corrosiveness	yes	Each Product	no	-	yes/1/

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Product Specific End-Use Products Data Requirements: Toxicology (See Chapter VI)

Guidelines Citation	Name Of Test	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2)(B)? If So, due when?
163.81-1	Acute Oral Toxicity	yes	Each Formulation or Substantially Similar Formulations	See Guidance Package for Requirements for Each Formulation or Substantially Similar Formulation		
163.81-2	Acute Dermal Toxicity	yes	Each Formulation or Substantially Similar Formulations	See Guidance Package for Requirements for Each Formulation or Substantially Similar Formulations		
163.81-3	Acute Inhalation Toxicity	yes	Each Formulation or Substantially Similar Formulations	See Guidance Package for Requirements for Each Formulation or Substantially Similar Formulations		
163.81-4	Primary Eye Irritation	yes	Each Formulation or Substantially Similar Formulations	See Guidance Package for Requirements for Each Formulation or Substantially Similar Formulations		
163.81-5	Primary Dermal Irritation	yes	Each Formulation or Substantially Similar Formulations	See Guidance Package for Requirements for Each Formulation or Substantially Similar Formulations		
163.81-6	Dermal Sensitization	yes	Each Formulation or Substantially Similar Formulations	See Guidance Package for Requirements for Each Formulations or Substantially Similar Formulations		

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

2-Ethyl-1,3-Hexanediol
Product Specific End-Use Products Data Requirements: Efficacy (See Chapter IX)

Site	Pest	Are Data Required?	Composition	Does EPA Have Data To Partially Or Totally Satisfy This Requirement?	Bibliographic Reference	Must Additional Data be Submitted Under FIFRA 3(c)(2(B)? If So, due when?
Humans: Direct Skin Application & Clothing	Black Flies	yes	Minimum of 20% Active Ingredient	yes	000001106, 000001109 000001112, 000001118 005000009, 005000164 005003264, 005003640 005006137	no
	Chiggers	yes	11/	partially	000001112, 005000130 005000299, 005002397	yes/April, 1983
	Fleas	yes	11/	partially	000001112, 000001181	yes/April, 1983
	Mosquitoes	yes	Min. of 20% A.I.	yes	12/	no
	Sand Flies (Biting Midges)	yes	11/	partially	000001106, 000001107 000001109, 000001112 005000164, 005003263 005000236, 005002669	yes/April, 1983
	Stable Flies	yes	Min. of 20% A.I.	yes	13/	no
	Ticks	yes	11/	partially	005002666	yes/April, 1983

All footnotes are located at the end of Chapter III.
These data requirements are current as of March, 1981. Refer to the guidance package for updated requirements.
A numerical bibliography is provided at the end of this Standard.

4. Footnotes

1/ These requirements must be fulfilled by each applicant. Data from other applications may not be cited. Therefore, even if the requirement has been partially or completely fulfilled for some products, no references are given. These requirements must be filled at the time of registration or reregistration.

2/ Hydrolysis data are not required, since the structure of this compound indicates its reaction with water will not be a significant route of degradation.

3/ The requirement for the submission of the above data is currently being reserved. Consequently, the absence of acceptable data within this topic does not constitute a data gap.

4/ Acute delayed neurotoxicity data are not required, because this chemical is not expected to cause esterase depression, nor is it related to a substance which induces delayed neurotoxicity.

5/ Subchronic oral toxicity data are not required, because the use of this chemical does not need a tolerance or an exemption from a tolerance, does not need the issuance of a food additive regulation, and is not likely to result in repeated human exposure through an oral route.

6/ Subchronic 21-day dermal toxicity data are not required, because the direct application of this chemical to the skin requires a subchronic 90-day dermal toxicity test.

7/ Acute inhalation data are not available. It is, thus, not possible to determine if a subchronic inhalation test is needed. A test may be required, depending on the results of the acute inhalation test.

8/ Subchronic neurotoxicity data are not required, because this chemical is not expected to cause esterase depression, nor is it related to a substance which induces delayed neurotoxicity.

9/ This study is listed in the Guidelines as a Chronic Feeding Study and not as a Chronic Dermal Study. We believe this reference will provide useful guidance with respect to factors other than route of exposure, such as number of animals per dosage group, number of dosage groups, etc.

10/ Ecological effects data are not required, because of the limited annual production and the use pattern of this chemical.

11/ Sufficient efficacy data are not available to establish a minimum percentage of active ingredient for these pests. Testing will be required for existing products until a minimum level is established.

12/ The bibliographic citations, which partially or totally support the claim for mosquito repellency are as follows:

MRID#	MRID#	MRID#	MRID#	MRID#
GS0020005	000001172	005000126	005000284	005011438
GS0020007	000004865	005000128	005000299	
GS0020011	000004866	005000130	005002395	
000001106	000004867	005000141	005002493	
000001107	000004868	005000164	005002667	
000001109	000004873	005000165	005002848	
000001112	000004874	005000167	005003262	
000001114	000004887	005000169	005003263	
000001115	000004890	005000170	005003265	
000001116	000004892	005000172	005003266	
000001117	000004893	005000187	005004864	
000001118	000004896	005000222	005006012	
000001121	005000042	005000231	005006137	
000001123	005000113	005000236	005006463	
000001166	005000121	005000280	005006505	

13/ The bibliographic citations, which partially or totally support the claim for stable fly repellency are as follows:

MRID#	MRID#	MRID#	MRID#	MRID#
GS0020005	000001114	000001123	000004892	005002395
GS0020011	000001115	000004865	000004893	
000001106	000001116	000004866	000021737	
000001107	000001117	000004867	005000164	
000001109	000001118	000004868	005000236	
000001112	000001121	000004874	005000268	

IV. PRODUCT CHEMISTRY

The available product chemistry data cannot be considered as acceptable to fill the data requirements for 2-ethyl-1,3-hexanediol. The studies are old, and the applicability of the data to the products currently manufactured has not been established. Registrants may use existing data by resubmitting it along with confirmation of its current applicability.

The Agency reminds registrants that chlorofluorocarbons (Freons) have been banned for use in pressurized products due to their having been demonstrated to cause a depletion in the ozone layer (43 FR 11318). Products containing Freon are not registrable under this Standard.

V. ENVIRONMENTAL FATE

1. Use Profile
2. Environmental Fate Profile
3. Exposure Profile

1. Use Profile

2-ethyl-1,3-hexanediol is an insect, mite, and tick repellent registered for direct application to human skin and human clothing for the repellency of a variety of insects. Those which fall into the area of public health concern, according to the Agency definition (44 FR 27932; May 11, 1979), include black flies, chiggers, fleas, mosquitoes, stable flies, sand flies, and ticks. Ready-to-use, pressurized liquids, and impregnated materials registered for skin application are labeled to warn against contact with eyes or lips; pressurized liquids are not to be sprayed directly into the face.

Window and door screens, excluding use in commercial food preparation and serving areas, may also be treated with 2-ethyl-1,3-hexanediol.

2. Environmental Fate

The minimum environmental fate data as required by the Agency under the Guidelines proposed in 43 FR 29712; July 10, 1978, are not required for 2-ethyl-1,3-hexanediol. These include hydrolysis and activated sludge data. Hydrolysis data are not necessary, because the structure of this compound indicates its reaction with water will not be a significant route of degradation, and the requirement for the submission of activated sludge data is currently being reserved. In addition if indirect or accidental discharge into an aquatic environment or a wastewater treatment system were to occur, the Agency has determined that the amount of such a discharge would not be of significant quantity to cause extensive environmental harm. Also, the potential use pattern as a repellent for humans and window and door screens is not expected to result in the introduction of significant amounts of this chemical into the environment.

3. Exposure Profile

No specific exposure data on 2-ethyl-1,3-hexanediol have been developed. Human exposure is clearly very high due to the direct application to the skin. The Agency has decided not to seek data to quantify exposure until the results of the additional required toxicology testing are reviewed. At that time the Agency will either:

1. Attempt to establish safety margins based on exposure as indicated by existing use directions, or
2. Use data developed for other similar chemicals, or
3. Seek additional exposure data from registrants of 2-ethyl-1,3-hexanediol.

VI. TOXICOLOGY

1. Introduction
2. Manufacturing-Use Products
3. End-Use Products
4. Summary of Major Data Gaps

1. Introduction

Little acceptable data exist for 2-ethyl-1,3-hexanediol, with the exception of a primary dermal irritation study. However, a low order of acute toxicity is suggested by studies done on mixtures.

2. Manufacturing-Use Products

Toxicology Profile

A human study (Kline and Gabriel 1965, MRID#000004881) indicates that 2-ethyl-1,3-hexanediol may be a weak primary skin irritant and/or weak skin sensitizer. Four out of 200 people showed a reaction. This study is acceptable to fulfill the data requirement for primary dermal irritation and skin sensitization, although it was not conducted in accordance with the requirements of the Guidelines.

Insufficient data were available to assess the chronic effects. One inadequate chronic dermal study suggests, that 2-ethyl-1,3-hexanediol might be oncogenic in female mice (Stenbaeck and Shubik 1974, MRID#005004319). The results of this study were not definitive, because of the discrepancies between the number of animals in the test groups and the number of total tumors. A linear trend analysis and a site-specific chi-square test was conducted with the information available in the study, which suggest a possible oncogenic potential. A firm conclusion cannot be made. This study does, however, further substantiate the need for additional chronic testing.

3. End-Use Products

Toxicology Profile

Limited acceptable data exists for the end-use products. The primary dermal irritation study performed with the manufacturing-use product will be acceptable to fulfill the skin sensitization data requirement for the end-use products. Registrants will be required to place a precautionary statement concerning skin sensitization on the label. Those registrants who do not wish to do this may submit data using the appropriate test animals, and following Guideline requirements, submit data which demonstrate that their product is not a skin sensitizer.

4. Summary of Major Data Gaps

Except for the primary dermal irritation study for the manufacturing-use products and the skin sensitization study for the manufacturing-use and end-use products, the full series of toxicological tests are required.

VII. RESIDUE CHEMISTRY

An allowable residue level (tolerance) for specific chemicals is determined by the Agency for the commodities on which they may occur. Since no 2-ethyl-1,3-hexanediol product is registered for use on food or feed crops, its use should not result in such residues. Therefore, there are no residue chemistry data requirements for this chemical.

VIII. ECOLOGICAL EFFECTS

There are no ecological effects data requirements for 2-ethyl-1,3-hexanediol. The Agency has determined, that if an accidental discharge of 2-ethyl-1,3-hexanediol into an aquatic environment or a wastewater treatment system were to occur, the amount of such a discharge would not be likely to be of significant quantity to cause extensive environmental harm. In addition the potential use pattern as a repellent for humans and window and door screens is not expected to result in the introduction of significant amounts of 2-ethyl-1,3-hexanediol into the environment.

IX. EFFICACY

1. Efficacy Profile
2. Factors Influencing Efficacy
3. Use Sites
4. Target Pests
5. Summary of Major Data Gaps

1. Efficacy Profile

The review of 2-ethyl-1,3-hexanediol data are limited to efficacy data only as they relate to public health applications. The Agency has provided for the waiver of efficacy data submission as a part of the registration process in all other instances (44 FR 27932; May 11, 1979).

2. Factors Influencing Efficacy

Available data indicate that several factors may influence the efficacy of repellents such as 2-ethyl-1,3-hexanediol. Elements such as minimum effective dose, rate of loss, desirability of the host, and avidity of the insect species directly contribute to the overall protection time of repellents (Smith et al. 1963, MRID #005000300). Indications also exist which support the theory that washoff by rainfall and perspiration appear to reduce effectiveness (Granett and Haynes 1945, MRID #000001112). Decreases in the relative humidity and absorption also appear to reduce effectiveness (Wood 1968, MRID #005011438 and Smith 1970, MRID #000001166).

3. Use Sites

In relation to certain public health pests, the majority of the test data reviewed by the Agency clearly indicate that 2-ethyl-1,3-hexanediol applied directly to human skin is an appropriate use method. Application to human clothing is also an appropriate method. Formulations to repel black flies, mosquitoes, and stable flies for either application method must contain at least 20% active ingredient. A minimum percentage of active ingredient has not yet been established for the other public health pests.

Insufficient information is available to support use against public health pests for window and door screens.

4. Target Pests

In general 2-ethyl-1,3-hexanediol when used as a repellent, may be adequate to superior, depending on the species of biting insect, the type of formulation and percentage of active ingredient. Effective control has been demonstrated for the following insects:

black flies
mosquitoes
stable flies

(Please refer to the table for efficacy in Chapter III for references.)
A minimum of 20% active ingredient is required for all formulations with regard to these pests.

The following pests were not supported with sufficient data to demonstrate efficacy:

chiggers
fleas
sand flies (biting midges)
ticks

5. Summary of Major Data Gaps

The major data gaps for efficacy of this chemical are for the treatment of chiggers, fleas, sand flies (biting midges), and ticks in direct skin or clothing application to humans.

X. CASE BIBLIOGRAPHY

Guide to Use of This Bibliography

1. Content of Bibliography. This bibliography contains citations of all the studies reviewed by EPA in arriving at the positions and conclusions stated elsewhere in this standard. The bibliography is divided into two sections: (1) citations in numerical order that contributed information useful to the review of the chemical and are considered to be part of the data base supporting registrations under the standard, (2) an alphabetical listing of all documents identified in the literature search, and (3) a standard reference bibliography. Primary sources for studies in this bibliography have been the body of data submitted to EPA and its predecessor agencies in support of past regulatory decisions, and the published technical literature.

2. Units of Entry. The unit of entry in this bibliography is called a "study". In the case of published materials, this corresponds closely to an article. In the case of unpublished materials submitted to the Agency, the Agency has sought to identify documents at a level parallel to a published article from within the typically larger volumes in which they were submitted. The resulting "studies" generally have a distinct title (or at least a single subject), can stand alone for purposes of review, and can be described with a conventional bibliographic citation. The Agency has attempted also to unite basic documents and commentaries upon them, treating them as a single study.

3. Identification of Entries. The entries in this bibliography are sorted by author, date of the document, and title. Each entry bears, to the left of the citation proper, a nine-digit numeric identifier. This number is unique to the citations and should be used at any time specific reference is required. This number is called the "Master Record Identifier" or "MRID". It is not related to the six-digit "Accession Number", which has been used to identify volumes of submitted data; see paragraph 4(d)(4) below for a further explanation. In a few cases, entries added to the bibliography late in the review may be preceded by a nine-character temporary identifier. This is also to be used whenever a specific reference is needed.

4. Form of the Entry. In addition to the Master Record Identifier (MRID), each entry consists of a bibliographic citation containing standard elements followed, in the case of materials submitted to EPA, by a description of the earliest known submission. The bibliographic conventions used reflect the standards of the American National Standards Institute (ANSI), expanded to provide for certain special needs. Some explanatory notes of specific elements follow:

   a. Author. Whenever the Agency could confidently identify one, the Agency has chosen to show a personal author. When no individual was identified, the Agency has shown an identifiable laboratory or testing facility as author. As a last resort, the Agency has shown the first known submitter as author.

b. Document Date. When the date appears as four digits with no question marks, the Agency took it directly from the document. When a four-digit date is followed by a question mark, the bibliographer deduced the date from evidence in the document. When the date appears as (19??), the Agency was unable to determine or estimate the date of the document.

c. Title. This is the third element in the citation. In some cases it has been necessary for Agency bibliographers to create or enhance a document title. Any such editorial insertions are contained between square brackets.

d. Trailing Parentheses. For studies submitted to us in the past, the trailing parentheses include (in addition to any self-explanatory text) the following elements describing the earliest known submissions:

(1) Submission Date. Immediately following the word 'received' appears the date of the earliest known submission, at the time that particular document was processed into the Pesticide Document Management System.

(2) Administrative Number. The next element, immediately following the word 'under', is the registration number, experimental permit number, petition number, or other administrative number associated with the earliest known submission, at the time that particular document was processed into the Pesticide Document Management System.

(3) Submitter. The third element is the submitter, following the phrase 'submitted by'. When authorship is defaulted to the submitter, this element is omitted.

(4) Volume Identification. The final element in the trailing parenthesis identifies the EPA accession number of the volume in which the original submission of the study appears. The six-digit accession number follows the symbol 'CDL', standing for "Company Data Library". This accession number is in turn followed by an alphabetic suffix which shows the relative position of the study within the volume. For example, within accession number 123456, the first study would be 123456-A; the second, 123456-B; the 26th, 123456-Z; and the 27th,123456-AA.

OFFICE OF PESTICIDE PROGRAMS
REGISTRATION STANDARD NUMERICAL BIBLIOGRAPHY
Citations Considered to be Part of the Data Base Supporting
Registrations Under the Standard

CASE GS0002 2-ethyl-1,3-hexanediol

MRID CITATION

GS0020005 Haynes, H.L. (1971) Letter sent to J. Touhey dated Mar 10, 1970. [Concerns the registration of "6-12 PLUS". Efficacy data are attached for mixture with ethyl hexanediol, as well as ethyl hexanediol alone.] (Unpublished study received Jul 10, 1971 under 5769-57; submitted by ?; CDL:007435)

GS0020007 Lahr, P.H. (?) Tarrytown Technical Memorandum TTM-81:Synergistic Mixtures of 2-Ethyl-1,3-hexanediol and M-Diethyltoluamide. Exhibit D. (Unpublished study which includes Tables I and V received Apr 25, 1968 under 5769-27; prepared by Rutgers University, Entomology Department, submitted by ?; CDL:022577)

GS0020011 Lomax, J.L. (1970) Summary and Discussion of Repellent Test Results (Duration Type in the Lab.) (Unpublished study which includes Table I received Apr 25, 1968 under 5769-27; prepared by Rutgers University, Entomology Department, Submitted by ?; CDL:022577)

GS0020019 U.S. Environmental Protection Agency, Hazard Evaluation Division (1980) Summary of Reported Pesticide Incidents Involving Ethyl Hexanediol. Pesticide Monitoring System Report No. 374.

GS0020024 Bontoyan, W., ed. (1976) Manual of Chemical Methods for Pesticides and Devices. U.S. Environmental Protection Agency, Office of Pesticide Programs, Technical Services Division, Chemical and Biological Investigations Branch. (Available from Association of Analytical Chemists, Arlington, VA)

000001106 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 56.0% 2-Ethyl-1,3-Hexanediol and 9.1% N,N-Diethyl-Meta-Toluamide and (2) 65% 2-Ethyl-1,3-Hexanediol: Exhibit A. (Unpublished study received Apr 9, 1970 under 3282-44; CDL:007757-A)

000001107 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 80% 2-Ethyl-1,3-Hexanediol and 10% N,N-Diethyl-Meta-Toluamide (2) 80% 2-Ethyl-1,3-Hexanediol and (3) 50% N,N-Diethyl-Meta-Toluamide: Exhibit A. (Unpublished study received Mar 24, 1970 under 5769-27; CDL:007758-A)

000001109 Haynes, H.L. (1969) Entomological Performance Data: [6-12 Insect Repellent Spray]. (Unpublished study that includes appended report, received Sep 18, 1969 under 3282-46, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007759-A)

000001112 Granett, P.; Haynes, H.L. (1945) Insect repellent properties of 2-ethylhexanediol-1,3. Journal of Economic Entomology 88(6): 671-675. (Also In unpublished submission that includes correction, received Feb 26, 1970 under 3282-46; prepared by Rutgers Univ., submitted by Union Carbide Corp., New York, N.Y.; CDL:007760-B)

000001114 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 40.0% 2-Ethyl-1,3-Hexanediol and 8.0% N,N-Diethyl-Meta-Toluamide (2) 48.6% 2-Ethyl-1,3-Hexanediol: [Insect Repellent Towelette]: Exhibit A. (Unpublished study received May 14, 1970 under 5769-44; CDL:007761-A)

000001115 Lomax, J.L. (1970) Summary and Discussion of Repellent Test Results (Duration Type in the Laboratory): [1481-21 Versus 1481-54, -57 Towelettes]: Exhibit E. (Unpublished study that includes attached report and appendices 1-2, received May 14, 1970 under 5769-44; prepared by Rutgers Univ., College of Agriculture, Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:007761-E)

000001116 Union Carbide Corporation (1970) Summary of 1969-1970 Test Results with Personal Insect Repellents Containing (1) 25% 2-Ethyl-1, 3-Hexanediol-5% N,N-Diethyl-Meta-Toluamide. (2) 27% 2-Ethyl-1, 3-Hexanediol-5% N,N-Diethyl-Meta-Toluamide. (3) 18% N, N-Diethyl-Meta-Toluamide, and (4) 18% 2-Ethyl-1, 3-Hexanediol: study received Apr 30, 1970 under 5769-48; CDL:007762-A)

000001117 Lomax, J.L. (1970) Summary and Discussion of Repellent Test Results (Duration Type in the Laboratory): ["6-12" Foam Versus 1481-57 and 1481-67]: Exhibit E. (Unpublished study that includes attached report and appendices 1-2, received Apr 30, 1970 under 5769-48; prepared by Rutgers Univ., College of Agriculture, Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:007762-E)

000001118 Lomax, J.L. (1969) Summary and Discussion of All Duration Field Test Results for Summer 1969: [Deet]: Exhibit F. (Unpublished study that includes appendices 1-4, received Apr 30, 1970 under 5769-48; prepared by Rutgers Univ., College of Agriculture, Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:007762-F)

000001121 Beam, F.; Granett, P. (1965) Repellency Tests June-September 1965. (Unpublished study that includes incomplete sections II and IV with Tables II, IV and Appendix 1, received Dec 3, 1966 under 5769-44; prepared by Union Carbide Consumer Products Co. in cooperation with Rutgers State Univ., submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:024243-A)

000001123 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 40.0% 2-Ethyl-1,3-Hexanediol and 10.0% N,N-Diethyl-Meta-Toluamide (2) 40% 2-Ethyl-1,3-Hexanediol: Exhibit A. (Unpublished study that includes appended letter, received Apr 9, 1970 under 5769-51; CDL:007764-A)

000001166 Smith, C.N. (1970) Repellents for anopheline mosquitoes. Miscellaneous Publications of the Entomological Society of America 7(1):99-117. (Also In unpublished submission received Jan 11, 1978 under 4822-10; prepared by U.S. Agricultural Research Service, Entomology Research Div., submitted by S.C. Johnson & Sons, Inc., Racine, Wis.; CDL:233318-I)

000001172 Altman, R.M. (1969) Repellent tests against Anopheles albimanus Wiedemann in the Panama Canal Zone. Mosquito News 29(1):110-112. (Also In unpublished submission received Jun 23, 1969 under 4822-EX-8; submitted by S.C. Johnson & Son, Inc., Racine, Wis.; CDL:127306-D)

000001181 Lindquist, A.W.; Madden, A.H.; Watts, C.N. (1944) The use of repellents against fleas. Journal of Economic Entomology 37(4): 485-486. (Also In unpublished submission received Jun 10, 1971 under 3282-48; prepared by U.S. Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007766-F)

000004865 Lomax, J.L. (1968) Union Carbide Consumer Products Company Research Project at Rutgers State University: Annual Report for 1968. (Unpublished study received Sep 18, 1969 under 3282-45; prepared by Rutgers Univ., Dept. of Entomology and Economic Zoology in cooperation with Union Carbide Consumer Products Co., submitted by d-Con Co., Inc., New York, N.Y.; CDL:022574-B)

000004866 D-Con Company, Incorporated (1963) Lab and Field Results of New Cream Lotion. (Unpublished study received May 28, 1968 under 3282-47; CDL:222081-A)

000004867 Granett, P.; Lomax, J.L. (1968) Results of Repellency Tests in the Laboratory against Caged Adult Yellow Fever Mosquitoes and Stable Flies. (Unpublished study received May 28, 1968 under 3282-47; prepared by Rutgers Univ., Dept. of Entomology and Economic Zoology, submitted by d-Con Co., Inc., New York, N.Y.; CDL: 222081-B)

000004868 Lahr, P.H. (1970) Synergism of Mixtures of Ethylhexanediol and Diethyltoluamide. (Unpublished study received Jul 1, 1970 under 3282-48; prepared by Union Carbide Corp. in cooperation with Rutgers Univ., submitted by d-Con Co., Inc., New York, N.Y.; CDL:007765-B)

000004873 Haynes, H.L. (1967) Personal Insect Repellent Tests in Madbury, N.H.--July 1, 2 and 3, 1967: Tested A (80% Diol + MGK Repellents), B (80% Diol), and C (80% Trimethyl pentanediol) and Each Mixture at One Half Strength. (Unpublished study including letter dated Jul 21, 1967 from R.J. Norton to Harry L. Haynes, received Apr 23, 1968 under 3282-45; prepared by Union Carbide Corp. in cooperation with Crop Protection Institute and Univ. of New Hampshire, Dept. of Entomology, submitted by d-Con Co., Inc., New York, N.Y.; CDL:022566-C)

000004874 Lomax, J. (1968) Results of Mosquito and Fly Repellency Tests in the Rutgers University Laboratory. (Unpublished study received May 28, 1968 under 3282-45; prepared by Rutgers Univ., Dept. of Entomology and Economic Zoology, submitted by d-Con Co., Inc., New York, N.Y.; CDL:022566-D)

000004881 Kline, P.R.; Gabriel, K.L. (1965) Project #20-124: A Repeated Insult Patch Test Conducted in 200 Human Subjects with Union Carbide Corporation--2 Ethyl hexanediol--1,3 (100%). (Unpublished study including letter dated Jul 12, 1966 from C.U. Dernehl to J.S. Leary, Jr., received Jul 14, 1966 under unknown admin. no.; submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:118533-A)

000004887 Granett, P.; Haynes, H.L. (19??) Laboratory evaluation of chemicals for rendering fabric repellent to mosquitoes. Pages 82-87, In Proceedings of the Thirty-Second Annual Meeting of the New Jersey Mosquito Extermination Association; Mar 28-30, Atlantic City, N.J. N.P. (Also In unpublished submission received Jan 30, 1969 under 5769-51; submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:022549-A)

000004890 Granett, P. (1961) Effectiveness of Various Products as Insect Repellents Applied to Skin of Arms or Legs of Testers. (Unpublished study including letter dated Oct 17, 1961 from P. Granett to Harry L. Haynes, received Jul 26, 1963 under 5769-32; prepared by Rutgers Univ., New Jersey Agricultural Experiment Station, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:231147-B)

000004892 Union Carbide Corporation (1965) Laboratory Tests: Summary and Conclusions. (Unpublished study received Jul 19, 1966 under 5769-48; CDL:022563-A)

000004893 Wisconsin Alumni Research Foundation (1959) Bioassay Report: Personal Repellent Tests with Samples 612 and Formula D, against Yellow Fever Mosquito and Stable Fly: WARF No. 902067-8. (Unpublished study received June 10, 1959 under 1021-566; submitted by McLaughlin Gormley King Co., Minneapolis, Minn.; CDL: 005220-A)

000004896 Cosmetics Incorporated (19??) Comparative Effectiveness of a Commercial Repellent Stick (OM-718) and 2-Ethyl-1,3-hexanediol (0-375) in Paired Tests as Skin Application against Aedes aegypti . (Unpublished study received Oct 27, 1953 under 4371-1; CDL:231140-A)

000021737 Haynes, H.L. (1967) Bioassay: WARF No. 7091961-2. (Unpublished study received Apr 23, 1968 under 5769-26; prepared by Wisconsin Alumni Research Foundation, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:028100-D)

005000009 Schmidt, M.L. (1977) Relative effectiveness of repellent against Simulium damnosum (Diptera: Simuliidae) and Glossina morsitans (Diptera: Glossinidae) in Ethiopia. Journal of Medical Entomology 14(3):276-278.

005000042 Spencer, T.S.; Bayles, S.F.; Shimmin, R.K.; Gabel, M.L.; Akers, W.A. (1975) Interactions between mosquito repellents and human skin. Pages 1-14, In Proceedings of the Ninth Army Science Conference; June 1975; West Point, N.Y. (Available from: NTIS, Springfield, VA; AD-A050-958/8ST)

005000113 Schreck, C.E. (1977) Techniques for the evaluation of insect repellents: A critical review. Annual Review of Entomology 22:101-119.

005000121 Bar-Zeev, M. (1962) A rapid method for screening and evaluating mosquito repellents. Bulletin of Entomological Research 53(3):521-528.

005000126 Wright, R.H. (1962) Studies in mosquito attraction and repulsion. V. Physical theory. Canadian Entomologist 94(10):1022-1029.

005000128 Roadhouse, L.A.O. (1953) Laboratory studies on insect repellency. Canadian Journal of Zoology 31:535-546.

005000130 Setterstrom, C.A. (1946) Insect repellents: Intensive research broadens market. Chemistry and Industry (London) 59:474-475.

005000141 Gilbert, I.H.; Gouck, H.K. (1955) Evaluation of repellents against mosquitoes in Panama. Florida Entomologist XXXVIII(4):153-163.

005000164 Travis, B.V.; Morton, F.A.; Cochran, J.H. (1946) Insect repellents used as skin treatments by the armed forces. Journal of Economic Entomology 39(5):627-630.

005000165 Applewhite, K.H.; Smith, C.N. (1950) Field tests with mosquito and sand fly repellents in Alaska. Journal of Economic Entomology 43(3):353-357.

005000167 Altman, R.M.; Smith, C.N. (1955) Investigations of repellents for protection against mosquitoes in Alaska, 1953. Journal of Economic Entomology 48(1):67-72.

005000169 Gilbert, I.H.; Gouck, H.K.; Smith, C.N. (1955) New mosquito repellents. Journal of Economic Entomology 48(6):741-743.

005000170 Gilbert, I.H. (1957) Evaluation of repellents against mosquitoes and deer flies in Oregon. Journal of Economic Entomology 50(1):46-48.

005000172 Bar-Zeev, M.; Smith, C.N. (1959) Action of repellents on mosquitoes feeding through treated membranes or on treated blood. Journal of Economic Entomology 52(2):263-267.

005000187 Gilbert, I.H.; Scanlon, J.E.; Bailey, D.L. (1970) Repellents against mosquitoes in Thailand. Journal of Economic Entomology 63(4):1207-1209.

005000222 Gabel, M.L.; Spencer, T.S.; Akers, W.A. (1976) Evaporation rates and protection times of mosquito repellents. Mosquito News 36(2):141-146.

005000231 Scott, J.A. (1946) Insect repellents. Pest Control and Sanitation 1(11):18-19.

005000236 Gilbert, I.H.; Gouck, H.K.; Smith, C.N. (1957) New insect repellent. Soap and Chemical Specialties 33(5):115-117,129,131,133.

005000268 Yeoman, G.H.; Warren, B.C. (1970) Repellents for Stomoxys calcitrans, the stable fly: Techniques and a comparative laboratory assessment of butyl methylcinchoninate. Bulletin of Entomological Research 59(4):563-577.

005000280 Gouck, H.K.; Bowman, M.C. (1959) Effect of repellents on the evolution of carbon dioxide and moisture from human arms. Journal of Economic Entomology 52(6):1257-1259.

005000284 Berry, R.; Joseph, S.R.; Langford, G.S. (1965) The question of area mosquito repellents. Pages 190-193, In New Brunswick, N.J.: New Jersey Mosquito Extermination Association.New Brunswick, N.J.: New Jersey Mosquito Extermination Association.

005000299 King, W.V., comp. (1954) Chemicals Evaluated as Insecticides and Repellents at Orlando, Fla. U.S. Department of Agriculture, Agricultural Research Service, Entomology Research Branch. Washington, D.C.: USDA. (USDA Agriculture Handbook no. 69).

005000300 Smith, C.N.; Gilbert, I.H.; Gouck, H.K.; Bowman, M.C.; Acree, F., Jr.; Schmidt, C.H. (1963) Factors affecting the protection period of mosquito repellents. Pages 1-36, In U.S. Department of Agriculture Technical Bulletin, No. 1285.

005002395 Travis, B.V. (1947) Mosquito repellents. American Perfumer and Essential Oil Review 50:141-142.

005002397 Madden, A.H.; Lindquist, A.W.; Knipling, E.F. (1944) Tests of repellents against chiggers. Journal of Economic Entomology 37(2):283-286.

005002493 Sarkaria, D.S.; Brown, A.W.A. (1951) Studies on the responses of the female Aedes mosquito. Part II.--The action of liquid repellent compounds. Bulletin of Entomological Research 42:115-122.

005002666 Smith, C.N.; Gouck, H.K. (1946) Observations on tick repellents. Journal of Economic Entomology 39(3):374-378.

005002667 Kasman, S.; Roadhouse, L.A.O.; Wright, G.F. (1953) Studies in testing insect repellents. Mosquito News 13(2):116-123.

005002669 Travis, B.V.; Morton, F.A. (1950) Insect repellents and nets for use against sand flies. Pages 154-156, In Proceedings of the Thirty-Seventh Annual Meeting of the New Jersey Mosquito Extermination Association. New Brunswick, N.J.: New Jersey Mosquito Extermination Association.

005002848 Christophers, S.R., Sir (1947) Mosquito repellents: Being a report of the work of the Mosquito Repellent Inquiry, Cambridge 1943-5. Journal of Hygiene 45:176-231.

005003262 Travis, B.V. (1949) Studies of mosquito and other biting-insect problems in Alaska. Journal of Economic Entomology 42(3):451-457.

005003263 Applewhite, K.H.; Cross, H.F. (1951) Further studies of repellents in Alaska. Journal of Economic Entomology 44(1):19-22.

005003264 DeFoliart, G.R. (1951) A comparison of several repellents against blackflies. Journal of Economic Entomology 44(2):265-266.

005003265 Travis, B.V.; Smith, C.N. (1951) Mosquito repellents selected for use on man. Journal of Economic Entomology 44(3):428-429.

005003266 Dowling, M.A.C. (1955) Insect repellents and miticides. Journal of the Royal Army Medical Corps 101(1):1-15.

005003640 Travis, B.V.; Smith, A.L.; Madden, A.H. (1951) Effectiveness of insect repellents against black flies. Journal of Economic Entomology 44(5):813-814.

005004319 Stenbaeck, F.; Shubik, P. (1974) Lack of toxicity and carcinogenicity of some commonly used cutaneous agents. Toxicology and Applied Pharmacology 30:7-13.

005004864 Spencer, T.S.; Zeller, K.L.; Brodel, C.F.; Akers, W.A. (1977) Analysis of four-site method for testing mosquito repellents. Pages 119-120, In Proceedings and Papers of the Annual Conference of the California Mosquito Control Association. Vol. 45. Visalia, Calif.: California Mosquito Control Association.

005006012 Linduska, J.P.; Morton, F.A. (1947) Determining the repellency of solid chemicals to mosquitoes. Journal of Economic Entomology 40(4):562-564.

005006137 Haynes, H.L.; Lahr, P.H., inventors; Union Carbide Corporation, assignee (1974) Synergistic insect repellent compositions containing N,N-diethyl meta toluamide and 2-ethyl-1,3-hexanediol. Canadian patent 960140. Dec 31. 22p.

005006463 Beroza, M.; Acree, F., Jr.; Turner, R.B.; Braun, B.H. (1966) Separation and insect repellent activity of diastereoisomers of 2-ethyl-1,3-hexanediol against Aedes aegypti. Journal of Economic Entomology 59(2):376-378.

005006505 Burton, D.J. (1969) Intrinsic mosquito repellency values of some chemical compounds. American Perfumer and Cosmetics 84(4):41-42,44.

005011438 Wood, P.W. (1968) The effect of ambient humidity on the repellency of ethylhexanediol ("6-12") to Aedes aegypti. Canadian Entomologist 100 (12):1331-1334.

OFFICE OF PESTICIDE PROGRAMS
REGISTRATION STANDARD ALPHABETICAL BIBLIOGRAPHY
Listing of All Documents Identified in the Literature Search

CASE GS0002 2-ethyl-1,3-hexanediol

MRID CITATION

005002316 Acree, F., Jr.; Beroza, M. (1962) Gas chromatography of insect repellents. Journal of Economic Entomology 55(1):128-130.

000001003 Allenbaugh, R.B. (1965) Review of Literature on n,n-diethyl-m-toluamide as an Insect Repellent. (Unpublished study that includes bibliography, received Feb 12, 1969 under 134-48; submitted by Hess & Clark, Research Dept., Div. of Richardson-Merrell, Inc., Ashland, Ohio; CDL:000602-C)

000001172 Altman, R.M. (1969) Repellent tests against Anopheles albimanus Wiedemann in the Panama Canal Zone. Mosquito News 29(1):110-112. (Also In unpublished submission received Jun 23, 1969 under 4822-EX-8; submitted by S.C. Johnson & Son, Inc., Racine, Wis.; CDL:127306-D)

005000167 Altman, R.M.; Smith, C.N. (1955) Investigations of repellents for protection against mosquitoes in Alaska, 1953. Journal of Economic Entomology 48(1):67-72.

005002670 Anon. (1953) Information on New Insect Repellent Compositions Developed for Military Use. Washington, D.C.: U.S. Dept. of Agriculture, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine.

000001067 Anon. (1968) Insect repellents. U.S. Navy Medical News Letter 52(6): ?. (Also In unpublished submission received Jul 7, 1969 under 1516-52; submitted by Curts Laboratories, Inc., Kansas City, Mo.; CDL:024967-A)

GS0020001 Anon. (1972) Letter sent to ? dated Oct 18, 1972. [Contains tests which concern the ammount of "6-12" washed off by water from sheets of embossed polyethylene.] (Unpublished study received under 3282-49; submitted by ?; CDL:222093)

005003263 Applewhite, K.H.; Cross, H.F. (1951) Further studies of repellents in Alaska. Journal of Economic Entomology 44(1):19-22.

005000165 Applewhite, K.H.; Smith, C.N. (1950) Field tests with mosquito and sand fly repellents in Alaska. Journal of Economic Entomology 43(3):353-357.

000014714 Atkins, E.L.; Greywood, E.A.; MacDonald, R.L. (1971) Effect of Pesticides on Apiculture: Project No. 1499. (Unpublished study received Jun 21, 1972 under 239-EX-61; prepared by Univ. of California--Riverside, Dept. of Entomology, Div. of Economic Entomology, submitted by Chevron Chemical Co., Richmond, Calif.; CDL:223505-AS)

005000604 Atkins, E.L.; MacDonald, R.L.; Greywood-Hale, E.A. (1975) Repellent additives to reduce pesticide hazards to honey bees: field tests. Environmental Entomology 4(2):207-210.

005000158 Atkins, E.L.; MacDonald, R.L.; McGovern, T.P.; Beroza, M.; Greywood-Hale, E.A. (1975) Repellent additives to reduce pesticide hazards to honeybees: Laboratory testing. Journal of Apicultural Research 14(2):85-97.

005002317 Axtell, R.C. (1967) Evaluations of repellents for Hippelates eye gnats. Journal of Economic Entomology 60(1):176-180.

GS0020023 Baker, G.J. (1965) Letter to J. Leary dated Feb 12, 1965. [Concerns the attached five pages from the company bulletin and labels.] Unpublished study received ? under 336-010; submitted by ?; CDL:101072)

005000121 Bar-Zeev, M. (1962) A rapid method for screening and evaluating mosquito repellents. Bulletin of Entomological Research 53(3):521-528.

005000172 Bar-Zeev, M.; Smith, C.N. (1959) Action of repellents on mosquitoes feeding through treated membranes or on treated blood. Journal of Economic Entomology 52(2):263-267.

005002330 Bartlett, P.D.; Dauben, H.J., Jr.; Hammond, G.S.; McKusick, B.C.; Mueller, G.P.; Packer, C.K.; Ross, S.D.; Schneider, A.; Siegel, S.; Woods, G.F. (1945) The Preparation of Some Organic Compounds for Testing as Insect Repellents. Washington, D.C.: U.S. Department of Commerce, Office of Technical Services. (U.S.Department of Commerce, Office of Technical Services PB report no. 27406 issued by the Office of Scientific Research and Development, National Defense Research Committee as report OSRD no. 6367; National Research Council, Insect Control Committee Report No. 155)

005004397 Bauman, P.M.; Berrios-Duran, L.; McMullen, D.B. (1955) Effectiveness of Abbott's Insect Repellent Cream (E 4856) as a protective barrier against Schistosoma mansoni in mice. Journal of Parasitology 41:298-301.

000001121 Beam, F.; Granett, P. (1965) Repellency Tests June-September 1965. (Unpublished study that includes incomplete Sections II and IV with Tables II, IV and Appendix 1, received Dec 3, 1966 under 5769-44; prepared by Union Carbide Consumer Products Co. in cooperation with Rutgers State Univ., submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:024243-A)

005006463 Beroza, M.; Acree, F., Jr.; Turner, R.B.; Braun, B.H. (1966) Separation and insect repellent activity of diastereoisomers of 2-ethyl-1,3-hexanediol against Aedes aegypti. Journal of Economic Entomology 59(2):376-378.

005000284 Berry, R.; Joseph, S.R.; Langford, G.S. (1965) The question of area mosquito repellents. Pages 190-193, In New Brunswick, N.J.: New Jersey Mosquito Extermination Association.New Brunswick, N.J.: New Jersey Mosquito Extermination Association.

005002553 Blaine, R.L.; Levy, P.F. (1974) The use of thermal evolution analysis (TEA) for the determination of vapor pressure of agricultural chemicals. Analytical Calorimetry 3:185-198.

005008771 Bondi, A.; Simkin, D.J. (1957) Heats of vaporization of hydrogen-bonded substances. A.I.Ch.E. Journal 3(4):473-479.

GS0020024 Bontoyan, W., ed. (1976) Manual of Chemical Methods for Pesticides and Devices. U.S. Environmental Protection Agency, Office of Pesticide Programs, Technical Services Division, Chemical and Biological Investigations Branch. (Available from Association of Official Analytical Chemists, Arlington, VA)

005004288 Bontoyan, W.R. (1979) Report on pesticide formulations: Herbicides, fungicides, and miscellaneous. Journal of the Association of Official Analytical Chemists 62(2):334-337.

005014407 Bornmann, G.; Loeser, A. (1956) Ueber die toxikologische Wirkung von 2-Aethylhexandiol-1,3 bei der Verwendung als Desinfektionsmittel. [The toxicological action of 2-ethylhexanediol-1,3 in application as a disinfectant.] Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 104:28-32.

005004488 Bowman, M.C.; Beroza, M.; Acree, F., Jr. (1959) Colorimetric determination of 2-ethyl-1,3-hexanediol. Journal of Agricultural and Food Chemistry 7(4):259-261.

005002398 Brennan, J.M. (1947) Preliminary report on some organic materials as tick repellents and toxic agents. Public Health Reports 62:1162-1165.

005000993 British Crop Protection Council (1974) Pesticide Manual: Basic Information on the Chemicals Used as Active Components of Pesticides. Edited by H. Martin and C.R. Worthing. 4th ed. London, England: British Crop Protection Council.

005006505 Burton, D.J. (1969) Intrinsic mosquito repellency values of some chemical compounds. American Perfumer and Cosmetics 84(4):41-42,44.

005004322 Buttle, G.A.H.; Bower, J.D. (1958) A note on the anaesthetic activity of 1:3-propanediols. Journal of Pharmacy and Pharmacology 10:447-449.

005007004 Caldas, A.D. (1962) O emprego de repelentes para moscas sugado-ras dos animais domesticos. [The use of repellents against blood-sucking flies on domestic animals.] Biologico XXVIII(4):111-112.

GS0020002 Carbide and Carbon Chemicals Corporation (1948) Application for "6-12" Insect Repellent with Sun Screen to the Food and Drug Administration. (Unpublished study that includes product chemistry and toxicology reports received ? under ?; submitted by Carbide and Carbon Chemicals Corporation; CDL:130593)

005002848 Christophers, S.R., Sir (1947) Mosquito repellents: being a report of the work of the Mosquito Repellent Inquiry, Cambridge 1943-5. Journal of Hygiene 45:176-231.

005006138 Ciferri, R. (1962) Repellenti degli insetti. [Insect repellents.] Coltivatore e Giornale Vinicolo Italiano. [The Grower and the Italian Wine-Growing Journal.] 108(3):100-101.

005006134 Claus, A. (1950) Zur Frage der Insektenvergraemungsmittel. [On the question of insect repellents.] Deutsche Tieraerztliche Wochenschrift 57(43/44):364-365.

005004954 Coler, M.A., inventor; Synergistics, assignee (1950) Skin dressings with fugitive colors. U.S. patent 2,496,270. Feb 7. 2 p. Cl. 167-22.

000004896 Cosmetics Incorporated (19??) Comparative Effectiveness of a Commercial Repellent Stick (OM-718) and 2-Ethyl-1,3-hexanediol (0-375) in Paired Tests as Skin Application against Aedes 4371-1; CDL:231140-A)

005005164 Crossley, J.; Williams, G. (1977) Relaxation in hydrogen-bonded liquids studied by dielectric and Kerr-effect techniques. Journal of the Chemical Society, Faraday Transactions 73(12):1906-1917.

000004863 Cutter, R.E.; Morison, C.R.W. (1961) A Comparison of the Effect of 6-12 and Deet Insect Repellents upon Common Surface Coatings. (Unpublished study received Jan 8, 1962 under 3282-45; prepared by Union Carbide Chemicals Co., submitted by d-Con Co., Inc., New York, N.Y.; CDL:022564-B)

005000301 Cutting, W.C. (1967) Insecticides, repellents and rodenticides. Pages 132-140, In Handbook of Pharmacology, 3rd Edition. New York: Appleton-Century-Crofts.

000004866 D-Con Company, Incorporated (1963) Lab and Field Results of New Cream Lotion. (Unpublished study received May 28, 1968 under 3282-47; CDL:222081-A)

005005417 Davidson, L.M.; Peairs, R.H. (1966) Applied insect control: Chemical. Pages 72-100, In Insect Pests of Farm, Garden and Orchard. 6th ed. New York: John Wiley.

005000232 Davies, J.J. (1946) Insect repellents. Pest Control and Sanitation 1(12):13.

005000191 Davis, E.E.; Rebert, C.S. (1972) Elements of olfactory receptor coding in the yellowfever mosquito. Journal of Economic Entomology 65(4):1058-1061.

005003264 DeFoliart, G.R. (1951) A comparison of several repellents against blackflies. Journal of Economic Entomology 44(2):265-266.

005003266 Dowling, M.A.C. (1955) Insect repellents and miticides. Journal of the Royal Army Medical Corps 101(1):1-15.

005004326 Draize, J.H.; Alvarez, E.; Whitesell, M.F.; Woodard, G.; Hagan, E.C.; Nelson, A.A. (1948) Toxicological investigations of compounds proposed for use as insect repellents: A. Local and systemic effects following topical skin application. B. Acute oral toxicity. C. Pathological examination. Journal of Pharmacology and Experimental Therapeutics 93:26-39.

005002556 Drake, N.L.; Eaker, C.M.; Kilmer, G.W.; Melamed, S.; Shenk, W.J.; Weaver, W.E. (1945) The Preparation of Some Compounds for Testing as Insect Repellents. Washington, D.C.: U.S. Department of Commerce, Office of Technical Services. (PB report no. 27409, issued by the Office of Scientific Research and Development, National Defense Research Committee as report OSRD no. 6370; National Research Council, Insect Control Committee report no. 153)

005000153 Dremova, V.P.; Markina, V.V.; Zvyagintzeva, T.V. (1976) Methodology for the primary selection of insect repellents in field conditions. International Pest Control 18(5):12-14.

005000197 Dukes, J.C.; Rodriguez, J.G. (1976) A bioassay for host-seeking responses of tick nymphs (Ixodidae). Journal of the Kansas Entomological Society 49(4):562-566.

005010268 Dyrssen, D.; Uppstrom, L.; Zangen, M. (1969) A distribution study of the association of 2,2-diethylpropanediol-1,3 and 2-ethylhexanediol-1,3 in chloroform. Analytica Chimica Acta 46(1):49-53.

005007048 Fairchild, E.J., ed. (1977) Agricultural Chemicals and Pesticides: A Subfile of the NIOSH Registry of Toxic Effects of Chemical Substances. Cincinnati, Ohio: National Institute for Occupational Safety and Health. (Pagination includes 46 pages numbered i-xlvi; available from: NTIS, Springfield, VA: PB-274 748)

005003269 Findlay, G.M.; Hardwicke, J.; Phelps, J. (1946) Tsetse fly repellents. Transactions of the Royal Society of Tropical Medicine and Hygiene 40(3):341-344.

000001070 Fisher, A.M.; Birdsall, C.M. (1972) Flash Point on Insect Repellent Liquid #1659-142. (Unpublished study received May 23, 1972 under unknown admin. no.; submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:117587-A)

005006462 Fluno, H.J.; Jones, H.A.; Snyder, F.M. (1946) Emulsifiers for liquid acaricides. Journal of Economic Entomology 39:810-811.

000001180 Fluno, J.A.; Weidhaas, D.E. (1968) Saving your skin--insect repellants. Pages 293-296, In Yearbook of Agriculture, 1968. By U.S. Dept of Agriculture. Washington, D.C.: U.S. Government Printing Office. (Yearbook separate no. 3605; Also In unpublished submission received Jun 10, 1971 under 3282-48 and 3282-51; prepared by U.S. Agricultural Research Service, Entomology Research Div., Insects Affecting Man and Animals Research Branch, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007766-B)

000004897 Fultz, T.O., Jr. (1977) Sandfly Efficacy Report: (Comparative Evaluations of Three Repellents). (Unpublished study received Feb 21, 1978 under 40195-1; submitted by Reaenge Insect Repellent Corp., Savannah, Ga.; CDL:232893-A)

005000222 Gabel, M.L.; Spencer, T.S.; Akers, W.A. (1976) Evaporation rates and protection times of mosquito repellents. Mosquito News 36(2):141-146.

005004321 Garner, D.D.; Garson, L.R. (1973) Silyl ether precursor-type insect repellents. Journal of Medicinal Chemistry 16(6):729-732.

005009433 Garner, F.H.; Marchant, P.J.M. (1961) Diffusivities of associated compounds in water. Transactions of the Institute of Chemical Engineers 39:397-408.

005000185 Garson, L.R.; Buckner, J.H.; Schreck, C.E.; Weidhaas, D.E.; Gilbert, I.H. (1970) Insect repellency of N,N-diethyl-m-toluamidine-a nitrogen isotere of deet. Journal of Economic Entomology 63(4):1116-1117.

005009862 Gast, R.; Early, J. (1956) Phytotoxicity of solvents and emulsifiers used in insecticide formulations. Agricultural Chemicals 11(4):42-45,136-137.

005004876 Gessner, P.K.; Parke, D.V.; Williams, R.T. (1960) Studies in detoxication: 80. The metabolism of glycols. Biochemical Journal 74:1-5.

005000170 Gilbert, I.H. (1957) Evaluation of repellents against mosquitoes and deer flies in Oregon. Journal of Economic Entomology 50(1):46-48.

005000157 Gilbert, I.H. (1966) Evaluation and use of mosquito repellents. Journal of the American Medical Association 196(3):163-165.

005000264 Gilbert, I.H.; Gouck, H.K. (1955) Evaluation of repellents against mosquitoes in Panama. Association of Southern Agricultural Workers Proceedings 52:93.

005000141 Gilbert, I.H.; Gouck, H.K. (1955) Evaluation of repellents against mosquitoes in Panama. Florida Entomologist XXXVIII(4):153-163.

005000298 Gilbert, I.H.; Gouck, H.K. (1962) Effect of Insect Repellents on Plastics, Paints, and Fabrics. Washington D.C.: USDA. (U.S. Department of Agriculture, Agricultural Research Service,).

005000169 Gilbert, I.H.; Gouck, H.K.; Smith, C.N. (1955) New mosquito repellents. Journal of Economic Entomology 48(6):741-743.

005000237 Gilbert, I.H.; Gouck, H.K.; Smith, C.N. (1957) Diethyltoluamide: new insect repellent, Part II-Clothing treatments. Soap and Chemical Specialties 33(6):95,97,99,109.

005000236 Gilbert, I.H.; Gouck, H.K.; Smith, C.N. (1957) New insect repellent. Soap and Chemical Specialties 33(5):115-117,129,131,133.

005000187 Gilbert, I.H.; Scanlon, J.E.; Bailey, D.L. (1970) Repellents against mosquitoes in Thailand. Journal of Economic Entomology 63(4):1207-1209.

005010120 Gjullin, C.M.; Cope, O.B.; Quisenberry, B.F.; DuChanois, F.R. (1949) The effect of some insecticides on black fly larvae in Alaskan streams. Journal of Economic Entomology 42(1):100-105.

005000118 Goldman, L. (1960) Dermatologic aspects of insect repellents and toxicants. Archives of Dermatology and Syphilology 62:245-260.

005000114 Gouck, H.K. (1966) Protection from ticks, fleas, chiggers, and leeches. Archives of Dermatology 93(1):112-113.

005000280 Gouck, H.K.; Bowman, M.C. (1959) Effect of repellents on the evolution of carbon dioxide and moisture from human arms. Journal of Economic Entomology 52(6):1257-1259.

005000168 Gouck, H.K.; Gilbert, I.H. (1955) Field tests with new tick repellents in 1954. Journal of Economic Entomology 48(5):499-500.

005000282 Granett, P. (1960) Insect Repellents for Personal Use. New Brunswick: New Jersey Agricultural Experimental Station. (N.J. A.E.S. circular no. 592).

000004890 Granett, P. (1961) Effectiveness of Various Products as Insect Repellents Applied to Skin of Arms or Legs of Testers. (Unpublished study including letter dated Oct 17, 1961 from P. Granett to Harry L. Haynes, received Jul 26, 1963 under 5769-32; prepared by Rutgers Univ., New Jersey Agricultural Experiment Station, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:231147-B)

000004887 Granett, P.; Haynes, H.L. (19??) Laboratory evaluation of chemicals for rendering fabric repellent to mosquitoes. Pages 82-87, In Proceedings of the Thirty-Second Annual Meeting of the New Jersey Mosquito Extermination Association; Mar 28-30, Atlantic City, N.J. N.P. (Also In unpublished submission received Jan 30, 1969 under 5769-51; submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:022549-A)

000001112 Granett, P.; Haynes, H.L. (1945) Insect repellent properties of 2-ethylhexanediol-1,3. Journal of Economic Entomology 88(6): 671-675. (Also In unpublished submission that includes correction, received Feb 26, 1970 under 3282-46; prepared by Rutgers Univ., submitted by Union Carbide Corp., New York, N.Y.; CDL:007760-B)

000004867 Granett, P.; Lomax, J.L. (1968) Results of Repellency Tests in the Laboratory against Caged Adult Yellow Fever Mosquitoes and Stable Flies. (Unpublished study received May 28, 1968 under 3282-47; prepared by Rutgers Univ., Dept. of Entomology and Economic Zoology, submitted by d-Con Co., Inc., New York, N.Y.; CDL: 222081-B)

000001138 Granett, P.; Lomax, J.L. (1971) Summary of Rutgers University Efficacy Data - June, 1971: "6-12" Brand Super Insect Repellent Stick Formula No. 1481-141B Stick Versus 50% Deet (95%) Liquid Formula No. 1481-141A: Exhibit I. (Unpublished study that includes Table 1 and Appendix Tables 15-16, received 1972 under 5769-Q; prepared by Rutgers Univ., submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:228420-A)

000001127 Granett, P.; Lomax, J. (1973) Summarized Results from Rutgers University: [Field Tests on Insect Repellent Spray: Deet]. (Unpublished study received Aug 24, 1973 under 5769-97; prepared by Rutgers Univ., Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:003305-A)

000001137 Granett, P.; Lomax, J. (1973) Summarized Results from Rutgers University: Treatments and Locations: [Deet]. (Unpublished study received Aug 24, 1973 under 3282-56; prepared by Rutgers Univ., Dept. of Entomology, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:009768-A)

005002325 Hall, S.A.; Green, N.; Beroza, M. (1957) Insect repellents and attractants. Journal of Agricultural and Food Chemistry 5(9):663-667,669.

000001060 Harris Laboratories Incorporated (1965) Subacute Dermal Toxicity Study of Repellent Mixtures: [Deet]. (Unpublished study received Nov 30, 1965 under unknown admin. no.; submitted by McLaughlin Gormley King Co., Minneapolis, Minn.; CDL:140026-A)

GS0020003 Haynes, H.L. (1966) Letter sent to ? dated Dec 7, 1966. [Concerns aerosol and pressurized space spray insecticide test methods.] (Unpublished study received under 3282-49; submitted by ?; CDL:222093)

000021737 Haynes, H.L. (1967) Bioassay: WARF No. 7091961-2. (Unpublished study received Apr 23, 1968 under 5769-26; prepared by Wisconsin Alumni Research Foundation, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:028100-D)

000004873 Haynes, H.L. (1967) Personal Insect Repellent Tests in Madbury, N.H.--July 1, 2 and 3, 1967: Tested A (80% Diol + MGK Repellents), B (80% Diol), and C (80% Trimethyl pentanediol) and Each Mixture at One Half Strength. (Unpublished study including letter dated Jul 21, 1967 from R.J. Norton to Harry L. Haynes, received Apr 23, 1968 under 3282-45; prepared by Union Carbide Corp. in cooperation with Crop Protection Institute and Univ. of New Hampshire, Dept. of Entomology, submitted by d-Con Co., Inc., New York, N.Y.; CDL:022566-C)

000004864 Haynes, H.L. (1969) Entomological Performance Data: [6-12]. (Unpublished study received Sep 18, 1969 under 3282-45; prepared by Union Carbide Corp. in cooperation with Rutgers Univ., submitted by d-Con Co., Inc., New York, N.Y.; CDL:022574-A)

000001109 Haynes, H.L. (1969) Entomological Performance Data: [6-12 Insect Repellent Spray]. (Unpublished study that includes appended report, received Sep 18, 1969 under 3282-46, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007759-A)

GS0020004 Haynes, H.L. (1970) Letter sent to H.G. Alford dated May 12, 1970. [Concerns the completed form for an Application for Amended Registration for "6-12". Attached is the application.] (Unpublished study received Apr 14, 1970 under 5769-50; submitted by Union Carbide Corporation; CDL:100917)

GS0020005 Haynes, H.L. (1971) Letter sent to J. Touhey dated Mar 10, 1970. [Concerns the registration of "6-12 PLUS". Efficacy data are attached for mixture with ethyl-hexanediol, as well as ethyl hexanediol alone.] Unpublished study received Jul 10, 1971] under 5769-56; submitted by ? CDL:007435)

000001122 Haynes, H.L. (1972) Supporting Data for "6-12 Plus" Brand Insect Repellent Spray. (Unpublished study that includes figures 1-2 and tables 1-2, received Jun 27, 1972 under 3282-48; submitted by Union Carbide Corp., New York, N.Y.; CDL:007767-A)

005006137 Haynes, H.L.; Lahr, P.H., inventors; Union Carbide Corp., assignee (1974) Synergistic insect repellent compositions containing N,N-diethyl meta toluamide and 2-ethyl-1,3-hexanediol. Canadian patent 960140. Dec 31. 22 p.

005008237 Hill, J.A.; Robinson, P.B.; McVey, D.L.; Akers, W.A.; Reifenrath, W.G. (1979) Evaluation of mosquito repellents on the hairless dog. Mosquito News 39(2):307-310.

005003270 Ihndris, R.W.; Gouck, H.K.; Bowen, C.V. (1955) Effect of Promising Insect Repellents on Plastics and Paints. Beltsville, Md.: U.S. Agricultural Research Service. (U.S. Department of Agriculture, Agricultural Research Service report ARS-33-7)

000004871 Industrial Toxicology Laboratories (1954) Repeated Insult Patch Test Study with Union Carbide & Carbon Insect Repellent Stick #1. (Unpublished study received Jan 27, 1954 under 3282-44; submitted by d-Con Co., Inc., New York, N.Y.; CDL:222080-A)

000004894 Industrial Toxicology Laboratories (1954) Repeated Insult Test Screening Study with 2-Ethyl hexanediol 1, 3 in Aerosol Spray. (Unpublished study received Aug 10, 1954 under 2915-11; submitted by Fuller Brush Co., Great Bend, Kans.; CDL:050483-A)

GS0020006 Jasper, R.L. (1963) Pharmacology Laboratory Report. (Unpublished study received Jul 2, 1963 under 643-92; submitted by ?; CDL:110120)

005003267 Jones, H.A.; McCollough, G.T.; Morton, F.A. (1946) Effect of storage on insect repellents. Soap and Sanitary Chemicals 22(10):151,153.

005003268 Kalmus, H.; Hocking, B. (1960) Behaviour of Aedes mosquitos in relation to blood-feeding and repellents. Entomologia Experimentalis et Applicata 3(1):1-26.

005002788 Kashin, P.; Kardatzke, M.L. (1975) Diurnal rhythm, age, and other variables affecting yellow fever mosquito avidity and the laboratory assay of repellents. Journal of Economic Entomology 68(6):766-768.

005002667 Kasman, S.; Roadhouse, L.A.O.; Wright, G.F. (1953) Studies in testing insect repellents. Mosquito News 13(2):116-123.

000001035 Keegan, H.L.; Weaver, R.E.; Fleshman, P.; Zarem, M. (1964) Studies of Taiwan Leeches: 3. Further Tests of Repellents Against Aquatic, Blood-Sucking Leeches. (Unpublished study received on unknown date under 901-37; prepared by U.S. Army Medical Command, Dept. of Entomology, 406th Medical Laboratory, submitted by Airosol Co., Inc., Neodesha, Kans.; CDL:221876-A)

005000127 Kellogg, F.E.; Burton, D.J.; Wright, R.H. (1968) Measuring mosquito repellency. Canadian Entomologist 100(7):763-768.

005006013 Kethley, T.W.; Fincher, E.L.; Cown, W.B. (1956) A system for the evaluation of aerial disinfectants. Applied Microbiology 4:237-243.

005000100 Khan, A.A. (1965) Effects of repellents on mosquito behavior. Quaestiones Entomologicae 1(1):1-35.

005014489 Khan, A.A. (1977) Mosquito attractants and repellents. Pages 305-325, In Chemical Control of Insect Behavior, Theory and Application, a Conference; May, 1975, Bellagio, Italy. Edited by H.H. Shorey and J.J. McKelvey, Jr. New York: Wiley.

000001163 Khan, A.A.; Maibach, H.I. (1972) A study of insect repellents. 1. Effect on the flight and approach by Aedes aegypti. Journal of Economic Entomology 65(5):1318-1321. (Also In unpublished submission received Jan 11, 1978 under 4822-10; prepared by Univ. of California School of Medicine, Dept. of Dermatology, submitted by S.C. Johnson & Sons, Inc., Racine, Wis.; CDL:233318-D)

005000218 Khan, A.A.; Maibach, H.I.; Skidmore, D.L. (1975) Addition of perfume fixatives to mosquito repellents to increase protection time. Mosquito News 35(1):23-26.

005000299 King, W.V., comp. (1954) Chemicals Evaluated as Insecticides and Repellents at Orlando, Fla. U.S. Department of Agriculture, Agricultural Research Service, Entomology Research Branch. Washington, D.C.: USDA. (USDA Agriculture Handbook no. 69).

005000017 Klier, M.; Hamburg, A.G. (1976) Neue Insektenabwehrmittel - Am Stickstoff disubstituierte beta-Alaninderivate. [New insect repellents - Derivatives of N-disubstituted beta-alanine.] Journal of the Society of Cosmetic Chemists 27(3):141-153.

000004881 Kline, P.R.; Gabriel, K.L. (1965) Project #20-124: A Repeated Insult Patch Test Conducted in 200 Human Subjects with Union Carbide Corporation--2 Ethylhexanediol--1, 3 (100%). (Unpublished study including letter dated Jul 12, 1966 from C.U. Dernehl to J.S. Leary, Jr., received Jul 14, 1966 under ? submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:118533-A)

005003641 Knipling, E.F. (1948) New insecticides, acaracides, and repellents for the control of arthropods attacking man. Pages 141-142, In Abstracts--International Congress of Tropical Medicine and Malaria. Vol. 4.

005004560 Kulpinski, M.S.; Nord, F.F. (1943) Essential steps in the catalytic condensation of aldehydes; new synthesis of glycol esters. Journal of Organic Chemistry 8:256-270.

GS0020007 Lahr, P.H. (?) Tarrytown Technical Memorandum TTM-81:Synergistic Mixtures of 2-Ethyl-1,3-Hexanediol and M-Diethyltoluamide. Exhibit D. (Unpublished study which includes Tables I and V received Apr 25, 1968 under 5769-27; prepared by Rutgers University, Entomology Department, submitted by ?; CDL:022577)

000004875 Lahr, P.H. (1968) Memorandum: Summary of 1967 Tests on Effectiveness of MGK Additives 11 and 264 in Improving 6-12 Insect Repellent Liquid. Summary of studies 022566-C and 022566-D. (Unpublished study including WARF nos. 7090335-36I, 7091961-2 and 7090335-36, received Apr 23, 1968 under 3282-45; prepared by Union Carbide Corp. in cooperation with Rutgers Univ., Dept. of Entomology and Economic Zoology and Wisconsin Alumni Research Foundation, submitted by d-Con Co., Inc., New York, N.Y.; CDL:022566-G)

000021734 Lahr, P.H. (1968) Summary of 1967 Tests on Effectiveness of MGK Additives 11 and 264 in Improving 6-12 Insect Repellent Liquid. (Unpublished study received Apr 23, 1968 under 5769-26; prepared in cooperation with Rutgers, The State Univ. of New Jersey, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:28100-A)

000004870 Lahr, P.H. (1970) Observations on the Patent Memorandum of March 4, 1969. (Unpublished study received Jul 1, 1970 under 3282-48; prepared by Union Carbide Corp. in cooperation with Rutgers Univ., Dept. of Entomology and Economic Zoology, submitted by d-Con Co., Inc., New York, N.Y.; CDL:007765-D)

000004869 Lahr, P.H. (1970) Synergism of Mixtures of Ethylhexanediol and Diethyltoluamide. (Unpublished study received Jul 1, 1970 under 3282-48; prepared by Union Carbide Corp., submitted by d-Con Co., Inc., New York, N.Y.; CDL:007765-C)

000004868 Lahr, P.H. (1970) Synergism of Mixtures of Ethylhexanediol and Diethyltoluamide. (Unpublished study received Jul 1, 1970 under 3282-48; prepared by Union Carbide Corp. in cooperation with Rutgers Univ., submitted by d-Con Co., Inc., New York, N.Y.; CDL:007765-B)

GS0020008 Lahr, P.H. (1972) Letter sent to H.L. Haynes dated Jul 21, 1972. [Conerns efficacy of Super Repellent Stick and Liquid with the "6-12 PLUS" stick.] (Unpublished study received Jul 25, 1972 under 1016-Q; prepared by Rutgers University, Department of Entomology, submitted by ?; CDL:117589)

GS0020009 Lahr, P.H. (1972) Letter sent to H.L. Haynes dated Jun 1, 1972. [Concerns the relative performance of super liquid insect repellents vs. 50% and 65% Deet liquid.] (Unpublished study received ? under 5769-93; submitted by Union Carbide Corporation; CDL:022494)

000001124 Lahr, P.H. (1972) Performance of "6-12 Plus" Spray Formula vs. 15 Percent Deet based on Rutgers Laboratory and Field Tests for 1968 through 1971: Tarrytown Technical Memorandum, TTM-102. (Unpublished study that includes Appendices I-IV, received Jun 27, 1972 under 3282-48; submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007768-A)

005007003 Lamdan, S. (1951) Consideraciones generales sobre atractivos y repelentes de insectos. [General ideas on insect attractants and repellents.] Buenos Aires, Argentina: Ministerio de Agricultura y Ganaderia.

005002319 Langford, G.S.; Joseph, S.R.; Berry, R. (1966) Some observations on mosquito repellents. Mosquito News 26(3):399-404.

005002396 Lehman, A.J. (1955) Insect repellents. Association of Food and Drug Officials of the United States, Quarterly Bulletin 19:87-99.

005010129 Lehman, A.J. (1956) Insect repellents. Medical Bulletin 16(3):243-256.

GS0020010 Lehman, A..J. (1959) Letter sent to T.W. Nale dated Nov 6, 1959. [Concerns the attached few pages from the company bulletin and labels.] (Unpublished study received ? under 336-10; submitted by ?; CDL:101072)

005004495 Lesser, M.A. (1952) Insect repellents. Soap and Sanitary Chemicals 28(3):136-137,141-142,173.

000001181 Lindquist, A.W.; Madden, A.H.; Watts, C.N. (1944) The use of repellents against fleas. Journal of Economic Entomology 37(4): 485-486. (Also In unpublished submission received Jun 10, 1971 under 3282-48; prepared by U.S. Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007766-F)

005006012 Linduska, J.P.; Morton, F.A. (1947) Determining the repellency of solid chemicals to mosquitoes. Journal of Economic Entomology 40(4):562-564.

000004874 Lomax, J.L. (1968) Results of Mosquito and Fly Repellency Tests in the Rutgers University Laboratory. (Unpublished study received May 28, 1968 under 3282-45; prepared by Rutgers Univ., Dept. of Entomology and Economic Zoology, submitted by d-Con Co., Inc., New York, N.Y.; CDL:022566-D)

000004865 Lomax, J.L. (1968) Union Carbide Consumer Products Company Research Project at Rutgers State University: Annual Report for 1968. (Unpublished study received Sep 18, 1969 under 3282-45; prepared by Rutgers Univ., Dept. of Entomology and Economic Zoology in cooperation with Union Carbide Consumer Products Co., submitted by d-Con Co., Inc., New York, N.Y.; CDL:022574-B)

000001118 Lomax, J.L. (1969) Summary and Discussion of All Duration Field Test Results for Summer 1969: [Deet]: Exhibit F. (Unpublished study that includes Appendices 1-4, received Apr 30, 1970 under 5769-48; prepared by Rutgers Univ., College of Agriculture, Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:007762-F)

000001117 Lomax, J.L. (1970) Summary and Discussion of Repellent Test Results (Duration Type in the Laboratory): ["6-12" Foam Versus 1481-57 and 1481-67]: Exhibit E. (Unpublished study that includes attached report and Appendices 1-2, received Apr 30, 1970 under 5769-48; prepared by Rutgers Univ., College of Agriculture, Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:007762-E)

GS0020011 Lomax, J.L. (1970) Summary and Discussion of Repellent Test Results (Duration Type in the Lab). (Unpublished study which includes Table I received Apr 25, 1968 under 5769-27; prepared by Rutgers University, Entomology Department, submitted by ?; CDL:022577)

000001115 Lomax, J.L. (1970) Summary and Discussion of Repellent Test Results (Duration Type in the Laboratory): [1481-21 Versus 1481-54, -57 Towelettes]: Exhibit E. (Unpublished study that includes attached report and Appendices 1-2, received May 14, 1970 under 5769-44; prepared by Rutgers Univ., College of Agriculture, Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:007761-E)

GS0020013 Lomax, J.L. (1972) Letter sent to H.L. Haynes dated Oct 23, 1972. [Concerns the requested stress test results from Rutgers University for "6-12 PLUS" stick formulation, which are attached.] (Unpublished study received Oct 19, 1972 under 5769-53; CDL:024240)

000001128 Lomax, J.L.; Granett, P. (1971) Current laboratory procedures for the development of improved insect repellents at Rutgers-the State University. Pages 41-47, In Proceedings of the 58th Annual Meeting of the New Jersey Mosquition Extermination Association; Mar 17-19, 1971, Atlantic City, New Jersey. New Brunswick, N.J.: Rutgers Univ. (Also In unpublished submission received Aug 24, 1973 under 5769-97; prepared by Rutgers Univ., Dept. of Entomology, submitted by Union Carbide Corp., New York, N.Y.; CDL:003305-B)

005002609 Lust, S. (1960) Ueber Wirkung und biologische Pruefung von Repellentien. [The effect and biological testing of repellents.] Parfuemerie Kosmetik 41(8):304-306.

000021860 Mace, E.F.; Neumiller, P.J.; Yocum, R.V.; et al. (1971) Maximized Insect Repellent: Project 573. (Unpublished study received Sep 9, 1971 under 4822-114; submitted by S.C. Johnson and Sons, Inc., Racine, Wis.; CDL:007511-A)

005002397 Madden, A.H.; Lindquist, A.W.; Knipling, E.F. (1944) Tests of repellents against chiggers. Journal of Economic Entomology 37(2):283-286.

005000116 Maibach, H.I.; Khan, A.A.; Akers, W. (1974) Use of insect repellents for maximum efficacy. Archives of Dermatology 109(1):32-35.

005010941 Martin, H.; Miles, J.R.W. (1953) Guide to the Chemicals Used in Crop Protection. 2nd ed. Ottawa, Ontario, Canada: Canada Department of Agriculture.

005000310 Mathieson, D.R.; Wilson, C.E. (1944) Insect Repellents. Attempts to Increase Duration of Effectiveness. Washington, D.C.: U.S. Department of Commerce, Office of the Publication Board. (U.S. Department of Commerce, Office of Technical Services PB).

005005521 McClure, H.B. (1944) Newer aliphatic chemicals. Chemical and Engineering News 22(6):416-421.

000001055 McLaughlin Gormley King Company (1957) Recommendations for the Use of Diethyltoluamide by the Armed Forces. (Unpublished study received Oct 22, 1974 under 1021-1323; CDL:028339-I)

000001057 McLaughlin Gormley King Company (1965) MGK (R) Repellents for personal Use. (Unpublished study received Feb 15, 1965 under unknown admin. no.; CDL:105970-B)

000001056 McLaughlin Gormley King Company (1965) Modified Subacute Dermal Study - MGK Repellent Mixes. (Unpublished study received Feb 15, 1965 under unknown admin. no.; CDL:105970-A)

000001000 Miller, W.V. (1955) Insect Repellents for Canines: [Butoxy Polypropylene Glycol]. (Unpublished study that includes Tables I-IV, received Mar 2, 1956 under 59-82; submitted by Burroughs Wellcome Co., Research Triangle Park, N.C.; CDL:000126-A)

000001129 Mitchell, R.B. (1971) "6-12 Plus" Insect Repellent Spray with Knockdown Power: Efficacy Data. (Unpublished study that includes TTM-95 with Appendices A-C, received Oct 13, 1971 under 5769-86; prepared by Union Carbide Corp. in cooperation with Crop Protection Institute; submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL:007772-A)

005002307 Moore, J.B. (1962) Insect repellent formulations for personal use. Aerosol Age 7(12):43,46,123,128.

005012265 Moriamez, C.; Allab, M.D. (1963) Sur les proprietes dielectriques de diols a chaine ramifiee, a l'etat pur et en solution. [On the dielectric properties of branch-chain diols in the pure state and in solution.] Pages 338-345, In Proceedings of the Colloque AMPERE; 1962. Vol. 11. Amsterdam: Colloque AMPERE.

005011439 Mulla, M.S. (1963) Chemical repellents for Hippelates eye gnats--a method and procedure for evaluation. Journal of Economic Entomology 56(6):753-757.

GS0020014 Nale, T.W. (1959) Letter sent to R.O. White dated Nov 10, 1959. [Concerns a precautionary statement on the label.] (Unpublished study received ? under 336-10; submitted by Union Carbide Corporation; CDL:101072)

GS0020015 Nale, T.W. (1959) Letter sent to A.J. Lehman dated Oct 30, 1959. [Concerns the irritation of the mucous membrane by "6-12".] (Unpublished study received ? under 336-10; submitted by ?; CDL:101072)

000004877 Nycum, J.S., ed. (1968) Continuing Guarantees under the Federal Food, Drug and Cosmetic Act: Special Report 31-81. (Unpublished study received Mar 23, 1973 under 1016-4; prepared by Carnegie-Mellon Univ., Mellon Institute, submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:100971-A)

GS0020023 Nycum, J.S.; Carpenter, C.R. (1968) Miscellaneous Acute Toxicity Data, Chemicals and Plastics Division. Special Report 31-136.

005005242 Ogawa, S.; Toyoda, M.; Tonogai, Y.; Ito, Y.; Iwaida, M. (1979) Colorimetric determination of boric acid in prawns, shrimp, and salted jelly fish by chelate extraction with 2-ethyl-1,3-hexanediol. Journal of the Association of Official Analytical Chemists 62(3):610-614.

005005162 Omohundro, A.L.; Neumeier, F.M.; Zeitlin, B.R., inventors; McKesson & Robbins, assignee (1949) Insect repellent stick. U.S. patent 2,465,470. Mar 29. 3 p. Cl. 167-42.

005005957 Peters, W. (1956) Experimentelle Untersuchungen zur Wirkungsweise insektenabwehrender Mittel (Repellents). [Experimental investigations on the efficacy of insect repellents.] Zeitschrift fuer Angewandte Zoologie 1:1-75.

005002422 Philips, F.S. (1946) Insecticides and rodenticides. Federation Proceedings 5:292-298.

005000235 Pierce, H.F. (1958) Diethyltoluamide in aerosol repellents. Soap and Chemical Specialties 34(6):80-81,83,85-86,191.

005004559 Pochini, A.; Salerno, G.; Ungaro, R. (1975) A new simple catalyst for the synthesis of 1,3-diols and their monoesters from linear aliphatic aldehydes. Synthesis 3:164-165.

000004862 Reinhard, G.M. (1961) Effect of Insect Repellent 6-12 on Stocking Dye. (Unpublished study including letter dated Jun 12, 1961 from S.M. Livengood to J.M. Hogrefe, received Jan 8, 1962 under 3282-45; prepared by Union Carbide Corp., submitted by d-Con Co., Inc., New York, N.Y.; CDL:022564-A)

005000128 Roadhouse, L.A.O. (1953) Laboratory studies on insect repellency. Canadian Journal of Zoology 31:535-546.

005002394 Roadhouse, L.A.O. (1953) Use of insect repellents. Agricultural Institute Review 8(2):23-24,30.

005001774 Roberts, R.S. (1969) A review of pesticides used in environmental health activities. Journal of Environmental Health 31(6):560-567.

000001097 S.C. Johnson & Son, Incorporated (1974) Fly and Mosquito Repellent 4071D9-3: Project [No.] 752. (Unpublished study that includes repellency test methods 3082D23, 3452D105, 3767R98 and 3767R99, received Aug 7, 1974 under 4822-138; CDL:102574-A)

GS0020016 Samuel J. Milazzao Manufacturing Company (?) Effectiveness Report. (Unpublished study that includes Hercules Bulletin AP-105B, received Feb 18, 1970 under 8218-2; submitted by ?; CDL:227966)

005002493 Sarkaria, D.S.; Brown, A.W.A. (1951) Studies on the responses of the female Aedes mosquito. Part II.--The action of liquid repellent compounds. Bulletin of Entomological Research 42:115-122.

005000009 Schmidt, M.L. (1977) Relative effectiveness of repellents against Simulium damnosum (Dipetera: Simuliidae) and Glossina morsitans (Diptera: Glossinidae) in Ethiopia. Journal of Medical Entomology 14(3):276-278.

005000199 Schmidt, M.L.; Schmidt, J.R. (1969) Relative effectiveness of chemical repellents against Phlebotomus papatasi (Sropoh). Journal of Medical Entomology 6(1):79-80.

005000113 Schreck, C.E. (1977) Techniques for the evaluation of insect repellents: a critical review. Annual Review of Entomology 22:101-119.

005000188 Schreck, C.E.; Gilbert, I.H.; Weidhaas, D.E.; Posey, K.H. (1970) Spatial action of mosquito repellents. Journal of Economic Entomology 63(5):1576-1578.

005004305 Schwartz, D.P.; Brewington, C.R.; Weihrauch, J.L. (1972) Methods for the isolation and characterization of constituents of natural products. XVI. Quantitative microdetermination of diols as bis-esters of pyruvic acid 2,6-dinitrophenylhydrazone: separation from monohydric alcohol derivatives and resolution of an homologous series. Microchemical Journal 17(3):302-308.

005000612 Schwartz, H., inventor; (1972) Neue synergistische Zusammensetzungen. [Synergistic bactericidal compositions.] German offenlegungsschrift 2,209,606. Nov 16. 11 p.

005000231 Scott, J.A. (1946) Insect repellents. Pest Control and Sanitation 1(11):18-19.

005000130 Setterstrom, C.A. (1946) Insect repellents: Intensive research broadens market. Chemistry and Industry (London) 59:474-475.

005000263 Shambaugh, G.F.; Brown, R.F.; Pratt, J.J., Jr. (1957) Repellents for biting arthropods. Pages 277-303, In Advances in Pest Control Research. New York: New York Interscience.

005004696 Shay, J.F.; Skilling, S.; Stafford, R.W. (1954) Identification of polyhydric alcohols in polymeric esters. Analytical Chemistry 26(4):652-656.

000004884 Shelanski, H.A. (1945) Patch Tests on Human Subjects. (Unpublished study received Feb 2, 1948 under ?; prepared by Smyth Laboratories, submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:110121-D)

005000270 Smith, C.N. (1958) Insect repellents. Pages 96-104, In Proceedings of the Annual Meeting, Chemical Specialties Manufacturers Association, No. 44; Dec 9-12, 1957. New York, N.Y.: Chemical Specialties Manufacturers Association.

005000276 Smith, C.N. (1962) Factors affecting the protection obtained with insect repellents. Pages 482-485, In Transactions of the International Congress of Entomology, 11th Congress, vol. 2, sect. 7/14.

000001020 Smith, C.N. (1965) Insect repellents--Their present usefulness and future development. Pages 507-509, In Section 8: Insecticides and Toxicology: [Proceedings of the] XIIth International Congress of Entomology; 1964(1965), London, N.P. (Also In unpublished submission received May 7, 1970 under 891-37; prepared by U.S. Agricultural Research Service, Entomology Research Div., submitted by Hercules, Inc., Agricultural Chemicals, Wilmington, Del.; CDL:005111-G)

000001166 Smith, C.N. (1970) Repellents for anopheline mosquitoes. Miscellaneous Publications of the Entomological Society of America 7(1):99-117. (Also In unpublished submission received Jan 11, 1978 under 4822-10; prepared by U.S. Agricultural Research Service, Entomology Research Div., submitted by S.C. Johnson & Sons, Inc., Racine, Wis.; CDL:233318-I)

005000166 Smith, C.N.; Cole, M.M.; Lloyd, G.W.; Selhime, A. (1952) Mosquito-repellent mixtures. Journal of Economic Entomology 45(5):805-809.

000001010 Smith, C.N.; Couch, M.D. (1957) Tests with Mosquitone Sticks from McKesson & Robbins, Inc. (Unpublished study received Oct 17, 1957 under 385-6; prepared by U.S. Agricultural Research Service, Entomology Research Div., Insects Affecting Man Section, submitted by McKesson Laboratories, Bridgeport, Conn.; CDL:229417-A)

005000277 Smith, C.N.; Gilbert, I.H.; Gouck, H.K. (1962) Factors in the attraction of mosquitoes to hosts, and their relation to protection with repellents. Pages 82-86, In Transactions of the International Congress of Entomology, 11th Congress, vol. 3, supp. 1/2, 5/7.

005000300 Smith, C.N.; Gilbert, I.H.; Gouck, H.K.; Bowman, M.C.; Acree, F., Jr.; Schmidt, C.H. (1963) Factors affecting the protection period of mosquito repellents. Pages 1-36, In U.S. Department of Agriculture Technical Bulletin, No. 1285.

005002666 Smith, C.N.; Gouck, H.K. (1946) Observations on tick repellents. Journal of Economic Entomology 39(3):374-378.

005000297 Smith, C.N.; Gouck, I.H.; Gouck, H.K. (1956) Use of Insect Repellents. Washington, D.C.: U.S. Department of Agriculture, Agricultural Research Service. (USDA, ARS report no. 33-26).

000001184 Smith, C.N.; Smith, N. (1961) Results of Tests with Six Samples of Suntan-Insect Repellent from Revlon. (Unpublished study received Dec 19, 1961 under 6650-1; prepared by U.S. Agricultural Research Service, Entomology Research Div., Insects Affecting Man and Animals Research Branch, submitted by Revlon, Inc., Bronx, N.Y.; CDL:229503-D)

GS0020019 Smyth, H.F., Jr. (1944) Special Report on Recapitulation of Toxicity and Irritation Data for Some Insect Repellents. Report 7-8.

GS0020020 Smyth, H.F., Jr. (1946) Special Report on Quantitative Aspects of Chemical Burns of the Eye. Report 11.

005007398 Smyth, H.F., Jr. (1952) Physiological aspects of the glycols and related compounds. Pages 300-327, In Glycols. Washington, D.C.: American Chemical Society Publications. (ACS monographs no. 114)

GS0020017 Smyth, H.F., Jr.; Carpenter, C.P.; Shaffer, C.B. (1943) Progress Report for the Month Ended Apr 30, 1943. Report 6-40.

GS0020018 Smyth, H.F.,Jr.; Carpenter, C.P.; Shaffer, C.B.; Weil, C.S. (1947) Progress Report for the Month Ended Jan 31, 1947. Report 10-19.

005006929 Smyth, H.F., Jr.; Carpenter, C.P.; Weil, C.S. (1951) Range-finding toxicity data: List IV. Archives of Industrial Hygiene and Occupational Medicine 4:119-122.

000004879 Smyth, H.F., Jr.; Carpenter, C.P.; Weil, C.S.; Priddle, O.D., Jr. (1955) Progress Report for the Month Ended November 30, 1955: Report 18-141. (Unpublished study received Mar 23, 1973 under 1016-4; prepared by Univ. of Pittsburgh, Mellon Institute of Industrial Research, submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:100971-C)

000004880 Smyth, H.F., Jr.; Carpenter, C.P.; Weil, C.S.; Priddle, O.D., Jr. (1956) Progress Report for the Month Ended November 30, 1956: Report 19-132. (Unpublished study received Mar 23, 1973 under 1016-4; prepared by Univ. of Pittsburgh, Mellon Institute of Industrial Research, submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:100971-D)

005000042 Spencer, T.S.; Bayles, S.F.; Shimmin, R.K.; Gabel, M.L.; Akers, W.A. (1975) Interactions between mosquito repellents and human skin. Pages 1-14, In Proceedings of the Ninth Army Science Conference; June 1975; West Point, N.Y. (Available from: NTIS, Springfield, VA; AD-A050-958/8ST)

005000603 Spencer, T.S.; Shimmin, R.K.; Schoeppner, R.F. (1975) Field test of repellents against the valley black gnat, Leptoconops. Vector Views 22(1):5-7.

005004864 Spencer, T.S.; Zeller, K.L.; Brodel, C.F.; Akers, W.A. (1977) Analysis of four-site method for testing mosquito repellents. Pages 119-120, In Proceedings and Papers of the Annual Conference of the California Mosquito Control Association. Vol. 45. Visalia, Calif.: California Mosquito Control Association.

005000045 Stenbaeck, F. (1977) Local and systemic effects of commonly used cutaneous agents: Lifetime studies of 16 compounds in mice and rabbits. Acta Pharmacologica et Toxicologica 41(5):417-431.

005004319 Stenbaeck, F.; Shubik, P. (1974) Lack of toxicity and carcinogenicity of some commonly used cutaneous agents. Toxicology and Applied Pharmacology 30:7-13.

005000106 Svirbely, W.J.; Eareckson, W.M., III.; Matsuda, K.; Pickard, H.B.; Solet, I.S.; Tuemmler, W.B. (1949) Physical properties of some organic insect repellents. American Chemical Society Journal 71:507-509.

005002315 Touhey, J.G.; Bray, D.F. (1961) Certain compounds as feeding deterrents against the smaller European elm bark beetle, Scolytus multistriatus. Journal of Economic Entomology 54(2):293-296.

005002395 Travis, B.V. (1947) Mosquito repellents. American Perfumer and Essential Oil Review 50:141-142.

005003643 Travis, B.V. (1947) New insect repellents. Pages 628-631, In U.S. Department of Agriculture Yearbook, 1943-1947. Washington, D.C.: U.S. Department of Agriculture.

005003262 Travis, B.V. (1949) Studies of mosquito and other biting-insect problems in Alaska. Journal of Economic Entomology 42(3):451-457.

005004302 Travis, B.V.; Jones, H.A., inventors; (1947) Insect repellent composition. U.S. patent 2,420,389. May 13. 2 p. Cl. 167-22.

005002668 Travis, B.V.; Morton, F.A. (1946) Treatment of clothing for protection against mosquitoes. Pages 65-69, In Proceedings of the Thirty-Third Annual Meeting of the New Jersey Mosquito Extermination Association. New Brunswick, N.J.: New Jersey Mosquito Extermination Association.

005005163 Travis, B.V.; Morton, F.A. (1946) Use of Insect Repellents and Miticides. Washington, D.C.: U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

000004872 Travis, B.V.; Morton, F.A. (1946) Use of Insect Repellents and Miticides: E-698. (Unpublished study received Jun 5, 1957 under 3282-44; prepared by U.S. Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, Div. of Insects Affecting Man and Animals, submitted by d-Con Co., Inc., New York, N.Y.; CDL:022578-A)

005002669 Travis, B.V.; Morton, F.A. (1950) Insect repellents and nets for use against sand flies. Pages 154-156, In Proceedings of the Thirty-Seventh Annual Meeting of the New Jersey Mosquito Extermination Association. New Brunswick, N.J.: New Jersey Mosquito Extermination Association.

005000164 Travis, B.V.; Morton, F.A.; Cochran, J.H. (1946) Insect repellents used as skin treatments by the armed forces. Journal of Economic Entomology 39(5):627-630.

005013243 Travis, B.V.; Morton, F.A.; Smith, C.N. (1953) Use of Insect Repellents and Toxicants. Washington, D.C.: U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine. (Bureau of Entomology and Plant Quarantine report no. E-698, second revision)

005003640 Travis, B.V.; Smith, A.L.; Madden, A.H. (1951) Effectiveness of insect repellents against black flies. Journal of Economic Entomology 44(5):813-814.

005006011 Travis, B.V.; Smith, C.N. (1950) Materials for protection against biting insects. Journal of Forestry 48:329-330.

005003265 Travis, B.V.; Smith, C.N. (1951) Mosquito repellents selected for use on man. Journal of Economic Entomology 44(3):428-429.

005003732 Twinn, C.R. (1948) Insect repellents. Canada, Sci. Serv., Div. Ent. Forest Insect Invest. Bi-monthly Progress Report 4(2):3.

005002328 U.S. Agricultural Research Service, Entomology Research Branch (1954) Composition of repellent mixtures of current or recent interest. Washington D.C.: USDA.

005000244 U.S. Bureau of Entomology and Plant Quarantine (1947) Results of screening tests with materials evaluated as insecticides, miticides and repellents at the Orlando, Fla. laboratory, April 1942 - April 1947 I-V, rep. no. E-733.

005000147 U.S. Department of Agriculture (1976) Controlling Chiggers. Washington, D.C.: USDA. (USDA Home and Garden Bulletin, no. 137).

000004891 Union Carbide Corporation (19??) Consumer Test of "6-12" Cream and Clear Lotion Type Insect Repellents. (Unpublished study received Jul 26, 1963 under 5769-32; CDL:231147-C)

000004889 Union Carbide Corporation (19??) 6-12 Insect Repellent Lotion. (Unpublished study received Jul 26, 1963 under 5769-32; CDL: 231147-A)

000004882 Union Carbide Corporation (1945) Mellon Institute Toxicological Tests on 2-Ethylhexanediol 1,3 (Insect Repellent "6-12"). (Unpublished study received Feb 2, 1948 under unknown admin. no.; CDL:110121-A)

000004886 Union Carbide Corporation (1947) Full Reports of All Investigations Which Have Been Made to Show That 6-12 Insect Repellent with Sun Screen Is Safe For Use. Summary of studies 130593-A, 118533-A, 100971-A through 100971-D, and 110121-A through 110121-D. (Unpublished study received Feb 2, 1948 under unknown admin. no.; CDL:110121-F)

000004885 Union Carbide and Carbon Corporation (1956) Technical Information: 2-Ethylhexanediol-1,3 (U.S.P.): F-6311A. (Unpublished study received Nov 22, 1957 under unknown admin. no.; CDL:110119-A)

000004895 Union Carbide Chemicals Company (1962) 2-Ethyl-1,3-hexanediol (U.S.P.). (Unpublished study received Nov 18, 1970 under 9157-7; submitted by Sun Swimming Pool Chemical Co.; CDL: 227413-A)

000004892 Union Carbide Corporation (1965) Laboratory Tests: Summary and Conclusions. (Unpublished study received Jul 19, 1966 under 5769-48; CDL:022563-A)

000001119 Union Carbide Corporation (1970) Summary of Microbiological Data: "6-12" Plus Foam: Exhibit G. (Unpublished study that includes attached report, received Apr 30, 1970 under 5769-48; CDL:007762-G)

000001111 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 25% 2-Ethyl-1,3-Hexanediol and 5% N,N-Diethyl-Meta-Toluamide, (2) 30% 2-Ethyl-1,3-Hexanediol and (3) 15% N,N-Diethyl-Meta-Toluamide: [Insect Repellent Spray: Exhibit A]. (Unpublished study received Feb 26, 1970 under 3282-46; CDL:007760-A)

000001123 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 40.0% 2-Ethyl-1,3-Hexanediol and 10.0% N,N-Diethyl-Meta-Toluamide (2) 40% 2-Ethyl-1,3-Hexanediol: Exhibit A. (Unpublished study that includes appended letter, received Apr 9, 1970 under 5769-51; CDL:007764-A)

000001114 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 40.0% 2-Ethyl-1,3-Hexanediol and 8.0% N,N-Diethyl-Meta-Toluamide (2) 48.6% 2-Ethyl-1,3-Hexanediol: [Insect Repellent Towelette]: Exhibit A. (Unpublished study received May 14, 1970 under 5769-44; CDL:007761-A)

000001106 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 56.0% 2-Ethyl-1,3-Hexanediol and 9.1% N,N-Diethyl-Meta-Toluamide and (2) 65% 2-Ethyl-1,3-Hexanediol: Exhibit A. (Unpublished study received Apr 9, 1970 under 3282-44; CDL:007757-A)

000001107 Union Carbide Corporation (1970) Summary of 1969 Test Results with Personal Insect Repellent Formulations Containing (1) 80% 2-Ethyl-1,3-Hexanediol and 10% N,N-Diethyl-Meta-Toluamide (2) 80% 2-Ethyl-1,3-Hexanediol and (3) 50% N,N-Diethyl-Meta-Toluamide: Exhibit A. (Unpublished study received Mar 24, 1970 under 5769-27; CDL:007758-A)

000001116 Union Carbide Corporation (1970) Summary of 1969-1970 Test Results with Personal Insect Repellents Containing (1) 25% 2-Ethyl-1, 3-Hexanediol-5% N,N-Diethyl-Meta-Toluamide. (2) 27% 2-Ethyl-1, 3-Hexanediol-5% N,N-Diethyl-Meta-Toluamide. (3) 18% N, N-Diethyl-Meta-Toluamide, and (4) 18% 2-Ethyl-1, 3-Hexanediol: study received Apr 30, 1970 under 5769-48; CDL:007762-A)

000001125 Union Carbide Corporation (1970) Summary of 1970 Test Results with Personal Insect Repellent Formulations Containing (1) 17% 2-Ethyl-1,3-Hexanediol - 3% N,N-Diethyl-Meta-Toluamide and (2) 20% 2-Ethyl-1,3-Hexanediol: Exhibit A. (Unpublished study received May 14, 1970 under 3282-47; CDL:022548-A)

000004876 Union Carbide Corporation (1971) Glycols: For Anti-Freezes, Coupling Agents, Humectants, Liquid Coolants, Solvents, Resin Intermediates. (Glycols bulletin #F-41515A, pp. 9,68 only; unpublished study received Sep 13, 1972 under 1016-4; CDL: 022140-A)

000001126 Union Carbide Corporation (1972) Wash-Off Tests on "6-12 Plus" Stick. (Unpublished study received Oct 19, 1972 under 3282-49; CDL:222043-A)

005000110 Utzinger, G.E. (1951) Insect repellents. Angewandte Chemie. 63:430-434.

000001098 WARF Institute, Incorporated (1974) Oral LD 50 (Male and Female), Skin [and] Eye Irritation [of] 4071D9-5: WARF No. 4044150. (Unpublished study that includes formulation, received Aug 7, 1974 under 4822-138; submitted by S.C. Johnson & Son, Inc., Racine, Wis.; CDL:140048-A)

000001099 WARF Institute, Incorporated (1974) Spray in Eye Irritation [of] 4071 D9-3: WARF No. 4044151. (Unpublished study received Aug 7, 1974 under 4822-138; submitted by S.C. Johnson & Son, Inc., Racine, Wis.; CDL:140048-B)

005004301 Wassell, H.E., inventor; Union Carbide Corporation, assignee (1958) Insect repellent sticks. U.S. patent 2,819,995. Jan 14. 2 p. Cl. 167-42.

005008509 Waterhouse, D.F. (1947) Insectary tests of repellents for the Australian sheep blowfly Lucilia cuprina. Pages 19-29, In Australia Council on Scientific and Industrial Research Bulletin No. 218.

005002400 Waterhouse, D.F. (1947) Studies of the Physiology and Toxicology of Blowflies. Melbourne, Australia: Council for Scientific and Industrial Research. (Commonwealth of Australia, Council for Scientific and Industrial Research bulletin no. 218)

005000120 Waterhouse, D.F.; Norris, K.R. (1966) Bushfly repellents (letter). Australian Journal of Science 28(9):351.

000004878 Weil, C.S., ed. (1969) Continuing Guarantees of Some Food, Drug, Cosmetic or Agricultural Product Chemicals: Special Report 32-116. (Unpublished study received Mar 23, 1973 under 1016-4; prepared by Carnegie-Mellon Univ., Mellon Institute, submitted by Union Carbide Corp., Agricultural Products, Washington, D.C.; CDL:100971-B)

GS0020021 Whitehead, W.G. (1972) Letter sent to H.L. Haynes dated Oct 18, 1972. [Concerns the attached wash-off tests for "6-12 PLUS" stick.] (Unpublished study received Oct 19, 1972 under 5769-53; submitted by ?; CDL:024240)

005004300 Wilkes, B.G., inventor; Carbide and Carbon Chemicals Corporation, assignee (1946) Insect repellents. U.S. patent 2,407,205. Sep 3. 5 p. Cl. 167-22.

000021735 Wisconsin Alumni Research Foundation (19??) Method: [2-Ethyl-1,3-hexane-diol]. (Unpublished study received Apr 23, 1968 under 5769-26; submitted by Union Carbide Corp., Tarrytown, N.Y.; CDL: 028100-B)

000004893 Wisconsin Alumni Research Foundation (1959) Bioassay Report: Personal Repellent Tests with Samples 612 and Formula D, against Yellow Fever Mosquito and Stable Fly: WARF No. 902067-8. (Unpublished study received June 10, 1959 under 1021-566; submitted by McLaughlin Gormley King Co., Minneapolis, Minn.; CDL: 005220-A)

000001047 Wisconsin Alumni Research Foundation (1964) [Efficacy of Insect Repellent E13-9A and Off (Pressurized) Against the Yellow Fever Mosquito, Aedes Aegypti]: Bioassay Report: WARF No. 4110412M. (Unpublished study received Feb 7, 1966 under 1021-737; submitted by McLaughlin Gormley King Co., Minneapolis, Minn.; CDL:005239-B)

005011438 Wood, P.W. (1968) The effect of ambient humidity on the repellency of ethylhexanediol ("6-12") to Aedes aegypti. Canadian Entomologist 100(12):1331-1334.

005004318 Wright, R.H. (1956) Physical basis of insect repellency. Nature 178:638.

005000126 Wright, R.H. (1962) Studies in mosquito attraction and repulsion. V. Physical theory. Canadian Entomologist 94(10):1022-1029.

005002322 Wright, R.H. (1962) The attraction and repulsion of mosquitoes. World Review of Pest Control 1(4):20-30.

005000227 Wright, R.H.; Kellogg, F.E. (1962) Mosquito attraction and repulsion. Nature (London) 195(4839):405-406.

005006767 Yates, W.W.; Lindquist, A.W.; Mote, D.C. (1951) Suggestions for Mosquito Control in Oregon. Corvallis, Ore.: Oregon Agricultural Experiment Station. (Oregon Agricultural Experiment Station bulletin no. 507)

005000268 Yeoman, G.H.; Warren, B.C. (1970) Repellents for Stomoxys laboratory assessment of butyl methylcinchoninate. Bulletin of Entomological Research 59(4):563-577.

GS0020022 Zofchak, A. (1963) Letter sent to U. Oakdale dated Aug 9, 1963. [Concerns the toxicity of ethyl hexanediol.] (Unpublished study received Sep 16, 1963 under 336-10; submitted by Union Carbide Chemicals Company; CDL:101072)

OFFICE OF PESTICIDE PROGRAMS
Standard Reference Material

GS0020024 Bontoyan, W., ed. (1976) Manual of Chemical Methods for Pesticides and Devices. U.S. Environmental Protection Agency, Office of Pesticide Programs, Technical Services Division, Chemical and Biological Investigations Branch. (Available from Association of Official Analytical Chemists, Arlington, VA)

005000301 Cutting, W.C. (1967) Insecticides, repellents and rodenticides. Pages 132-140d, In Handbook of Pharmacology, 3rd Edition. New York: Appleton-Century-Crofts.

005005417 Davidson, L.M.; Peairs, R.H. (1966) Applied insect control: Chemical. Pages 72-100, In Insect Pests of Farm, Garden and Orchard. 6th ed. New York: John Wiley.

005007048 Fairchild, E.J., ed. (1977) Agricultural Chemicals and Pesticides: A Subfile of the NIOSH Registry of Toxic Effects of Chemical Substances. Cincinnati, Ohio: National Institute for Occupational Safety and Health. (Pagination includes 46 pages numbered i-xlvi; available from: NTIS, Springfield, VA: PB-274 748)

005010941 Martin, H.; Miles, J.R.W. (1953) Guide to the Chemicals Used in Crop Protection. 2nd ed. Ottawa, Ontario, Canada: Canada Department of Agriculture.

*U.S. GOVERNMENT PRINTING OFFICE: 1981 341-082/242 1-3