

CODING FORMS FOR SRC INDEXING

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| Contractor | | | |
| Document Title | INITIAL SUBMISSION: LETTER FROM ETHYL CORP TO USEPA REGARDING COMMENTS AND DATA ON TERTIARY AMINES WITH ATTACHMENTS, DATED 11/01/89 | | |
| Chemical Category | TERTIARY AMINES | | |

CODING FORM FOR GLOBAL INDEXING

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ETHYL CORPORATION
Health and Environment Department



NYI-94-001108
INIT 97/26/94

Toxicology and
Regulatory Affairs

Ethyl Tower
451 Florida Street
Baton Rouge, LA 70801

74I-0794-001108

November 1, 1989



84948000151

ITC (TS-792)
Office of Toxic Substances
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Attention: Mr. John Walker

Contains No CBI

Dear Mr. Walker:

This is to confirm our 10/21/89 phone conversation that permission has been granted to the Agency to place the following Ethyl submissions in the Public Docket:

- 1) Saytex Flame Retardant Product List
- 2) Final report on dermal LD₅₀, inhalation LC₅₀ on HBCD
- 3) Dermal irritation, corrosion, eye irritation and oral LD₅₀ on HBCD

As we discussed, other than those specifically listed above, Ethyl wishes to reassert the confidentiality claim on all remaining documents included in the May 1988 submissions to the ITC.

If you have any questions, please call me.

Sincerely,

Louise L. Wen
Louise L. Wen, Ph.D.
Regulatory Associate

LLW:ab
memos/p3
cc: T. S. Allen
F. Orlandi
R. L. Smith

94 JUL 26 PM 3:30

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ETHYL CORPORATION
Health and Environment Department
ETHYL TOWER, 451 FLORIDA
BATON ROUGE, LOUISIANA 70801

May 23, 1988

RECEIVED
MAY 24 4 1988
RHB

Mr. Robert Brink
Executive Secretary
TSCA Interagency Testing
Committee (TS-792)
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, DC 20460

Dear Mr. Brink:

Ethyl Corporation is submitting the enclosed information in response to ITC's request for comments and data on tertiary amines.

Ethyl is a manufacturer of 1-dodecanamine, N,N-dimethyl (112-18-5), 1-hexadecanamine, N,N-dimethyl (112-69-6), 1-tetradecanamine, N,N-dimethyl (112-75-4) and 1-octadecanamine, N,N-dimethyl (124-28-7). For your information we have enclosed the following technical and acute toxicity data:

1. Product literature entitled "Fatty Tertiary Amines" (Ethyl Corporation Chemicals Group).
2. Material Safety Data Sheets for each of the above chemicals.
3. Toxicity Data on:

N,N-dimethyl-1-dodecanamine: Rabbit dermal LD₅₀ (6/7/79)
Rat oral toxicity (5/3/79)
DOT skin corrosivity (4/13/79)
Eye irritation (3/30/79)

N,N-dimethyl-1-tetradecanamine: Rabbit dermal LD₅₀ (6/13/79)
Rat oral toxicity (5/3/79)
DOT skin corrosivity (4/13/79)
Eye irritation (3/30/79)

N,N-dimethyl-1-hexadecanamine: Rabbit dermal toxicity (4/23/81)
Rat oral toxicity (5/30/79)
DOT skin corrosivity (2/8/80)
Eye irritation (3/30/79)

Mr. Robert Brink
Page 2
May 23, 1988

N,N-dimethyl-1-octadecanamine:

Rabbit dermal LD50 (2/13/80)
Rat oral toxicity (4/14/80)
DOT skin corrosivity (1/30/80)
Eye irritation (2/8/80)

In addition, under separate cover as attachment, Ethyl is submitting proprietary information which we are requesting the ITC to hold as "TSCA Confidential Business Information".

If you have any questions, please call me at (504) 388-7650.

Sincerely,



Louise I. Wen
Regulatory Affairs Associate

LLW:imc:ab
2555r



MATERIAL SAFETY DATA SHEET

Emergency Phone 504-344-7147

97.5.1

PRODUCT IDENTIFICATION

TRADE NAME: ADMA® 12 Amine
CHEMICAL NAME: Dodecyldimethylamine
CHEMICAL FAMILY: Tertiary amine
CHEMICAL FORMULA: CH₃(CH₂)₁₁N(CH₃)₂
CAS NO.: 112-18-5

THIS MATERIAL IS IN COMPLIANCE WITH THE TOXIC SUBSTANCES CONTROL ACT (15 USC 2601 - 2629).

SUMMARY OF HAZARDS

Causes burns to the eyes.
May cause delayed skin burns.

| | <u>COMPONENT NAME</u> | <u>CAS NO.</u> | <u>EXPOSURE LIMIT</u> |
|-----------------------------|------------------------------|----------------|----------------------------------|
| HAZARDOUS COMPONENTS | Tertiary amine ^{NL} | 112-18-5 | Not established by OSHA or ACGIH |

Carcinogenicity listing of the above indicated by:
@ = NTP; ‡ = IARC; & = OSHA; * = Other, NL = not Listed.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR: Clear liquid/fatty amine odor.
BOILING POINT: 271°C/519°F.
VAPOR DENSITY: ~ 7.4 (air = 1).
VAPOR PRESSURE: 0.005 mm Hg (@ 25°C/77°F).
SOLUBILITY IN WATER: Slight.
SPECIFIC GRAVITY: 0.79 (@ 25°C/25°C).
EVAPORATION RATE: Less than 1 (butyl acetate = 1).

Ethyl Corporation - Chemicals Group

01/29/88

Ethyl Tower 451 Florida Blvd., Baton Rouge, LA 70801
REPRESENTING ETHYL FOREIGN SALES CORPORATION FOR EXPORT SALES

TRADE NAME: ADMA® 12 Amine

**FIRE
AND
EXPLOSION
HAZARDS**

FLASH POINT (METHOD): 116°C/240°F (PMCC).

FLAMMABLE LIMITS: Not established.

EXTINGUISHING MEDIA: Dry chemical, water spray (fog), foam or carbon dioxide.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS: Include oxides of carbon and nitrogen.

SPECIAL FIRE FIGHTING PROCEDURES: Avoid breathing smoke or vapors.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

**REACTIVITY
DATA**

STABILITY: Stable.

CONDITIONS TO AVOID: None known.

MATERIALS TO AVOID: Copper and copper containing alloys.

HAZARDOUS POLYMERIZATION: Will not occur.

**HEALTH
HAZARDS**

EYE CONTACT: Expected to cause burns.

SKIN IRRITATION: Expected to produce initial mild to severe irritation. Prolonged skin contact may cause a severe effect, progressing to a delayed burn.

CHRONIC EFFECTS OF OVEREXPOSURE: None known.

TOXICITY DATA: Oral LD₅₀ = 800 mg/kg
Dermal LD₅₀ = ~ 5000 mg/kg

TRADE NAME: ADMA® 12 Amine

**EMERGENCY
FIRST
AID
PROCEDURES**

INHALATION: If inhaled, remove to fresh air.

EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. Get medical attention.

SKIN CONTACT: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Contaminated clothing cannot be washed clean and should not be reused for any purpose.

INGESTION: Do not induce vomiting. Give large quantities of water. Get medical attention immediately. Never give anything by mouth to an unconscious person.

**EXPOSURE
CONTROL
INFORMATION**

EXPOSURE LIMITS: Not established by OSHA or ACGIH.

EYE PROTECTION: Chemical goggles.

PROTECTIVE GLOVES: Resistant to chemical penetration.

RESPIRATORY PROTECTION: NIOSH approved full face-piece organic vapor, methyl amine or supplied air respirator in irritating atmospheres.

MECHANICAL VENTILATION: Recommended.

LOCAL VENTILATION: At source of vapors from heated material.

01/29/88
Continued

TRADE NAME: ADMA® 12 Amine

OTHER: If skin contact or contamination of clothing is likely, protective clothing should be worn.

SPILLS OR LEAKS: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Take up small spills with dry chemical absorbent. Large spills may be taken up with pump or vacuum and finished off with dry chemical absorbent. May require excavation of contaminated soil.

ENVIRONMENTAL PROTECTION

DISPOSAL METHODS:

Under the CERCLA/RCRA regulations in effect December 29, 1986, this product is not regulated as a hazardous waste or material. Therefore, it may be disposed of as an industrial waste in a manner acceptable to good waste management practice and in compliance with applicable local, state, and federal regulations.

STORAGE REQUIREMENT:

Store in steel or glass lined storage vessels.

REVISED: 01/29/88

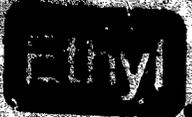
SUPERSEDES: 05/01/87

MSDS prepared by: Health & Environment Department
Ethyl Corporation

FOR ADDITIONAL NONEMERGENCY MSDS INFORMATION, CONTACT:

**HEALTH AND ENVIRONMENT DEPARTMENT
ETHYL CORPORATION
451 FLORIDA ST.
BATON ROUGE, LA 70801
(504) 388-7717**

THIS MATERIAL SAFETY DATA SHEET CONTAINS AT LEAST THE INFORMATION REQUIRED BY THE FEDERAL OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200(g)(2).



EXPLANATION OF MATERIAL SAFETY DATA SHEET TERMINOLOGY

PRODUCT IDENTIFICATION

TRADE NAME AND SYNONYMS
The name under which the product is sold and various synonyms.

CHEMICAL NAME AND FORMULA
Chemical descriptive name and the chemical formula.

CAS NO.
Chemical Abstract Service registry number which identifies the product.

SUMMARY OF HAZARDS

Emphasizes major hazard(s) associated with the product. Further details are provided in subsequent sections.

COMPONENTS

COMPONENT NAME
Chemical, generic, or proprietary name that identifies the product or components of a mixture. Inclusion of a CAS No. is not necessarily based on hazard criteria.

EXPOSURE LIMIT
The airborne concentration at which most workers can be exposed without any expected adverse effects. Source may be NIOSH guideline, ACGIH TLV® (Threshold Limit Value), or OSHA PEL (Permissible Exposure Limit).

TYPES OF EXPOSURE LIMITS
TLV - the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

STL (Short-Term Exposure Limit) - a 15 minute time-weighted average exposure which should not be exceeded at any time during a workday even if the 8-hour time-weighted average is within the TLV.

CELILING - the concentration that should not be exceeded during any part of the working exposure.

PEL - The maximum concentration and duration of exposure allowable above the ceiling concentration for an 8-hour shift.

ACGIH - American Conference of Governmental Industrial Hygienists.

OSHA - Occupational Safety and Health Administration.

NIOSH - National Institute of Occupational Safety and Health.

CARCINOGENICITY LISTING

Indicates whether a component is thought to be a cancer hazard based on human experience and animal data.

NIH - National Toxicology Program.

IARC - International Agency for Research on Cancer.

OSHA - May include preliminary data or studies not yet evaluated by the major agencies. Also includes ACGIH and NIOSH listings.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR

Description of material at normal temperature and pressure that may be useful in identifying the presence of the product.

BOILING POINT

The temperature at which the vapor pressure of the liquid is equal to the pressure of the atmosphere.

MELTING POINT (FREEZING POINT)

Temperature at which a substance changes from the solid to liquid state.

VAPOR PRESSURE

The pressure exerted at any temperature by a vapor existing in equilibrium with its liquid or solid phase.

SOLUBILITY IN WATER

The amount of the product, by weight, that will dissolve in a given weight of water at a specified temperature.

| Approximate | GRAMS/100 H ₂ O |
|-------------|----------------------------|
| Slight | < 0.1 |
| Moderate | 0.1 - 1.0 |
| Appreciable | 1 - 10 |
| Complete | > 10 |

Soluble in all proportions

SPECIFIC GRAVITY

Ratio of the weight of a volume of the product to the weight of an equal volume of water (liquids/solids) or air (gases).

EVAPORATION RATE

Ratio of the rate of vaporization of the product to the rate of a known material.

PERCENT VOLATILES

The percentage of the product (liquid or solid) that will evaporate at ambient temperature.

POUR POINT

The lowest temperature at which a liquid will flow when the container is inverted.

VISCOSITY

A measure of flow characteristics of a liquid, expressed in units called Centistokes (cSt).

FINE AND EXPLOSION HAZARDS

FLASH POINT (CLOSED CUP METHOD)

Lowest temperature at which the product will give off enough vapor to ignite.

FLAMMABLE LIMITS

Range of vapor concentration (percent by volume in air) which will burn or explode in the presence of spark of flame. LEL is the lower explosive limit and UEL is the upper explosive limit.

EXTINGUISHING MEDIA

The fire fighting agents which are recommended for use.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS

From hazardous products resulting from heating or burning the compound.

SPECIAL FIREFIGHTING PROCEDURES

General firefighting procedures of chemical fires are not described, but special procedures are given, if required.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hazards not covered by other sections of the MSDS pertaining to chemical reactions in the presence of heat and/or fire.

REACTIVITY DATA

STABILITY

Indicates the susceptibility of the product to dangerous decomposition.

CONDITIONS AND MATERIALS TO AVOID

Given the conditions and materials that may cause undesirable reactions or instability of the product.

HAZARDOUS DECOMPOSITION PRODUCTS

Describes the hazardous materials produced from a chemical reaction.

HAZARDOUS POLYMERIZATION

Indicates the tendency of the product's molecules to combine in a violent reaction.

HEALTH HAZARDS

Given the immediate effects of over-exposure to the product by skin or eye contact, breathing vapors or dust, and ingestion. Common symptoms which may occur from exposure to the product are given.

CHRONIC EFFECTS

Refers to the effects that may occur after repeated or prolonged over-exposure to the product.

OTHER HEALTH EFFECTS

Includes medical conditions which may be aggravated by exposure to the product.

TOXICITY

Gives numerical results from animal tests on the product. LD₅₀ or LC₅₀ is the dose level that kills half of the animals tested.

EMERGENCY FIRST AID

Gives emergency and first aid instructions for treating overexposure by inhalation, ingestion, and skin and eye contact.

NOTE TO PHYSICIAN

Do not give any contraindicated treatment or recommended treatment for a licensed health care professional to conduct.

EXPOSURE CONTROL INFORMATION**EYE PROTECTION**

Specification of eyes or face protection beyond normal use of safety glasses.

PROTECTIVE GLOVES

Indicates the need for protective gloves when skin contact may occur.

RESPIRATORY PROTECTION

Specification of the type of respirator recommended for use during routine or emergency situations.

VENTILATION

Specification of the type (local/general) of ventilation recommended to capture contaminants or prevent the build-up of hazardous atmospheres.

OTHER

Specification of other recommended personal protective equipment based on type and degree of hazard.

ENVIRONMENTAL PROTECTION**SPILLS AND LEAKS**

Indicates special precautions for clean-up of spills and leaks and preparation of chemical for disposal.

DISPOSAL METHOD

Tells the EPA classification of the product as well as the proper disposal procedure.

EPA

Environmental Protection Agency

RQ

Reportable Quantity - The amount of the product or one of its components that, when spilled, must be reported to the EPA and possibly other regulatory agencies.

RCRA - Resource Conservation and Recovery Act.

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act.

STORAGE REQUIREMENTS

Any unusual requirements or precautions for storage of the product.

ADDITIONAL PRECAUTIONS OR COMMENTS

State or re-emphasizes any special precautions or handling requirements.

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Ethyl Corporation makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its safety and suitability for their purposes prior to use. In no event will Ethyl Corporation be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. **NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE, ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH THE INFORMATION REFERS.**

MATERIAL SAFETY DATA SHEET

Emergency Phone 504-344-7147

97.5.3

| | | |
|-------------------------------|--------------------------|--|
| PRODUCT IDENTIFICATION | TRADE NAME: | ADMA® 16 Amine |
| | CHEMICAL NAME: | Hexadecyldimethylamine |
| | CHEMICAL FAMILY: | Tertiary amine |
| | CHEMICAL FORMULA: | $\text{CH}_3(\text{CH}_2)_{15}\text{N}(\text{CH}_3)_2$ |
| | CAS NO.: | 112-69-6 |

THIS MATERIAL IS IN COMPLIANCE WITH THE TOXIC SUBSTANCES CONTROL ACT (15 USC 2601 - 2629).

SUMMARY OF HAZARDS

Causes burns to eyes.
May cause delayed skin burns.

| | <u>COMPONENT NAME</u> | <u>CAS NO.</u> | <u>EXPOSURE LIMIT</u> |
|-----------------------------|---------------------------------------|----------------|-------------------------------|
| HAZARDOUS COMPONENTS | Hexadecyldimethyl-amine ^{NL} | 112-69-6 | Not established by OSHA/ACGIH |

Carcinogenicity listing of the above indicated by:
@ = NTP; ‡ = IARC; † = OSHA; * = Other, NL = Not Listed.

| | | |
|---|-----------------------------|--------------------------------|
| CHEMICAL AND PHYSICAL PROPERTIES | APPEARANCE/ODOR: | Clear liquid/fatty amine odor. |
| | BOILING POINT: | 331°C/627°F. |
| | VAPOR DENSITY: | ~ 9.3 (air = 1) |
| | VAPOR PRESSURE: | 0.00008 mm Hg (@ 25°C/77°F). |
| | SOLUBILITY IN WATER: | Slight. |
| | SPECIFIC GRAVITY: | 0.797. |

01/29/88

Ethyl Corporation - Chemicals Group

Ethyl Tower 451 Florida Blvd., Baton Rouge, LA 70801
REPRESENTING ETHYL FOREIGN SALES CORPORATION FOR EXPORT SALES

TRADE NAME: ADMA[®] 16 Amine

**FIRE
AND
EXPLOSION
HAZARDS**

FLASH POINT (METHOD): 146°C/295°F (PMCC).

FLAMMABLE LIMITS: Not established.

EXTINGUISHING MEDIA: Dry chemical, water spray (fog), foam or carbon dioxide.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS:
Include oxides of carbon and nitrogen.

SPECIAL FIRE FIGHTING PROCEDURES:
Avoid breathing smoke and vapors.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
None known.

**REACTIVITY
DATA**

STABILITY: Stable.

CONDITIONS TO AVOID: None known.

MATERIALS TO AVOID: Copper and copper alloys.

HAZARDOUS POLYMERIZATION:
Will not occur.

**HEALTH
HAZARDS**

EYE CONTACT: Expected to cause burns.

SKIN IRRITATION: Initial moderate skin irritation. Prolonged skin contact may cause a severe effect, progressing to a delayed burn within 48 hours. Transient contact may produce dermatitis, possibly delayed.

CHRONIC EFFECTS OF OVEREXPOSURE:
None known.

01/29/88

SYNTH NAME: ADMA 16 Amine

**EMERGENCY
FIRST
AID
PROCEDURES**

INHALATION: If inhaled, remove to fresh air.

EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. Get medical attention.

SKIN CONTACT: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Contaminated clothing can not be washed clean and should not be reused for any purpose.

INGESTION: Do not induce vomiting. Give large quantities of water. Get medical attention immediately. Never give anything by mouth to an unconscious person.

**EXPOSURE
CONTROL
INFORMATION**

EXPOSURE LIMITS: Not established by OSHA/ACGIH.

EYE PROTECTION: Chemical goggles.

PROTECTIVE GLOVES: Resistant to chemical penetration.

RESPIRATORY PROTECTION: NIOSH approved organic vapor respirator when exposed to vapors from heated material.

MECHANICAL VENTILATION: Recommended.

LOCAL EXHAUST: At source of heated vapors.

OTHER: If skin contact or contamination of clothing is likely, protective clothing should be worn.

TRADE NAME: ADMA® 16 Amine

**ENVIRONMENTAL
PROTECTION:**

***PILLS OR LEAKS:**

Remove sources of ignition. Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Take up small spills with dry chemical absorbent. Large spills may be taken up with pump or vacuum and finished off with dry chemical absorbent. May require excavation of contaminated soil.

DISPOSAL METHODS:

Under the CERCLA/RCRA regulations in effect December 29, 1986, this product is not regulated as a hazardous waste or material. Therefore, it may be disposed of as an industrial waste in a manner acceptable to good waste management practice and in compliance with applicable local, state, and federal regulations.

STORAGE REQUIREMENT.

Store in steel or glass-lined vessels. Avoid contact with copper and copper alloys.

REVISED: 01/29/88

SUPERSEDES: 05/01/87

MSDS prepared by: Health and Environment Department
Krytox Corporation

FOR ADDITIONAL NONEMERGENCY MSDS INFORMATION, CONTACT:

HEALTH AND ENVIRONMENT DEPARTMENT
KRYTOX CORPORATION
451 FLORIDA ST.
BATON ROUGE, LA 70801
(504) 338-7717

**THIS MATERIAL SAFETY DATA SHEET CONTAINS AT LEAST
THE INFORMATION REQUIRED BY THE FEDERAL OSHA HAZARD
COMMUNICATION RULE, 29 CFR 1910.1200(g)(2).**



EXPLANATION OF MATERIAL SAFETY DATA SHEET TERMINOLOGY

PRODUCT IDENTIFICATION

TRADE NAME AND SYNONYMS

The name under which the product is sold and common synonyms.

CHEMICAL NAME AND FORMULA

Chemical descriptive name and the chemical formula.

CAS NO.

Chemical Abstract Service registry number which identifies the product.

SUMMARY OF HAZARDS

Emphasizes major hazard(s) associated with the product. Further details are provided in subsequent sections.

COMPONENTS

COMPONENT NAME

Chemical, generic, or proprietary name that identifies the product or components of a mixture. Inclusion of a component is not necessarily based on hazard criteria.

EXPOSURE LIMIT

The airborne concentration at which most workers can be exposed without any expected adverse effects. Source may be Ethyl guideline, ACGIH TLV® (Threshold Limit Value), or OSHA PEL (Permissible Exposure Limit).

TYPES OF EXPOSURE LIMITS

TLV_T - the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

STEL (Short-Term Exposure Limit) - a 15 minute time-weighted average exposure which should not be exceeded at any time during a workday even if the 8-hour time-weighted average is within the TLV.

CEILING - the concentration that should not be exceeded during any part of the working exposure.

Peak - The maximum concentration and duration of exposure allowable above the ceiling concentration for an 8-hour shift.

ACGIH - American Conference of Governmental Industrial Hygienists.

OSHA - Occupational Safety and Health Administration.

NIOSH - National Institute of Occupational Safety and Health.

CARCINOGENICITY LISTING

Indicates whether a component is thought to be a cancer hazard based on human experience and animal data.

NTP - National Toxicology Program.

IARC - International Agency for Research on Cancer.

Other - May include preliminary data or studies not yet evaluated by the major agencies. Also includes ACGIH and NIOSH listings.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR

Description of material at normal temperature and pressure that may be useful in identifying the presence of the product.

BOILING POINT

The temperature at which the vapor pressure of the liquid is equal to the pressure of the atmosphere.

MELTING POINT (FREEZING POINT)

Temperature at which a substance changes from the solid to liquid state.

VAPOR PRESSURE

The pressure exerted at any temperature by a vapor existing in equilibrium with its liquid or solid phase.

SOLUBILITY IN WATER

The amount of the product, by weight, that will dissolve in a given weight of water at a specified temperature.

Negligible
Slight
Moderate
Appreciable
Complete

grams/100 H₂O
< 0.1
0.1 - 1.0
1 - 10
> 10
Soluble in all proportions

SPECIFIC GRAVITY

Ratio of the weight of a volume of the product to the weight of an equal volume of water (liquids/solids) or air (gases).

EVAPORATION RATE

Ratio of the rate of vaporization of the product to the rate of a known material.

PERCENT VOLATILES

The percentage of the product (liquid or solid) that will evaporate at ambient temperature.

POUR POINT

The lowest temperature at which a liquid will flow when the container is inverted.

VISCOSITY

A measure of flow characteristics of a liquid, expressed in units called Centistokes (cSt).

FIRE AND EXPLOSION HAZARDS

FLASH POINT (CLOSED CUP METHOD)

Lowest temperature at which the product will give off enough vapor to ignite.

FLAMMABLE LIMITS

Range of vapor concentration (percent by volume in air) which will burn or explode in the presence of spark of flame. LEL is the lower explosive limit and UEL is the upper explosive limit.

EXTINGUISHING MEDIA

The fire fighting agents which are recommended for use.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS

Known hazardous products resulting from heating or burning the compound.

SPECIAL FIREFIGHTING PROCEDURES

General firefighting procedures of chemical fires are not described, but special procedures are given, if required.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hazards not covered by other sections of the MSDS pertaining to chemical reactions in the presence of heat and/or fire.

REACTIVITY DATA

STABILITY

Indicates the susceptibility of the product to dangerous decomposition.

CONDITIONS AND MATERIALS TO AVOID

Gives the conditions and materials that may cause undesirable reactions or instability of the product.

HAZARDOUS DECOMPOSITION PRODUCTS

Describes the hazardous materials produced from a chemical reaction.

HAZARDOUS POLYMERIZATION

Indicates the tendency of the product's molecules to combine in a violent reaction.

HEALTH HAZARDS

Gives the immediate effects of over-exposure to the product by skin or eye contact, breathing vapors or dust, and ingestion. Common symptoms which may occur from exposure to the product are given.

CHRONIC EFFECTS

Refers to the effects that may occur after repeated or prolonged over-exposure to the product.

OTHER HEALTH EFFECTS

Includes medical conditions which may be aggravated by exposure to the product.

TOXICITY

Gives numerical results from animal tests on the product. LD₅₀ or LC₅₀ is the dose level that kills half of the animals tested.

EMERGENCY FIRST AID

Gives emergency and first aid instructions for treating overexposure by inhalation, ingestion, and skin and eye contact.

NOTE TO PHYSICIAN

May give any contraindicated treatment or recommended treatment for a licensed health care professional to conduct.

EXPOSURE CONTROL INFORMATION**EYE PROTECTION**

Specification of eyes or face protection beyond normal use of safety glasses.

PROTECTIVE GLOVES

Indicates the need for protective gloves when skin contact may occur.

RESPIRATORY PROTECTION

Specification of the type of respirator recommended for use during routine or emergency situations.

VENTILATION

Specification of the type (local/general) of ventilation recommended to capture contaminants or prevent the build-up of hazardous atmospheres.

OTHER

Specification of other recommended personal protective equipment based on type and degree of hazard.

ENVIRONMENTAL PROTECTION**SPILLS AND LEAKS**

Indicates special precautions for clean-up of spills and leaks and preparation of chemical for disposal.

DISPOSAL METHOD

Tells the EPA classification of the product as well as the proper disposal procedure.

EPA

Environmental Protection Agency

RQ

Reportable Quantity - The amount of the product or one of its components that, when spilled, must be reported to the EPA and possibly other regulatory agencies.

RCRA - Resource Conservation and Recovery Act.

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act.

STORAGE REQUIREMENTS

Any unusual requirements or precautions for storage of the product.

ADDITIONAL PRECAUTIONS OR COMMENTS

States or re-emphasizes any special precautions or handling requirements.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Ethyl Corporation makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its safety and suitability for their purposes prior to use. In no event will Ethyl Corporation be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE, ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

MATERIAL SAFETY DATA SHEET

Emergency Phone 504-344-7147

97.5.2

PRODUCT IDENTIFICATION

TRADE NAME: ADMA[®] 14 Amine
CHEMICAL NAME: Tetradecyldimethylamine
CHEMICAL FAMILY: Tertiary amine
CHEMICAL FORMULA: CH₃(CH₂)₁₃N(CH₃)₂
CAS NO.: 112-75-4

THIS MATERIAL IS IN COMPLIANCE WITH THE TOXIC SUBSTANCES CONTROL ACT (15 USC 2601 - 2629).

SUMMARY OF HAZARDS

Causes burns to eyes.
 May cause delayed skin burns.

HAZARDOUS COMPONENTS

| <u>COMPONENT NAME</u> | <u>CAS NO.</u> | <u>EXPOSURE LIMIT</u> |
|---------------------------------------|----------------|-------------------------------|
| Tetradecyldimethylamine ^{NL} | 112-75-4 | Not established by OSHA/ACGIH |

Carcinogenicity listing of the above indicated by:
 † = NTP; ‡ = IARC; & = OSHA; * = Other; NL = Not Listed.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR: Clear liquid/fatty amine odor.
BOILING POINT: 302°C/576°F.
VAPOR DENSITY: 8.3 (air = 1)
VAPOR PRESSURE: 0.0006 mm Hg (@ 25°C/77°F).
SOLUBILITY IN WATER: Slight.
SPECIFIC GRAVITY: 0.795.

Ethyl Corporation - Chemicals Group

Ethyl Tower 451 Florida Blvd., Baton Rouge, LA 70801
 REPRESENTING ETHYL FOREIGN SALES CORPORATION FOR EXPORT SALES

TRADE NAME: ADMA® 14 Amine

| | | |
|---|--|--|
| FIRE AND EXPLOSION HAZARDS | FLASH POINT (METHOD): | 132°C/270°F (PMCC). |
| | FLAMMABLE LIMITS: | Not established. |
| | EXTINGUISHING MEDIA: | Dry chemical, water spray (fog), foam or carbon dioxide. |
| | HAZARDOUS THERMAL DECOMPOSITION PRODUCTS: | Include oxides of carbon and nitrogen. |
| | SPECIAL FIRE FIGHTING PROCEDURES: | Avoid breathing smoke and vapors. |
| | UNUSUAL FIRE AND EXPLOSION HAZARDS: | None known. |

| | | |
|----------------------------|----------------------------------|---------------------------|
| REACTIVITY DATA | STABILITY: | Stable. |
| | CONDITIONS TO AVOID: | None known. |
| | MATERIALS TO AVOID: | Copper and copper alloys. |
| | HAZARDOUS POLYMERIZATION: | Will not occur. |

| | | |
|---------------------------|---|--|
| HEALTH HAZARDS | EYE CONTACT: | Expected to cause burns. |
| | SKIN IRRITATION: | Initial moderate skin irritation. Prolonged skin contact may cause a severe effect, progressing to a delayed burn within 48 hours. Transient contact may produce dermatitis, possibly delayed. |
| | CHRONIC EFFECTS OF OVEREXPOSURE: | None known. |
| | TOXICITY DATA: | ORAL LD ₅₀ (rats): 0.7 g/kg DERMAL LD ₅₀ (rabbits): 4.4 g/kg |

01/29/88

TRADE NAME: ADMA® 14 Adhesive

**EMERGENCY
FIRST
AID
PROCEDURES**

INHALATION: If inhaled, remove to fresh air.

EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. Get medical attention promptly.

SKIN CONTACT: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Contaminated clothing can not be washed clean and should not be reused for any purpose.

INGESTION: Do not induce vomiting. Give large quantities of water. Get medical attention immediately. Never give anything by mouth to an unconscious person.

**EXPOSURE
CONTROL
INFORMATION**

EXPOSURE LIMITS: Not established by OSHA/ACGIH.

EYE PROTECTION: Chemical goggles.

PROTECTIVE GLOVES: Resistant to chemical penetration.

RESPIRATORY PROTECTION: NIOSH approved organic vapor respirator when exposed to vapors from heated material.

MECHANICAL VENTILATION: Recommended.

LOCAL EXHAUST: At source of heated vapors.

OTHER: If skin contact or contamination of clothing is likely, protective clothing should be worn.

TRADE NAME: ADMA® 14 Amine

SPILLS OR LEAKS:

Remove sources of ignition. Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Take up small spills with dry chemical absorbent. Large spills may be taken up with pump or vacuum and finished off with dry chemical absorbent. May require excavation of contaminated soil.

**ENVIRONMENTAL
PROTECTION****DISPOSAL METHODS:**

Under the CERCLA/RCRA regulations in effect December 29, 1986, this product is not regulated as a hazardous waste or material. Therefore, it may be disposed of as an industrial waste in a manner acceptable to good waste management practice and in compliance with applicable local, state, and federal regulations.

STORAGE REQUIREMENT:

Store in steel or glass-lined vessels. Avoid contact with copper and copper alloys.

REVISED: 01/29/86**SUPERSEDES:** 05/01/87

MSDS prepared by: Health and Environment Department
Ethyl Corporation

FOR ADDITIONAL NONEMERGENCY MSDS INFORMATION, CONTACT:
HEALTH AND ENVIRONMENT DEPARTMENT
ETHYL CORPORATION
451 FLORIDA ST.
BATON ROUGE, LA 70801
(504) 388-7717

**THIS MATERIAL SAFETY DATA SHEET CONTAINS AT LEAST
THE INFORMATION REQUIRED BY THE FEDERAL OSHA HAZARD
COMMUNICATION RULE, 29 CFR 1910.1200(g)(2).**

Ethyl

EXPLANATION OF MATERIAL SAFETY DATA SHEET TERMINOLOGY

PRODUCT IDENTIFICATION

TRADE NAME AND SYNONYMS

The name under which the product is sold and common synonyms.

CHEMICAL NAME AND FORMULA

Chemical descriptive name and the chemical formula.

CAS NO.

Chemical Abstract Service registry number which identifies the product.

SUMMARY OF HAZARDS

Summarizes major hazard(s) associated with the product. Further details are provided in subsequent sections.

COMPONENTS

COMPONENT NAME

Chemical, generic, or proprietary name that identifies the product or components of a mixture. Inclusion of a component is not necessarily based on hazard criteria.

EXPOSURE LIMIT

The airborne concentration at which most workers can be exposed without any expected adverse effects. Sources may be Ethyl guideline, ACGIH TLV® (Threshold Limit Value), or OSHA PEL (Permissible Exposure Limit).

TYPES OF EXPOSURE LIMITS

TWA - the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

STEL (Short-Term Exposure Limit) - a 15 minute time-weighted average exposure which should not be exceeded at any time during a workday even if the 8-hour time-weighted average is within the TLV.

Ceiling - the concentration that should not be exceeded during any part of the working exposure.

Peak - The maximum concentration and duration of exposure allowable above the ceiling concentration for an 8-hour shift.

ACGIH - American Conference of Governmental Industrial Hygienists.

OSHA - Occupational Safety and Health Administration.

NIOSH - National Institute of Occupational Safety and Health.

CARCINOGENICITY LISTING

Indicates whether a component is thought to be a cancer hazard based on human experience and animal data.

NTP - National Toxicology Program.

IARC - International Agency for Research on Cancer.

Other - May include preliminary data or studies not yet evaluated by the major agencies. Also includes ACGIH and NIOSH listings.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR

Description of material at normal temperature and pressure that may be useful in identifying the presence of the product.

BOILING POINT

The temperature at which the vapor pressure of the liquid is equal to the pressure of the atmosphere.

MELTING POINT (FREEZING POINT)

Temperature at which a substance changes from the solid to liquid state.

VAPOR PRESSURE

The pressure exerted at any temperature by a vapor existing in equilibrium with its liquid or solid phase.

SOLUBILITY IN WATER

The amount of the product, by weight, that will dissolve in a given weight of water at a specified temperature.

| | grams/100 H ₂ O |
|-------------|----------------------------|
| Negligible | < 0.1 |
| Slight | 0.1 - 1.0 |
| Moderate | 1 - 10 |
| Appreciable | > 10 |
| Complete | Soluble in all proportions |

SPECIFIC GRAVITY

Ratio of the weight of a volume of the product to the weight of an equal volume of water (liquids/solids) or air (gases).

EVAPORATION RATE

Ratio of the rate of vaporization of the product to the rate of a known material.

PERCENT VOLATILES

The percentage of the product (liquid or solid) that will evaporate at ambient temperature.

PCMR POINT

The lowest temperature at which a liquid will flow when the container is inverted.

VISCOSITY

A measure of flow characteristics of a liquid, expressed in units called Centistokes (cSt).

FIRE AND EXPLOSION HAZARDS

FLASH POINT (CLOSED CUP METHOD)

Lowest temperature at which the product will give off enough vapor to ignite.

FLAMMABLE LIMITS

Range of vapor concentration (percent by volume in air) which will burn or explode in the presence of spark of flame. LEL is the lower explosive limit and UEL is the upper explosive limit.

EXTINGUISHING MEDIA

The fire fighting agents which are recommended for use.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS

Known hazardous products resulting from heating or burning the compound.

SPECIAL FIREFIGHTING PROCEDURES

General firefighting procedures of chemical fires are not described, but special procedures are given, if required.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hazards not covered by other sections of the MSDS pertaining to chemical reactions in the presence of heat and/or fire.

REACTIVITY DATA

STABILITY

Indicates the susceptibility of the product to dangerous decomposition.

CONDITIONS AND MATERIALS TO AVOID

Gives the conditions and materials that may cause undesirable reactions or instability of the product.

HAZARDOUS DECOMPOSITION PRODUCTS

Describes the hazardous materials produced from a chemical reaction.

HAZARDOUS POLYMERIZATION

Indicates the tendency of the product's molecules to combine in a violent reaction.

HEALTH HAZARDS

Gives the immediate effects of over-exposure to the product by skin or eye contact, breathing vapors or dust, and ingestion. Common symptoms which may occur from exposure to the product are given.

CHRONIC EFFECTS

Refers to the effects that may occur after repeated or prolonged over-exposure to the product.

OTHER HEALTH EFFECTS

Includes medical conditions which may be aggravated by exposure to the product.

TOXICITY

Gives numerical results from animal tests on the product. LD₅₀ or LC₅₀ is the dose level that kills half of the animals tested.

EMERGENCY FIRST AID

Gives emergency and first aid instructions for treating overexposure by inhalation, ingestion, and skin and eye contact.

NOTE TO PHYSICIAN

May give any contraindicated treatment or recommended treatment for a licensed health care professional to conduct.

EXPOSURE CONTROL INFORMATION**EYE PROTECTION**

Specification of eyes or face protection beyond normal use of safety glasses.

PROTECTIVE GLOVES

Indicates the need for protective gloves when skin contact may occur.

RESPIRATORY PROTECTION

Specification of the type of respirator recommended for use during routine or emergency situations.

VENTILATION

Specification of the type (local/general) of ventilation recommended to capture contaminants or prevent the build-up of hazardous atmospheres.

OTHER

Specification of other recommended personal protective equipment based on type and degree of hazard.

ENVIRONMENTAL PROTECTION**SPILLS AND LEAKS**

Indicates special precautions for clean-up of spills and leaks and preparation of chemical for disposal.

DISPOSAL METHOD

Tells the EPA classification of the product as well as the proper disposal procedure.

EPA

Environmental Protection Agency

RQ

Reportable Quantity - The amount of the product or one of its components that, when spilled, must be reported to the EPA and possibly other regulatory agencies.

RCRA - Resource Conservation and Recovery Act.

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act.

STORAGE REQUIREMENTS

Any unusual requirements or precautions for storage of the product.

ADDITIONAL PRECAUTIONS OR COMMENTS

States or re-emphasizes any special precautions or handling requirements.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Ethyl Corporation makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its safety and suitability for their purposes prior to use. In no event will Ethyl Corporation be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE, ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

MATERIAL SAFETY DATA SHEET

Emergency Phone 504-344-7147

97.5.4

PRODUCT IDENTIFICATION

TRADE NAME: ADMA® 18 Amine
CHEMICAL NAME: Octadecyldimethylamine
CHEMICAL FAMILY: Tertiary amines
CHEMICAL FORMULA: CH₃(CH₂)₁₇N(CH₃)₂
CAS NO.: 124-28-7

THIS MATERIAL IS IN COMPLIANCE WITH THE TOXIC SUBSTANCES CONTROL ACT (15 USC 2601 - 2629).

SUMMARY OF HAZARDS

Causes burns to eyes.
 May cause delayed skin burns.

HAZARDOUS COMPONENTS

| <u>COMPONENT NAME</u> | <u>CAS NO.</u> | <u>EXPOSURE LIMIT</u> |
|---------------------------------------|----------------|-------------------------------|
| Octadecyldimethyl-amine ^{NL} | 124-28-7 | Not established by OSHA/ACGIH |

Carcinogenicity listing of the above indicated by:
 @ = NTP; ‡ = IARC; & = OSHA; * = Other; NL = Not Listed.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR: Clear liquid/fatty amine odor.
BOILING POINT: 347°C/656°F.
VAPOR PRESSURE: Less than 0.1 mm Hg (@ 25°C/77°F).
VAPOR DENSITY: 10.1 (air = 1).
SOLUBILITY IN WATER: Slight.
SPECIFIC GRAVITY: 0.805.

Ethyl Corporation - Chemicals Group

01/29/88

Ethyl Tower 451 Florida Blvd., Baton Rouge, LA 70801
 REPRESENTING ETHYL FOREIGN SALES CORPORATION FOR EXPORT SALES

TRADE NAME: ADMA® 18 Amine

**FIRE
AND
EXPLOSION
HAZARDS**

FLASH POINT (METHOD): 155°C/311°F (PMCC).

FLAMMABLE LIMITS: Not established.

EXTINGUISHING MEDIA: Dry chemical, water spray (fog), foam or carbon dioxide.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS:
Include oxides of carbon and nitrogen.

SPECIAL FIRE FIGHTING PROCEDURES:
Avoid breathing smoke and vapors.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
None known.

**REACTIVITY
DATA**

STABILITY: Stable.

CONDITIONS TO AVOID: None known.

MATERIALS TO AVOID: Copper and copper alloys.

HAZARDOUS POLYMERIZATION:
Will not occur.

**HEALTH
HAZARDS**

EYE CONTACT: Expected to cause burns.

SKIN IRRITATION: Initial moderate skin irritation. Prolonged skin contact may cause a severe effect, progressing to a delayed burn within 48 hours. Transient contact may produce dermatitis, possibly delayed.

CHRONIC EFFECTS OF OVEREXPOSURE:
None known.

TOXICITY DATA: ORAL LD₅₀ (rats): 1.23 g/kg.
DERMAL LD₅₀ (rabbits): 8 g/kg.

TRADE NAME: ADMA® 18 Amine**EMERGENCY
FIRST
AID
PROCEDURES**

INHALATION: If inhaled, remove to fresh air.

EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. Get medical attention.

SKIN CONTACT: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Contaminated clothing can not be washed clean and should not be reused for any purpose.

INGESTION: Do not induce vomiting. Give large quantities of water. Get medical attention immediately. Never give anything by mouth to an unconscious person.

**EXPOSURE
CONTROL
INFORMATION**

EXPOSURE LIMITS: Not established by OSHA or ACGIH.

EYE PROTECTION: Chemical goggles.

PROTECTIVE GLOVES: Resistant to chemical penetration.

RESPIRATORY PROTECTION: NIOSH approved organic vapor respirator when exposed to vapors from heated material.

MECHANICAL VENTILATION: Recommended.

OTHER: If skin contact or contamination of clothing is likely, protective clothing should be worn.

01/29/88

TRADE NAME: ADMA® 18 Amine

SPILLS OR LEAKS:

Remove sources of ignition. Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Take up small spills with dry chemical absorbent. Large spills may be taken up with pump or vacuum and finished off with dry chemical absorbent. May require excavation of contaminated soil.

**ENVIRONMENTAL
PROTECTION**

DISPOSAL METHODS:

Under the CERCLA/RCRA regulations in effect December 29, 1986, this product is not regulated as a hazardous waste or material. Therefore, it may be disposed of as an industrial waste in a manner acceptable to good waste management practice and in compliance with applicable local, state, and federal regulations.

STORAGE REQUIREMENT:

Store in steel or glass-lined vessels. Avoid contact with copper and copper alloys.

REVISED: 01/29/88

SUPERSEDES: 05/01/87

**MSDS prepared by: Health & Environment Department
Ethyl Corporation**

FOR ADDITIONAL NONEMERGENCY MSDS INFORMATION, CONTACT:

**HEALTH AND ENVIRONMENT DEPARTMENT
ETHYL CORPORATION
451 FLORIDA ST.
BATON ROUGE, LA 70801
(504) 388-7717**

**THIS MATERIAL SAFETY DATA SHEET CONTAINS AT LEAST
THE INFORMATION REQUIRED BY THE FEDERAL OSHA HAZARD
COMMUNICATION RULE, 29 CFR 1910.1200(g)(2).**

CHRONIC EFFECTS

Refers to the effects that may occur after repeated or prolonged over-exposure to the product.

OTHER HEALTH EFFECTS

Includes medical conditions which may be aggravated by exposure to the product.

TOXICITY

Gives numerical results from animal tests on the product. LD₅₀ or LC₅₀ is the dose level that kills half of the animals tested.

EMERGENCY FIRST AID

Gives emergency and first aid instructions for treating overexposure by inhalation, ingestion, and skin and eye contact.

NOTE TO PHYSICIAN

May give any contraindicated treatment or recommended treatment for a licensed health care professional to conduct.

EXPOSURE CONTROL INFORMATION**EYE PROTECTION**

Specification of eyes or face protection beyond normal use of safety glasses.

PROTECTIVE GLOVES

Indicates the need for protective gloves when skin contact may occur.

RESPIRATORY PROTECTION

Specification of the type of respirator recommended for use during routine or emergency situations.

VENTILATION

Specification of the type (local/general) of ventilation recommended to capture contaminants or prevent the build-up of hazardous atmospheres.

OTHER

Specification of other recommended personal protective equipment based on type and degree of hazard.

ENVIRONMENTAL PROTECTION**SPILLS AND LEAKS**

Indicates special precautions for clean-up of spills and leaks and preparation of chemical for disposal.

DISPOSAL METHOD

Tells the EPA classification of the product as well as the proper disposal procedure.

EPA

Environmental Protection Agency

RQ

Reportable Quantity - The amount of the product or one of its components that, when spilled, must be reported to the EPA and possibly other regulatory agencies.

RCRA - Resource Conservation and Recovery Act.

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act.

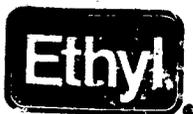
STORAGE REQUIREMENTS

Any unusual requirements or precautions for storage of the product.

ADDITIONAL PRECAUTIONS OR COMMENTS

States or re-emphasizes any special precautions or handling requirements.

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EXPLANATION OF MATERIAL SAFETY DATA SHEET TERMINOLOGY

PRODUCT IDENTIFICATION

TRADE NAME AND SYNONYMS

The name under which the product is sold and common synonyms.

CHEMICAL NAME AND FORMULA

Chemical descriptive name and the chemical formula.

CAS NO.

Chemical Abstract Service registry number which identifies the product.

SUMMARY OF HAZARDS

Emphasizes major hazard(s) associated with the product. Further details are provided in subsequent sections.

COMPONENTS

COMPONENT NAME

Chemical, generic, or proprietary name that identifies the product or components of a mixture. Inclusion of a component is not necessarily based on hazard criteria.

EXPOSURE LIMIT

The airborne concentration at which most workers can be exposed without any expected adverse effects. Source may be Ethyl guideline, ACGIH TLV[®] (Threshold Limit Value), or OSHA PEL (Permissible Exposure Limit).

TYPES OF EXPOSURE LIMITS

TWA - the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, 40 hours after day, without adverse effect.

STEL (Short-Term Exposure Limit) - a 15 minute time-weighted average exposure which should not be exceeded at any time during a workday even if the 8-hour time-weighted average is within the TWA.

CEILING - the concentration that should not be exceeded during any part of the working exposure.

Peak - The maximum concentration and duration of exposure allowable above the ceiling concentration for an 8-hour shift.

ACGIH - American Conference of Governmental Industrial Hygienists.

OSHA - Occupational Safety and Health Administration.

NIOSH - National Institute of Occupational Safety and Health.

CARCINOGENICITY LISTING

Indicates whether a component is thought to be a cancer hazard based on human experience and animal data.

NTP - National Toxicology Program.

IARC - International Agency for Research on Cancer.

OTHER - May include preliminary data or studies not yet evaluated by the major agencies. Also includes ACGIH and NIOSH listings.

CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE/ODOR

Description of material at normal temperature and pressure that may be useful in identifying the presence of the product.

BOILING POINT

The temperature at which the vapor pressure of the liquid is equal to the pressure of the atmosphere.

MELTING POINT (FREEZING POINT)

Temperature at which a substance changes from the solid to liquid state.

VAPOR PRESSURE

The pressure exerted at any temperature by a vapor existing in equilibrium with its liquid or solid phase.

SOLUBILITY IN WATER

The amount of the product, by weight, that will dissolve in a given weight of water at a specified temperature.

| | grams/100 H ₂ O |
|-------------|----------------------------|
| Negligible | < 0.1 |
| Slight | 0.1 - 1.0 |
| Moderate | 1 - 10 |
| Appreciable | > 10 |
| Complete | Soluble in all proportions |

SPECIFIC GRAVITY

Ratio of the weight of a volume of the product to the weight of an equal volume of water (liquids/solids) or air (gases).

EVAPORATION RATE

Ratio of the rate of vaporization of the product to the rate of a known material.

PERCENT VOLATILES

The percentage of the product (liquid or solid) that will evaporate at ambient temperature.

POUR POINT

The lowest temperature at which a liquid will flow when the container is inverted.

VISCOSITY

A measure of flow characteristics of a liquid, expressed in units called Centistokes (cSt).

FIRE AND EXPLOSION HAZARDS

FLASH POINT (CLOSED CUP METHOD)

Lowest temperature at which the product will give off enough vapor to ignite.

FLAMMABLE LIMITS

Range of vapor concentration (percent by volume in air) which will burn or explode in the presence of spark of flame. LEL is the lower explosive limit and UEL is the upper explosive limit.

EXTINGUISHING MEDIA

The fire fighting agents which are recommended for use.

HAZARDOUS THERMAL DECOMPOSITION PRODUCTS

Known hazardous products resulting from heating or burning the compound.

SPECIAL FIREFIGHTING PROCEDURES

General firefighting procedures of chemical fires are not described, but special procedures are given, if required.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hazards not covered by other sections of the MSDS pertaining to chemical reactions in the presence of heat and/or fire.

REACTIVITY DATA

STABILITY

Indicates the susceptibility of the product to dangerous decomposition.

CONDITIONS AND MATERIALS TO AVOID

Gives the conditions and materials that may cause undesirable reactions or instability of the product.

HAZARDOUS DECOMPOSITION PRODUCTS

Describes the hazardous materials produced from a chemical reaction.

HAZARDOUS POLYMERIZATION

Indicates the tendency of the product's molecules to combine in a violent reaction.

HEALTH HAZARDS

Gives the immediate effects of over-exposure to the product by skin or eye contact, breathing vapors or dust, and ingestion. Common symptoms which may occur from exposure to the product are given.

MB Research Laboratories, Inc.

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

FOR: ETHYL CORPORATION

Project number: MB 79-3571

Objective : To determine dermal toxicity

steinsburg and wentz roads

post office box 203

spinnerstown, pennsylvania 18968

215-536-4110

Test started : 4/10/79

Test ended : 6/07/79

MATERIALS

Sample label : ADMA 2, Lot 600-116

Sample received: 3/16/79

N,N-dimethyl-1-dodecylamine

Description : Clear Liquid

ANIMALS

Supplier(s) : Nicholas Helf, Ace Animals,
and Perfection Breeders

Weight range : 2.0 - 3.0 kg

Sex : 12 Males

4 Females

New Zealand White rabbits, approximately 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rabbits were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Site Preparation - Immediately prior to dosing, the fur was clipped from the abdomen of the animals. The clipped area was 200 square cm, approximately 10% of the body surface. Abrasions were made in one half of the rabbits. The abrasions, extending the length of the exposure site, scratched the stratum corneum but did not reach the derma or produce bleeding.

Treatment - Four rabbits were dosed at 20.0 g/kg. For liquid materials the dose was based on the sample weight as calculated from the specific gravity. The test material was applied once dermally to the prepared site under gauze patches. The patches were secured with adhesive tape and the trunks were wrapped with impervious material. The test material was kept in contact with the skin for 24 hours, at which time the wrappings were removed. An estimate of the amount of material remaining was recorded. The exposure site was wiped, but not washed, to remove excess material. If deaths occurred at the initial level, 3 additional groups of four rabbits were dosed at log intervals in an attempt to determine the LD 50. Doses were selected in an attempt to achieve at least two "partial kills" and if possible a "zero kill" and/or a "100% kill".

Observations - Dermal reactions were scored at 24 hours by the Draize scoring system (attached). The rabbits were observed daily for 14 days for signs of

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

Project #: MB 79-3571

Page -2-

Sample #: ADMA 2

toxicity, pharmacological effects and mortality. Body weights were recorded pretest and in the survivors at 14 days.

Termination - If there were deaths during the study, all animals in the high dose group were examined for gross pathology. In the lower dose levels, only animals which died during the study were examined for gross pathology.

The LD 50, if possible, was calculated according to the method of Litchfield J.T. Jr. & F. Wilcoxon (J. Pharm. & Exp. Therap. 96:99, 1949).

C O N C L U S I O N

The test material is not toxic as defined in 16 CFR 1500.3, nor is it a Class B Poison as defined in 49 CFR 173.343.

S U M M A R Y O F D A T A

Deaths occurred at all dose levels. 8/8 animals died at the two highest levels; 10.2 and 20.0 g/kg. Significant predeath toxic signs included lethargy, ptosis, anorexia, adipsia, diarrhea, mucus in feces and ataxia.

Dermal reactions were moderate to severe at all dose levels.

Minimal weight gains or weight loss were noted in all surviving animals.

Necropsy observations revealed dilated hearts and gastrointestinal irregularities.

Respectfully submitted,

Oscar M. Moreno
Oscar M. Moreno, Ph.D.

Mary Irene Moreno
Study Director

Jeffrey D. Miller 6/8/79 6/2
Quality Assurance & Dates of Inspection

Elizabeth J. Altenbach
Archivist
Submitted 6/25/79

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

RESULTS

LD 50: Approximately 5.0 g/kg.

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death: | | | | | |
|------------|--------------|--------------|---------------|---|---|---|---|---|
| | | | 2 | 3 | 4 | 6 | 7 | 9 |
| | 2.68 | 2/4 | 1 | | 1 | | | |
| | 5.20 | 1/4 | | 1 | | | | |
| | 10.20 | 4/4 | | | 1 | 1 | | 1 |
| | 20.00 | 4/4 | 4 | | | | | |

- TOXICITY: @ 2.68 g/kg:** Two out of four animals died at this level of testing, one animal on day 2 and one animal on day 4. Predeath signs in both animals included lethargy, ptosis, ataxia, and yellow nasal discharge, and in the day 4 death, difficulty in walking due to skin reaction. Toxic signs noted in the surviving animals included lethargy and diarrhea and isolated instances of mucus in stool, ataxia, ptosis, and yellow nasal discharge. One animal appeared normal days 8 thru 14, the other appeared normal days 10 thru 12. All animals were inadvertently necropsied, and the necropsy observations revealed the following instances: one normal animal, yellow nose/mouth exudate (2), red intestinal area (1), yellow intestinal areas (2), bloated intestines (1), dark lung areas (2), dilated heart (2 and non-coagulated blood.
- @ 5.20 g/kg:** One animal died at this level of testing on day 3. Pre-death signs included lethargy, ataxia, and yellow nasal discharge. In addition to these toxic signs, surviving animals also exhibited diarrhea and isolated instances of vocalization post dose, blood-shot eyes, ptosis, mucus in stool, and difficulty in mobility of rear legs, possibly due to severe skin reaction. Necropsy observations of the fatality included yellow nose/mouth exudate, brown anogenital exudate, bloated intestines, white nodules on liver, dark areas on lungs and dilated heart.
- @ 10.20 g/kg:** All four animals died at this dose level. Predeath toxic signs generally noted included lethargy, ataxia, ptosis, inability to use back legs possibly due to severe skin reaction, anorexia, adipsia, few feces in pan, diarrhea, and isolated instances of mucus in stool. Necropsy observations included the following instances: brown anogenital exudate (4), red intestinal areas (2), yellow intestinal areas (2), bloated intestines (1), red stomach areas (3), white nodules on liver (1), dilated heart (4), and whitish areas on liver (1).
- @ 20.00 g/kg:** All four animals died at this dose level. Predeath signs in all animals included, vocalization and jumping post dose, lethargy and ptosis. Necropsy observations included the following instances: blood in urine (1), dilated heart (4), whitish areas on liver (1), small dark thymus (1), and non-coagulated blood (3).

ACUTE DERMAL TOXICITY IN RABBITS

Project #: MB 79-3571

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Sample #: ADMA 2

INDIVIDUAL BODY WEIGHTS AND SKIN GRADES:

| | Rabbit Number | Weights - kg | | Day 1 Dermal Reactions | |
|--------------|---------------|--------------|------------|------------------------|-------|
| | | 0 | 14 | Erythema | Edema |
| @ 2.68 g/kg | 13 | 2.3 | DEAD DAY 4 | 3 | 3 |
| | 14# | 2.3 | DEAD DAY 2 | 3 | 3 |
| | 15 | 2.0 | 2.0 | 4 | 3 |
| | 15# | 2.0 | 2.1 | 4 | 4 |
| @ 5.20 g/kg | 9 | 2.5 | 2.4 | 3 | 3 |
| | 10# | 2.9 | 2.5 | 4 | 3 |
| | 11 | 2.8 | 2.0 | 4 | 3 |
| | 12# | 2.9 | DEAD DAY 3 | 3 | 3 |
| @ 10.20 g/kg | 5 | 3.0 | DEAD DAY 4 | 4 ^{bg*} | 3 |
| | 6# | 2.9 | DEAD DAY 7 | 4 ^{bg*} | 3 |
| | 7 | 2.9 | DEAD DAY 9 | 4 ^{bg*} | 3 |
| | 8# | 2.9 | DEAD DAY 6 | 4 ^b | 3 |
| @ 20.00 g/kg | 1 | 2.3 | DEAD DAY 2 | 2 ^g | 2 |
| | 2# | 2.6 | DEAD DAY 2 | 4 ^g | 2 |
| | 3 | 2.0 | DEAD DAY 2 | 3 ^g | 3 |
| | 4# | 2.5 | DEAD DAY 2 | 3 ^g | 2 |

CODE: b = brown areas
 g = green areas
 * = black areas
 # = abraded

| | Value |
|--|-------|
| Erythema: No erythema | 0 |
| Very slight erythema (barely perceptible) | 1 |
| Well defined erythema | 2 |
| Moderate to severe erythema | 3 |
| Severe erythema (best redness) to slight eschar formation (injuries in depth) | 4 |
| Edema : No edema | 0 |
| Very slight edema (barely perceptible) | 1 |
| Slight edema (edges of area well defined by definite raising) | 2 |
| Moderate edema (raised approximately 1 millimeter) | 3 |
| Severe edema (raised more than 1 mm and extending beyond the area of exposure) | 4 |

MB Research Laboratories, Inc.

TEST FOR ORAL TOXICITY IN RATS

FOR: ETHYL CORPORATION

Project Number: MB 79-3571

Objective : To determine oral toxicity
and/or oral LD 50

steinsburg and wents roads
post office box 703
spinnerstown, pennsylvania 18968
715-536-4110

Test started: 3/20/79
Test ended : 5/03/79

MATERIALS

Sample label : ADMA 2, Lot #600-116

Sample rec'd.: 3/16/79

Description : Clear Liquid

N,N-dimethyl-1-dodecanamine

ANIMALS

Supplier(s) : Ace Animals

Weight range : 202 - 300 g
Sex : 40 Males

Wistar rats, at least 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rats were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. Each animal was identified by an indelible body mark.

The animals were housed 5/cage in suspended wire mesh cages (20" x 10" x 7"). Fresh Purina rat chow and water were freely available except for 16-20 hours prior to dosing when food was removed. The animal room reserved exclusively for rodents on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Treatment - The test material was given orally by syringe and 13 gauge blunt end needle. One group of 10 male rats was dosed at 5.0 g/kg initially. Based on the results of the initial dose, 3 additional groups of 10 male rats were dosed at various levels in order to determine the LD 50 of the test material. For liquid materials, the dose was based on the sample weight as calculated from the specific gravity. The vehicle, if any, was chosen because of its lack of known toxicity, lack of physiological effect and because it is relatively unreactive with other chemical substances.

Observations - The rats were observed 3-4 hours after dosing and once daily for 14 days. Mortality, toxicity and pharmacological effects were recorded. Body weights were recorded pretest and in the survivors at 14 days.

Termination - At 14 days the survivors were sacrificed. All animals were examined for gross pathology.

The LD 50 was calculated, if possible, according to the method of Litchfield, J.J. Jr. and F. Wilcoxon (JPET 96:99, 1949).

TEST FOR ORAL TOXICITY IN RATS

Page -2-

Project #: MB 79-3571

Sample #: ADMA 2

RESULTS

LD 50: 0.79 (0.44 - 1.42) g/kg

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death | | | | | | |
|------------|--------------|--------------|--------------|---|---|---|---|----|--|
| | | | 0 | 1 | 2 | 3 | 5 | 11 | |
| | 0.072 | 0/10 | | | | | | | |
| | 0.30 | 2/10 | | | | | 1 | 1 | |
| | 1.22 | 6/10 | | | 3 | 2 | 1 | | |
| | 5.0 | 10/10 | 6 | 3 | 1 | | | | |

TOXICITY : *@ 0.072 g/kg: All animals survived this dose level. Isolated instances of chromorhinorrhea and lethargy were noted 3-4 hours post dose. All animals were normal on Days 1 thru 4. Isolated instances of respiratory rattle and chromorhinorrhea were noted in three animals. At all times not mentioned all animals were normal.

@ 0.30 g/kg: Two animals died at this dose level. One animal on Day 5 and one animal on Day 11. Predeath signs in the Day 5 death included lethargy, piloerection, dyspnea, chromorhinorrhea, ataxia, ptosis, diarrhea, emaciation and chromodacryorrhea. The predeath signs in the Day 11 death included lethargy, chromorhinorrhea, emaciation, ataxia and a swollen left foot. Isolated instances of respiratory rattle and chromorhinorrhea were also noted. Two animals remained normal throughout testing.

@ 1.22 g/kg: Six animals died at this dose level. Three animals died on Day 1, two animals died on Day 2 and one animal died on Day 3. Predeath signs in the Day 1 deaths included prostration, piloerection, ptosis, bulging eyes, diarrhea, ataxia, chromorhinorrhea and dyspnea. Predeath signs in the Day 2 deaths included lethargy, ataxia, piloerection, ptosis, diarrhea, foaming at the mouth, gasping and oily bodies. Predeath signs in the Day 3 death included lethargy, ataxia, piloerection, ptosis, diarrhea, tremors, chromorhinorrhea and oily body. The surviving animals exhibited isolated instances of lethargy, ataxia, ptosis, piloerection, diarrhea, chromodacryorrhea, emaciation, chromorhinorrhea, foaming at the mouth, oily bodies and bulging eyes on Days 1 thru 6. The surviving animals appeared normal on Days 8 thru 14.

@ 5.0 g/kg: All animals died at this dose level. Predeath signs included lethargy, ataxia, diarrhea, stiff when manipulated, irritable when touched, chromorhinorrhea, piloerection, ptosis and prostration.

NOTE: *0.072 - used as 10% w/v mixture in Mazola Oil.

TEST FOR ORAL TOXICITY IN RATS

Page -3-

Project #: MB 79-3571

Sample #: ADMA 2

BODY WEIGHTS - g:

| g/kg | AN. # | DAY 0 | DAY 14 | g/kg | AN. # | DAY 0 | DAY 14 |
|-------|-------|-------|------------|------|-------|-------|-------------|
| 0.072 | 31 | 282 | 368 | 0.30 | 21 | 297 | 383 |
| | 32 | 298 | 381 | | 22 | 265 | 338 |
| | 33 | 297 | 363 | | 23 | 268 | 375 |
| | 34 | 292 | 384 | | 24 | 300 | 392 |
| | 35 | 293 | 401 | | 25 | 265 | 383 |
| | 36 | 282 | 377 | | 26 | 300 | 392 |
| | 37 | 202 | 344 | | 27 | 295 | DEAD DAY 5 |
| | 38 | 218 | 356 | | 28 | 263 | DEAD DAY 11 |
| | 39 | 215 | 364 | | 29 | 278 | 390 |
| | 40 | 225 | 372 | | 30 | 290 | 370 |
| 1.22 | 11 | 272 | DEAD DAY 2 | 5.0 | 1 | 212 | DEAD DAY 0 |
| | 12 | 251 | 326 | | 2 | 220 | DEAD DAY 1 |
| | 13 | 279 | 381 | | 3 | 208 | DEAD DAY 0 |
| | 14 | 267 | DEAD DAY 2 | | 4 | 218 | DEAD DAY 1 |
| | 15 | 273 | 331 | | 5 | 218 | DEAD DAY 0 |
| | 16 | 245 | 311 | | 6 | 209 | DEAD DAY 2 |
| | 17 | 234 | DEAD DAY 3 | | 7 | 213 | DEAD DAY 1 |
| | 18 | 276 | DEAD DAY 1 | | 8 | 211 | DEAD DAY 0 |
| | 19 | 250 | DEAD DAY 1 | | 9 | 222 | DEAD DAY 0 |
| | 20 | 229 | DEAD DAY 1 | | 10 | 207 | DEAD DAY 0 |

| NECROPSY OBSERVATIONS: | g/kg | | 0.072 | | 0.30 | | 1.22 | | 5.0 | |
|--------------------------------|------|---|---------------|---|---------------|---|---------------|---|---------------|----|
| | | | An. with Sign | |
| | D | S | D | S | D | S | D | S | D | S |
| Normal | | 9 | | 8 | | 4 | | | | |
| Cannibalized | | | | 1 | | | | | | |
| Exudate, nose/mouth, red | | | | 1 | | 3 | | | | 4 |
| Exudate, anogenital, brown | | | | | | 3 | | | | 4 |
| Intestines, areas red | | | | 1 | | 4 | | | | 6 |
| Intestines, areas yellow | | | | 1 | | | | | | |
| Intestines, bloated | | | | | | 2 | | | | 6 |
| Intestines contained fluid | | | | 1 | | 4 | | | | 10 |
| Stomach areas red | | | | | | 3 | | | | 6 |
| Liver dark | | | | | | | | | | 1 |
| Liver mottled | | | | | | | | | | 4 |
| Lungs areas dark | | | | 1 | | 2 | | | | 1 |
| Heart dilated | | | | | | 5 | | | | 4 |
| Intestines gelatinous | | | | 1 | | 1 | | | | 3 |
| Stomach contained clear fluid | | | | 1 | | 4 | | | | 7 |
| Reddish stain, anogenital area | | | | | | 3 | | | | 6 |
| Exudate, nose/mouth green | | | | | | 1 | | | | |
| Stomach, bloated | | | | | | | | | | 2 |

CODE: D = death, S = sacrifice

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-3571

Sample #: ADMA 2

CONCLUSION

The test material is toxic as defined in 16 CFR 1500.3, but not a Class B poison as defined in 49 CFR 173.343.

SUMMARY OF DATA

Deaths occurred at the three highest dose levels; 0.30, 1.22 and 5.0 g/kg. 16/20 animals died at the two highest levels. Significant predeath toxic signs included lethargy, emaciation, ataxia, prostration, piloerection, ptosis, bulging eyes, diarrhea, dyspnea, gasping, tremors, oily bodies and irritability.

Normal body weight changes were observed in the survivors.

Significant necropsy observations observed in the animals which died included: various intestinal irregularities and dilated hearts.

Respectfully submitted,

Oscar M. Moreno
Oscar M. Moreno, Ph.D.

Mary Ann Flores
Study Director

G. D. Miller 5/4/79 6/15/79
Quality Assurance & Dates of Inspection

Elizabeth J. Altman
Archivist

Submitted: 5/24/79

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

I B Research Laboratories, Inc.

steinsburg and wents roads
post office box 203
spinnerstown, pennsylvania 18968
215-536-4110

TEST FOR EYE IRRITATION

FOR: ETHYL CORPORATION

Project number: MB 79-3571
Sample number : ADMA 2, Lot #600-116
Description : Clear Liquid

Material received: 3/16/79
Test started : 3/27/79
Test ended : 3/30/79

ANIMALS

Six New Zealand white rabbits, approximately 8 to 11 weeks of age, were used. The animals selected were in good health when received from our local supplier and remained in good health during the equilibration period in this laboratory. The rabbits were housed in suspended wire cages in a temperature controlled room reserved exclusively for rabbits on acute tests. Tap water and fresh Purina rabbit chow were freely available. The cages and room were kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member. The eyes of all rabbits selected for testing were free from damage and irritation.

TEST PROCEDURE

One-tenth of a milliliter or 0.1 ml equivalent of the test material was instilled into the conjunctival sac of one eye of each of the 6 rabbits. The lids were held together briefly to insure adequate distribution of the material over the surface of the eye. The untreated eye of each rabbit served as a control. The ocular reactions were graded at 24, 48 and 72 hours after dosing.

The eye irritation potential was determined as defined in 16 CFR 1500.3 and 1500.42.

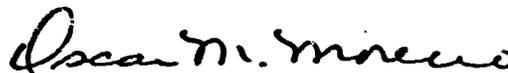
RESULTS

The individual scores are appended.

CONCLUSION

The test material is an irritant.

Respectfully submitted,



Oscar M. Moreno, Ph.D.
President

4/05/79



**Rabbit Eye Irritation Study
Individual Daily Scores**

Material: ADMA 2, Lot #
600-116

Project No: MB 79-3571

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 |
|------------|------|-------------|-------------------------------------|-------|-------|-------|
| 1 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 2 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 12 | 12 |
| | | | Totals Added (1 + 2 + 3) | 12 | 12 | 12 |
| 2 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 1 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 10 | 10 |
| | | | Totals Added (1 + 2 + 3) | 12 | 10 | 10 |
| 3 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 2 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 12 | 12 |
| | | | Totals Added (1 + 2 + 3) | 12 | 12 | 12 |

**Rabbit Eye Irritation Study
Individual Daily Scores**

Material: ADMA 2, Lot # 600-116 Project No: MB 79-3571

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 |
|------------|------|-------------------------------------|-----------|-------|-------|-------|
| 4 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | (2) Iris Total = (C) x 5 | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 0 | 0 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 2 |
| | F | Conjunctiva | Discharge | 2 | 2 | 1 |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | 12 | 10 | 6 |
| | | Totals Added (1 + 2 + 3) | | 12 | 10 | 6 |
| 5 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | (2) Iris Total = (C) x 5 | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 2 |
| | F | Conjunctiva | Discharge | 2 | 1 | 1 |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | 14 | 10 | 8 |
| | | Totals Added (1 + 2 + 3) | | 14 | 10 | 8 |
| 6 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | (2) Iris Total = (C) x 5 | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 2 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 2 |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | 14 | 14 | 12 |
| | | Totals Added (1 + 2 + 3) | | 14 | 14 | 12 |

SCALE FOR SCORING OCULAR LESIONS**

(1) CORNEA

(A) OPACITY- DEGREE OF DENSITY (AREA MOST DENSE TAKEN FOR READING)

| | |
|--|----|
| NO OPACITY | 0 |
| SCATTERED OR DIFFUSE AREA, DETAILS OF IRIS CLEARLY VISIBLE | 1° |
| EASILY DISCERNIBLE TRANSLUCENT AREAS, DETAILS OF IRIS SLIGHTLY OBSCURED | 2° |
| OPALESCENT AREAS, NO DETAILS OF IRIS VISIBLE, SIZE OF PUPIL BARELY DISCERNIBLE | 3° |
| OPAQUE, IRIS INVISIBLE | 4° |

(B) AREA OF CORNEA INVOLVED

| | |
|---|---|
| ONE QUARTER (OR LESS) BUT NOT ZERO | 1 |
| GREATER THAN ONE QUARTER, BUT LESS THAN HALF | 2 |
| GREATER THAN HALF, BUT LESS THAN THREE QUARTERS | 3 |
| GREATER THAN THREE QUARTERS, UP TO WHOLE AREA | 4 |

SCORE EQUALS A x B x 5

TOTAL MAXIMUM = 80

(2) IRIS

(A) VALUES

| | |
|--|----|
| NORMAL | 0 |
| FOLDS ABOVE NORMAL, CONGESTION, SWELLING, CIRCUMCORNEAL INJECTION (ANY OR ALL OF THESE OR COMBINATION OF ANY THEREOF) IRIS STILL REACTING TO LIGHT (SLUGGISH REACTION IS POSITIVE) | 1° |
| NO REACTION TO LIGHT, HEMORRHAGE, GROSS DESTRUCTION (ANY OR ALL OF THESE) | 2° |

SCORE EQUALS A x 5

TOTAL MAXIMUM = 10

(3) CONJUNCTIVAE

(A) REDNESS (REFERS TO PALPEBRAL AND BULBAR CONJUNCTIVAE EXCLUDING CORNEA AND IRIS)

| | |
|---|----|
| VESSELS NORMAL | 0 |
| VESSELS DEFINITELY INJECTED ABOVE NORMAL | 1 |
| MORE DIFFUSE, DEEPER CRIMSON RED, INDIVIDUAL VESSELS NOT EASILY DISCERNIBLE | 2° |
| DIFFUSE BEEFY RED | 3° |

(B) CHEMOSIS

| | |
|---|----|
| NO SWELLING | 0 |
| ANY SWELLING ABOVE NORMAL (INCLUDES NICTITATING MEMBRANE) | 1 |
| OBVIOUS SWELLING WITH PARTIAL EVERSION OF LIDS | 2° |
| SWELLING WITH LIDS ABOUT HALF CLOSED | 3° |
| SWELLING WITH LIDS ABOUT HALF CLOSED TO COMPLETELY CLOSED | 4° |

(C) DISCHARGE

| | |
|---|---|
| NO DISCHARGE | 0 |
| ANY AMOUNT DIFFERENT FROM NORMAL (DOES NOT INCLUDE SMALL AMOUNTS OBSERVED IN INNER CANTHUS OF NORMAL ANIMALS) | 1 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS JUST ADJACENT TO LIDS | 2 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS, AND CONSIDERABLE AREA AROUND THE EYE | 3 |

SCORE EQUALS (A + B + C) x 2

TOTAL MAXIMUM = 20

THE MAXIMUM TOTAL SCORE IS THE SUM OF ALL SCORES OBTAINED FOR THE CORNEA, IRIS, AND CONJUNCTIVAE. TOTAL MAXIMUM SCORE POSSIBLE = 110

*AN ANIMAL SHALL BE CONSIDERED AS EXHIBITING A POSITIVE REACTION

**DRAITZ, J.H. ET AL. J. PHARM. EXP. THER. 82:377-390, 1944

CONCLUSIONS

NON-IRRITANT
 INDETERMINATE
 IRRITANT

0 OR 1 RABBIT(S) WITH POSITIVE SCORES
 2 OR 3 RABBITS WITH POSITIVE SCORES
 4 TO 6 RABBITS WITH POSITIVE SCORES

MB Research Laboratories, Inc.

TEST FOR MATERIAL CORROSIVITY IN RABBITS-DOT

FOR: ETHYL CORPORATION

Project number: MB 79-3571

Objective : To identify corrosive materials as defined in 49 CFR 173.240

steinsburg and wentz roads
post office box 203
spinnerstown, pennsylvania 18908
215-536-4110

Test started : 4/11/79
Test ended : 4/13/79

MATERIALS

Sample label : ADMA 2; Lot #600-116

Sample received: 3/16/79

N,N-dimethyl-1-dodecanamine

Description : Clear Liquid

ANIMALS

Supplier(s) : Perfection Breeders

Sex : 4 Males
2 Females

New Zealand White rabbits, approximately 8 weeks old when received, were equilibrated for at least one week in this laboratory. Six apparently healthy rabbits were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21° C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Site Preparation - The fur was clipped from the back and sides of the animals. The skin of each animal remained intact.

Treatment - Six rabbits were dosed once dermally at one intact site/animal. 0.5 g (if the material was solid) or 0.5 ml (if the material was liquid) was applied beneath 2.5 cm square gauze patches. The patches were secured with adhesive tape and the trunks were wrapped with impervious material. The test material was kept in contact with the skin for 4 hours, at which time the wrappings were removed.

Observations and Calculations - Dermal reactions were scored at 4, 24 and 48 hours by the Draize scoring system (attached). The skin was evaluated for corrosivity. Corrosivity, as defined in the DOT regulations, is destruction or irreversible alteration of the tissue. Tissue destruction is considered to have occurred if there is ulceration or necrosis. The mean values (6 rabbits) for erythema/eschar and edema on intact skin at 4, 24 and 48 hours (a total of 6 values) were added and divided by 3 to give a modified primary irritation index. If this value was 5 or more, the material was considered to be a primary irritant.

RESULTS

INDIVIDUAL SCORES

| | Rabbit Number | | | | | | Mean Score |
|----------|---------------|---|---|---|---|----------------|------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| Erythema | | | | | | | |
| 4 Hours | 1 | 2 | 1 | 2 | 1 | 4 | 1.83 |
| 24 Hours | 1 | 2 | 2 | 2 | 2 | 4 ^b | 2.13 |
| 48 Hours | 2 | 3 | 2 | 3 | 2 | 4 ^b | 2.67 |
| Edema | | | | | | | |
| 4 Hours | 1 | 2 | 1 | 2 | 1 | 2 | 1.50 |
| 24 Hours | 1 | 2 | 1 | 2 | 1 | 2 | 1.50 |
| 48 Hours | 2 | 2 | 1 | 3 | 1 | 2 | 1.83 |

b = brown area

SUM OF MEAN SCORES = 11.46

MODIFIED PRIMARY IRRITATION INDEX = SUM OF MEAN SCORES/3 = 3.82

CONCLUSION

The test material is; Non-Irritant/Non-Corrosive.

SUMMARY OF DATA

Average erythema scores increased over the observation period. However, a great variance in individual scores was noted.

On the average, edema scores remained very slight to slight over the observation period.

Respectfully submitted,

Oscar M. Moreno
Oscar M. Moreno, Ph.D. 4/26/79
Theresa Jones
Study Director
Jeffery D. Miller 4/17/79 4/27/79
Quality Assurance & Dates of Inspection
Elysebeth J. Altendorf
Archivist

| | Value |
|--|-------|
| Erythema: No erythema | 0 |
| Very slight erythema (barely perceptible) | 1 |
| Well defined erythema | 2 |
| Moderate to severe erythema | 3 |
| Severe erythema (beet redness) to slight eschar formation (injuries in depth) | 4 |
| Edema : No edema | 0 |
| Very slight edema (barely perceptible) | 1 |
| Slight edema (edges of area well defined by definite raising) | 2 |
| Moderate edema (raised approximately 1 millimeter) | 3 |
| Severe edema (raised more than 1 mm and extending beyond the area of exposure) | 4 |

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

MB Research Laboratories, Inc.

TEST FOR ORAL TOXICITY IN RATS

FOR: ETHYL CORPORATION

Project Number: MB 79-3572

Objective : To determine oral toxicity
and/or oral LD 50

Steinsburg and Wertz roads
post office box 203
Spinnerstown, Pennsylvania 18968
215-536-4110

Test started: 3/20/79
Test ended : 5/03/79

MATERIALS

Sample label : AD MA 4, Lot #600-112

Sample rec'd.: 3/16/79

Description : Clear liquid
N,N-dimethyl-1-tetradecanamine

ANIMALS

Supplier(s) : Ace Animals

Weight range : 200 - 300 g
Sex : 40 Males

Wistar rats, at least 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rats were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. Each animal was identified by an indelible body mark.

The animals were housed 5/cage in suspended wire mesh cages (20" x 10" x 7"). Fresh Purina rat chow and water were freely available except for 16-20 hours prior to dosing when food was removed. The animal room reserved exclusively for rodents on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Treatment - The test material was given orally by syringe and 13 gauge blunt end needle. One group of 10 male rats was dosed at 5.0 g/kg initially. Based on the results of the initial dose, 3 additional groups of 10 male rats were dosed at various levels in order to determine the LD 50 of the test material. For liquid materials, the dose was based on the sample weight as calculated from the specific gravity. The vehicle, if any, was chosen because of its lack of known toxicity, lack of physiological effect and because it is relatively unreactive with other chemical substances.

Observations - The rats were observed 3-4 hours after dosing and once daily for 14 days. Mortality, toxicity and pharmacological effects were recorded. Body weights were recorded pretest and in the survivors at 14 days.

Termination - At 14 days the survivors were sacrificed. All animals were examined for gross pathology.

The LD 50 was calculated, if possible, according to the method of Litchfield, J.J. Jr. and F. Wilcoxon (JPET 96:99, 1949).

RESULTS

LD 50: 0.72 (0.54 - 0.96) g/kg.

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death | | |
|------------|--------------|--------------|--------------|---|---|
| | | | 1 | 2 | 4 |
| | 0.30 | 0/10 | | | |
| | 0.60 | 2/10 | | 2 | |
| | 1.22 | 9/10 | 1 | 7 | 1 |
| | 5.0 | 10/10 | 9 | 1 | |

TOXICITY: @ 0.30 g/kg: All animals survived this dose level. Chromorhinorrhea was intermittently noted in 7/10 animals. Isolated instances of diarrhea, lethargy, and chromodacryorrhea were also noted. Three animals remained normal throughout testing.

@ 0.60 g/kg: Two animals died at this dose level, both on day 2. Predeath signs included lethargy, ataxia, diarrhea, piloerection and chromorhinorrhea. These toxic signs were also noted in the surviving animals. Isolated instances of chromodacryorrhea, respiratory noise, and alopecia were also noted. Three of the surviving animals had returned to normal by day 2, and by day 14, 7/8 animals appeared normal.

aws effects

@ 1.22 g/kg: 9/10 animals died at this dose level, one on day 1, seven on day 2 and one on day 4. Predeath signs included lethargy, ataxia, ptosis, dyspnea, diarrhea, piloerection, bulging eyes, chromorhinorrhea, and chromodacryorrhea. The surviving animal exhibited lethargy, ataxia, piloerection, chromorhinorrhea, emaciation and chromodacryorrhea throughout testing.

aws effects →

@ 5.0 g/kg: All animals died at this dose level; one animal on day 2, and the remaining nine on day 1. Predeath signs included diarrhea, lethargy, ptosis, ataxia, flaccid muscle tone, chromodacryorrhea, and chromorhinorrhea.

aws effects

TEST FOR ORAL TOXICITY IN RATS

Project #: MB 79-3572

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Sample #: ADMA 4, Lot #600-112

BODY WEIGHTS - g:

| @ 0.30 g/kg: | AN. # | DAY 0 | DAY 14 | @ 0.60 g/kg: | AN. # | DAY 0 | DAY 14 |
|--------------|-------|-------|------------|--------------|-------|-------|------------|
| | 21 | 265 | 338 | | 31 | 296 | 392 |
| | 22 | 268 | 332 | | 32 | 294 | 395 |
| | 23 | 286 | 380 | | 33 | 288 | 391 |
| | 24 | 268 | 389 | | 34 | 288 | 360 |
| | 25 | 291 | 388 | | 35 | 300 | DEAD DAY 2 |
| | 26 | 299 | 412 | | 36 | 298 | 460 |
| | 27 | 295 | 424 | | 37 | 298 | DEAD DAY 2 |
| | 28 | 300 | 443 | | 38 | 290 | 376 |
| | 29 | 296 | 430 | | 39 | 289 | 371 |
| | 30 | 300 | 419 | | 40 | 300 | 404 |
| | | | | | | | |
| @ 1.22 g/kg: | AN. # | DAY 0 | DAY 14 | @ 5.0 g/kg: | AN. # | DAY 0 | DAY 14 |
| | 11 | 224 | 324 | | 1 | 212 | DEAD DAY 1 |
| | 12 | 278 | DEAD DAY 2 | | 2 | 233 | DEAD DAY 2 |
| | 13 | 259 | DEAD DAY 4 | | 3 | 230 | DEAD DAY 1 |
| | 14 | 252 | DEAD DAY 2 | | 4 | 212 | DEAD DAY 1 |
| | 15 | 295 | DEAD DAY 2 | | 5 | 210 | DEAD DAY 1 |
| | 16 | 238 | DEAD DAY 1 | | 6 | 215 | DEAD DAY 1 |
| | 17 | 276 | DEAD DAY 2 | | 7 | 218 | DEAD DAY 1 |
| | 18 | 304 | DEAD DAY 2 | | 8 | 202 | DEAD DAY 1 |
| | 19 | 297 | DEAD DAY 2 | | 9 | 206 | DEAD DAY 1 |
| | 20 | 243 | DEAD DAY 2 | | 10 | 200 | DEAD DAY 1 |

| NECROPSY OBSERVATIONS: | g/kg | | 0.30 | | 0.60 | | 1.22 | | 5.0 | |
|--|------|----|---------------|---|---------------|---|---------------|---|---------------|---|
| | | | An. with Sign | | An. with Sign | | An. with Sign | | An. with Sign | |
| | D | S | D | S | D | S | D | S | D | S |
| Normal | | 10 | | 8 | | | | | | |
| Exudate, nose/mouth, red | | | 2 | | 7 | | | | 9 | |
| Exudate, anogenital, brown | | | 2 | | 9 | | | | 10 | |
| Intestines, areas red | | | 2 | | 1 | | | | 10 | |
| Intestines, areas yellow | | | | | | | | | | |
| Intestines contained fluid | | | | | 4 | | | | | |
| Stomach areas red | | | 2 | | | | | | 4 | |
| Lungs dark | | | | | | | | | 3 | |
| Lungs areas dark | | | | | 7 | | 1 | | 5 | |
| Spleen large | | | | | 1 | | | | | |
| Heart dilated | | | | | 1 | | | | 4 | |
| Caecum, fluid filled | | | | | | | | | 8 | |
| Stomach, air-filled | | | | | | | | | 7 | |
| Intestines, gelatinous | | | | | 2 | | | | 8 | |
| Stomach, distended with mucibus material | | | | | | | | | 6 | |
| Fluid in chest | | | | | | | | | 1 | |

CODE: D = death, S = sacrifice

TEST FOR ORAL TOXICITY IN RATS

Project #: MB 79-3072

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Sample #: ADMA 4, Lot #600-112

CONCLUSION

The test material is toxic but not a Class B poison as defined in 16 CFR 1500.3 and 49 CFR 173.343.

SUMMARY OF DATA

Deaths occurred at the three highest dose levels; 0.60, 1.22 and 5.0 g/kg. 19/20 animals died at the two highest dose levels. Significant predeath toxic signs included lethargy, ataxia, diarrhea, piloerection, chromorrhinorrhea, dyspnea, bulging eyes, chromodacryorrhea and flaccid muscle tone.

In the survivors, normal body weight changes were observed.

Significant necropsy observations in the animals which died included: intestinal irregularities and dilated hearts.

Respectfully submitted,

Oscar M. Moreno
Oscar M. Moreno, Ph.D.

Mary Teresa Moreno
Study Director

Jeffery W. Miller 5/4/79 6/5/79
Quality Assurance & Dates of Inspection

Elizabeth J. Atchuck
Archivist

Submitted: 5/24/79

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

M B R Research Laboratories, Inc.

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

FOR: ETHYL CORPORATION

Project number: MB 79-3572

Objective : To determine dermal toxicity

Steinburg and Wentz Roads
post office box 703
spinnerstown, pennsylvania 18968
215-536-4110
Test started : 4/10/79
Test ended : 6/13/79

MATERIALS

Sample label : ADMA 4, Lot 600-112 Sample received: 3/16/79

N,N-dimethyl-1-tetradecanamine

Description : Clear liquid

ANIMALS

Supplier(s) : Perfection Breeders, Weight range : 2.3 - 3.0 kg
Nicholas Helf, and Ace Animals Sex : 8 Males
8 Females

New Zealand white rabbits, approximately 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rabbits were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Site Preparation - Immediately prior to dosing, the fur was clipped from the abdomen of the animals. The clipped area was 200 square cm, approximately 10% of the body surface. Abrasions were made in one half of the rabbits. The abrasions, extending the length of the exposure site, scratched the stratum corneum but did not reach the derma or produce bleeding.

Treatment - Four rabbits were dosed at 20.0 g/kg. For liquid materials the dose was based on the sample weight as calculated from the specific gravity. The test material was applied once dermally to the prepared site under gauze patches. The patches were secured with adhesive tape and the trunks were wrapped with impervious material. The test material was kept in contact with the skin for 24 hours, at which time the wrappings were removed. An estimate of the amount of material remaining was recorded. The exposure site was wiped, but not washed, to remove excess material. If deaths occurred at the initial level, 3 additional groups of four rabbits were dosed at log intervals in an attempt to determine the LD 50. Doses were selected in an attempt to achieve at least two "partial kills" and if possible a "zero kill" and/or a "100% kill".

Observations - Dermal reactions were scored at 24 hours by the Draize scoring system (attached). The rabbits were observed daily for 14 days for signs of

toxicity, pharmacological effects and mortality. Body weights were recorded pretest and in the survivors at 14 days.

Termination - If there were deaths during the study, all animals in the high dose group were examined for gross pathology. In the lower dose levels, only animals which died during the study were examined for gross pathology.

The LD 50, if possible, was calculated according to the method of Litchfield J.T. Jr. & F. Wilcoxon (J. Pharm. & Exp. Therap. 96:99, 1949).

CONCLUSION

The test material is not toxic as defined in 16 CFR 1500.3, nor is it a Class B Poison as defined in 49 CFR 173.343.

SUMMARY OF DATA

Deaths occurred at all dose levels. All animals died at the two highest levels; 10.20 and 20.0 g/kg. Significant predeath toxic signs included; lethargy, ptosis, ataxia, adipsia, anorexia, prostration, tachypnea, diarrhea, emaciation and blood in feces.

Dermal reactions were moderate to severe at the higher dose levels.

Weight loss was noted in the surviving animals.

Necropsy observations revealed enlarged hearts and gastrointestinal irregularities.

Respectfully submitted,

Oscar M. Moreno

Oscar M. Moreno, Ph.D.

Therese Irene Moreno

Study Director

Gaffney D. Miller 6/19/79 6/27/79
Quality Assurance & Dates of Inspection

Elizabeth J. Ritzenbach

Archivist

Submitted 6/25/79

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

RESULTSLD 50: 4.40 (2.91 - 7.30) g/kg.

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death: | | | | | | |
|------------|--------------|--------------|---------------|---|---|---|----|----|--|
| | | | 4 | 5 | 6 | 7 | 12 | 13 | |
| | 2.68 | 1/4 | | | | 1 | | | |
| | 5.20 | 2/4 | | | | | 1 | 1 | |
| | 10.20 | 4/4 | | 4 | | | | | |
| | 20.00 | 4/4 | 2 | 1 | 1 | | | | |

- TOXICITY: @ 2.68 g/kg:** There was one fatality at this dose level on day 6. Predeath signs included lethargy, ptosis and diarrhea noted on days 5 and 6. This animal appeared normal days 0 thru 4. Toxic signs generally noted throughout testing in the surviving animals included lethargy, ptosis, diarrhea, and yellow nasal discharge and isolated instances of few feces in pan, adipsia, anorexia, and mucus in stool. Necropsy observations on the fatality included yellow exudate from the nose/mouth, brown anogenital exudate, yellow intestinal areas, severely erythemic skin, and enlarged heart.
- @ 5.20 g/kg:** 2/4 animals died at this level of testing, one animal on day 12, and one animal on day 13. Predeath signs in the day 12 death included lethargy, ptosis, diarrhea, difficulty with mobility of rear legs, possibly due to severe skin reaction, blood in feces and emaciation. Ataxia, yellow nasal discharge, and few feces in pan were additionally noted in the day 13 death. Toxic signs generally noted throughout testing in the surviving animals included lethargy, diarrhea, ptosis, emaciation, and difficulty with mobility of rear legs, possibly due to severe skin reaction, and isolated instances of vocalization post dosing, mucus in stool, blood in feces, yellow nasal discharge and tremors. Necropsy observations on the two fatalities included yellow nose/mouth exudate, brown anogenital exudate, red intestinal areas, bloated intestines, severely erythemic skin, enlarged heart, clear fluid in abdominal cavity and yellow fluid in intestines.
- @ 10.20 g/kg:** All animals died at this dose level on day 5. Predeath signs included lethargy, ataxia, ptosis, anorexia, and adipsia. Necropsy observations included brown anogenital exudate, red intestinal areas, bloated intestines, enlarged hearts, gelatinous intestines, and yellow fluid in intestines. One animal had severely erythemic skin.
- @ 20.00 g/kg:** All animals died at this dose level, two animals on day 4, one animal on day 5, and one animal on day 6. Predeath signs included lethargy, ptosis, ataxia, adipsia, anorexia, partial posterior weakness, prostration, tachypnea, and vocalization post dose. Necropsy observations included yellow nose/mouth exudate, brown anogenital exudate, red

• ACUTE DERMAL TOXICITY IN RABBITS

Project #: MB 79-3572

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Sample #: ADMA 4

TOXICITY (CONTINUED):

@ 20.00 g/kg: intestinal areas, clear fluid in intestines, dark lung areas, severely erythemic skin, enlarged hearts, and gelatinous intestines. One animal had clear fluid in abdominal cavity.

INDIVIDUAL BODY WEIGHTS AND SKIN GRADES:

| | Rabbit Number | Weights - kg | | Day 1 Dermal Reactions | |
|---------------|---------------|--------------|-------------|---------------------------|-------|
| | | 0 | 14 | Erythema | Edema |
| @ 2.68 g/kg | 13 | 2.6 | DEAD DAY 7 | 1 | 3 |
| | 14# | 2.6 | 1.8 | 1 | 3 |
| | 15 | 2.1 | 1.9 | 0 | 2 |
| | 16# | 2.8 | 2.1 | 2 | 3 |
| @ 5.20 g/kg: | 9 | 2.5 | DEAD DAY 12 | 4 | 3 |
| | 10# | 2.3 | 1.8 | 3 | 3 |
| | 11 | 2.3 | 1.5 | 2 ^{bg} | 3 |
| | 12# | 2.5 | DEAD DAY 13 | 4 ^{bg} | 3 |
| @ 10.20 g/kg: | 5 | 2.5 | DEAD DAY 5 | 4 ^b | 3 |
| | 6# | 2.6 | DEAD DAY 5 | 4 ^b | 3 |
| | 7 | 3.0 | DEAD DAY 5 | 4 ^b | 3 |
| | 8# | 2.6 | DEAD DAY 5 | 4 ^{bg} | 2 |
| @ 20.00 g/kg: | 1 | 2.6 | DEAD DAY 6 | 2 ^{wg} | 3 |
| | 2# | 3.0 | DEAD DAY 5 | 3 ^w | 3 |
| | 3 | 2.5 | DEAD DAY 4 | 2 | 3 |
| | 4# | 2.9 | DEAD DAY 4 | 2 | 3 |

CODE: b = brown areas
g = green areas
w = white areas
= abraded

| | Value |
|--|-------|
| Erythema: No erythema | 0 |
| Very slight erythema (barely perceptible) | 1 |
| Well defined erythema | 2 |
| Moderate to severe erythema | 3 |
| Severe erythema (bee redness) to slight eschar formation (injuries in depth) | 4 |
| Edema : No edema | 0 |
| Very slight edema (barely perceptible) | 1 |
| Slight edema (edges of area well defined by definite raising) | 2 |
| Moderate edema (raised approximately 1 millimeter) | 3 |
| Severe edema (raised more than 1 mm and extending beyond the area of exposure) | 4 |

M B Research Laboratories, Inc.

steinsburg and ventz roads
post office box 203
spinnerstown, pennsylvania 18968
215-536-4110

TEST FOR EYE IRRITATION

FOR: ETHYL CORPORATION

Project number: MB 79-3572
Sample number: ADMA 4, Lot #600-112
Description: Clear Liquid

N,N-dimethyl-tetradecanamide

Material received: 3/16/79
Test started: 3/27/79
Test ended: 3/30/79

ANIMALS

Six New Zealand white rabbits, approximately 8 to 11 weeks of age, were used. The animals selected were in good health when received from our local supplier and remained in good health during the equilibration period in this laboratory. The rabbits were housed in suspended wire cages in a temperature controlled room reserved exclusively for rabbits on acute tests. Tap water and fresh Purina rabbit chow were freely available. The cages and room were kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member. The eyes of all rabbits selected for testing were free from damage and irritation.

TEST PROCEDURE

One-tenth of a milliliter or 0.1 ml equivalent of the test material was instilled into the conjunctival sac of one eye of each of the 6 rabbits. The lids were held together briefly to insure adequate distribution of the material over the surface of the eye. The untreated eye of each rabbit served as a control. The ocular reactions were graded at 24, 48 and 72 hours after dosing.

The eye irritation potential was determined as defined in 16 CFR 1500.3 and 1500.42.

RESULTS

The individual scores are appended.

CONCLUSION

The test material is an irritant.

Respectfully submitted,

Oscar M. Moreno

Oscar M. Moreno, Ph.D.
President
4/05/79



Rabbit Eye Irritation Study
Individual Daily Scores

Material: ADMA 4, Lot #
600-112

Project No: MB 79-3572

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 |
|------------|------|-------------|-------------------------------------|-------|-------|-------|
| 1 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 12 | 10 |
| | | | Totals Added (1 + 2 + 3) | 12 | 12 | 10 |
| 2 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 2 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 12 | 12 |
| | | | Totals Added (1 + 2 + 3) | 12 | 12 | 12 |
| 3 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 2 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 14 | 12 | 12 |
| | | | Totals Added (1 + 2 + 3) | 14 | 12 | 12 |

**Rabbit Eye Irritation Study
Individual Daily Scores**

Material: ADMA 4, Lot # 600-112 Project No: MB 79-3572

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 |
|------------|------|-------------|-------------------------------------|-------|-------|-------|
| 4 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 1 | 1 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 10 | 10 | 10 |
| | | | Totals Added (1 + 2 + 3) | 10 | 10 | 10 |
| 5 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 0 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 1 | 2 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 10 | 12 | 8 |
| | | | Totals Added (1 + 2 + 3) | 10 | 12 | 8 |
| 6 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 12 | 10 |
| | | | Totals Added (1 + 2 + 3) | 12 | 12 | 10 |

0054

SCALE FOR SCORING OCULAR LESIONS**

| | | |
|--|--|--------------------|
| (1) CORNEA | | |
| (A) OPACITY- DEGREE OF DENSITY (AREA MOST DENSE TAKEN FOR READING) | | |
| NO OPACITY | | 0 |
| SCATTERED OR DIFFUSE AREA, DETAILS OF IRIS CLEARLY VISIBLE | | 1* |
| EASILY DISCERNIBLE TRANSLUCENT AREAS, DETAILS OF IRIS SLIGHTLY OBTURED | | 2* |
| OPALESCENT AREAS, NO DETAILS OF IRIS VISIBLE, SIZE OF PUPIL BARELY DISCERNIBLE | | 3* |
| OPAQUE, IRIS INVISIBLE | | 4* |
| (B) AREA OF CORNEA INVOLVED | | |
| ONE QUARTER (OR LESS) BUT NOT ZERO | | 1 |
| GREATER THAN ONE QUARTER, BUT LESS THAN HALF | | 2 |
| GREATER THAN HALF, BUT LESS THAN THREE QUARTERS | | 3 |
| GREATER THAN THREE QUARTERS, UP TO WHOLE AREA | | 4 |
| SCORE EQUALS A x B x 5 | | TOTAL MAXIMUM = 80 |
| (2) IRIS | | |
| (A) VALUES | | |
| NORMAL | | 0 |
| FOLDS ABOVE NORMAL, CONGESTION, SWELLING, CIRCUMCORNEAL INJECTION (ANY OR ALL OF THESE OR COMBINATION OF ANY THEREOF) IRIS STILL REACTING TO LIGHT (SLUGGISH REACTION IS POSITIVE) | | 1* |
| NO REACTION TO LIGHT, HEMORRHAGE, GROSS DESTRUCTION (ANY OR ALL OF THESE) | | 2* |
| SCORE EQUALS A x 5 | | TOTAL MAXIMUM = 10 |
| (3) CONJUNCTIVAE | | |
| (A) REDNESS (REFERS TO PALPEBRAL AND BULBAR CONJUNCTIVAE EXCLUDING CORNEA AND IRIS) | | |
| VESSELS NORMAL | | 0 |
| VESSELS DEFINITELY INJECTED ABOVE NORMAL | | 1 |
| MORE DIFFUSE, DEEPER CRIMSON RED, INDIVIDUAL VESSELS NOT EASILY DISCERNIBLE | | 2* |
| DIFFUSE BEEFY RED | | 3* |
| (B) CHEMOSIS | | |
| NO SWELLING | | 0 |
| ANY SWELLING ABOVE NORMAL (INCLUDES NICTITATING MEMBRANE) | | 1 |
| OBVIOUS SWELLING WITH PARTIAL EVERSION OF LIDS | | 2* |
| SWELLING WITH LIDS ABOUT HALF CLOSED | | 3* |
| SWELLING WITH LIDS ABOUT HALF CLOSED TO COMPLETELY CLOSED | | 4* |
| (C) DISCHARGE | | |
| NO DISCHARGE | | 0 |
| ANY AMOUNT DIFFERENT FROM NORMAL (DOES NOT INCLUDE SMALL AMOUNTS OBSERVED IN INNER CANTHUS OF NORMAL ANIMALS) | | 1 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS JUST ADJACENT TO LIDS | | 2 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS, AND CONSIDERABLE AREA AROUND THE EYE | | 3 |
| SCORE EQUALS (A + B + C) x 2 | | TOTAL MAXIMUM = 20 |

THE MAXIMUM TOTAL SCORE IS THE SUM OF ALL SCORES OBTAINED FOR THE CORNEA, IRIS, AND CONJUNCTIVAE. TOTAL MAXIMUM SCORE POSSIBLE = 110

*AN ANIMAL SHALL BE CONSIDERED AS EXHIBITING A POSITIVE REACTION
 **DRAIZE, J.H., ET AL. J. PHARM. EXP. THER. 82:377-390, 1944

CONCLUSIONS

| | |
|---------------|---------------------------------------|
| NON-IRRITANT | 0 OR 1 RABBIT(S) WITH POSITIVE SCORES |
| INDETERMINATE | 2 OR 3 RABBITS WITH POSITIVE SCORES |
| IRRITANT | 4 TO 6 RABBITS WITH POSITIVE SCORES |

MB Research Laboratories, Inc.

TEST FOR MATERIAL CORROSIVITY IN RABBITS-DOT

FOR: ETHYL CORPORATION

Project number: MB 79-3572

Objective : To identify corrosive materials as defined in 49 CFR 173.240

steinsburg and wentz roads
post office box 203
spinnerstown, pennsylvania 18968
215-536-4110

Test started : 4/11/79
Test ended : 4/13/79

MATERIALS

Sample label : ADMA 4; Lot #600-112
N,N-dimethyl-1-tetradecanamine Sample received: 3/16/79

Description : Clear Liquid

ANIMALS

Supplier(s) : Perfection Breeders Sex : 4 Males
2 Females

New Zealand White rabbits, approximately 8 weeks old when received, were equilibrated for at least one week in this laboratory. Six apparently healthy rabbits were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21° C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Site Preparation - The fur was clipped from the back and sides of the animals. The skin of each animal remained intact.

Treatment - Six rabbits were dosed once dermally at one intact site/animal. 0.5 g (if the material was solid) or 0.5 ml (if the material was liquid) was applied beneath 2.5 cm square gauze patches. The patches were secured with adhesive tape and the trunks were wrapped with impervious material. The test material was kept in contact with the skin for 4 hours, at which time the wrappings were removed.

Observations and Calculations - Dermal reactions were scored at 4, 24 and 48 hours by the Draize scoring system (attached). The skin was evaluated for corrosivity. Corrosivity, as defined in the DOT regulations, is destruction or irreversible alteration of the tissue. Tissue destruction is considered to have occurred if there is ulceration or necrosis. The mean values (6 rabbits) for erythema/eschar and edema on intact skin at 4, 24 and 48 hours (a total of 6 values) were added and divided by 3 to give a modified primary irritation index. If this value was 5 or more, the material was considered to be a primary irritant.

TEST FOR MATERIAL CORROSIVITY IN RABBITS-DOT

Project #: MB 79-3572

Page -2-

Sample #: ADMA 4

RESULTS

INDIVIDUAL SCORES

| | Rabbit Number | | | | | | Mean Score |
|----------|---------------|---|---|---|---|---|------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| Erythema | | | | | | | |
| 4 Hours | 1 | 2 | 1 | 2 | 1 | 1 | 1.33 |
| 24 Hours | 1 | 2 | 2 | 2 | 2 | 4 | 2.17 |
| 48 Hours | 1 | 2 | 2 | 3 | 2 | 4 | 2.33 |
| Edema | | | | | | | |
| 4 Hours | 1 | 2 | 1 | 2 | 1 | 2 | 1.50 |
| 24 Hours | 0 | 1 | 1 | 2 | 1 | 1 | 1.00 |
| 48 Hours | 0 | 2 | 1 | 3 | 1 | 2 | 1.50 |

SUM OF MEAN SCORES = 9.83

MODIFIED PRIMARY IRRITATION INDEX = SUM OF MEAN SCORES/3 = 3.28

CONCLUSION

The test material is; Non-Irritant/Non-Corrosive

SUMMARY OF DATA

Variance in individual erythema scores was noted. However, on the average, erythema scores increased over the observation period.

On the average, edema scores remained very slight to slight over the observation period.

Respectfully submitted,

Oscar M. Moreno
 Oscar M. Moreno, Ph.D. 4/26/79

Jeffrey W. Miller
 Study Director 9/17/79 4/27/79

Elizabeth J. Altobach
 Quality Assurance & Dates of Inspection

Archivist

| | Value |
|--|-------|
| Erythema: No erythema | 0 |
| Very slight erythema (barely perceptible) | 1 |
| Well defined erythema | 2 |
| Moderate to severe erythema | 3 |
| Severe erythema (beet redness) to slight eschar formation (injuries in depth) | 4 |
| Edema : No edema | 0 |
| Very slight edema (barely perceptible) | 1 |
| Slight edema (edges of area well defined by definite raising) | 2 |
| Moderate edema (raised approximately 1 millimeter) | 3 |
| Severe edema (raised more than 1 mm and extending beyond the area of exposure) | 4 |

The raw data is filed at MB Research by project number.
 The final report is filed by sponsor name and project number.



BIOSEARCH, INC. p.o. box 8598 philadelphia, pennsylvania 19101
telephone: (215) 848-4499

Project Number: 80-1892A

Submitted to: Ethyl Corporation
451 Florida Boulevard
Baton Rouge, Louisiana
70801

Material: Ethyl Corporation - ADMA 6 *N,N-dimethyl-1-hexadecanamine*

Sample Received: 1/25/80

Study Initiated: 1/30/80 Study Completed: 2/1/80

Date of Report: 2/8/80

Test: D.O.T. Skin Corrosivity - Rabbits

Object of Test: To determine the skin corrosivity, if any, which the subject material may produce when applied to the intact skin of albino rabbits. The testing was performed in order to classify this material under Title 49CFR-Department of Transportation.

Method of Test: The methods employed in the testing and evaluation were similar to those described in Section 173.240 (a) (1) and Appendix A to that part.

In carrying out the study the experimental sample was used as supplied.

The animals were housed and maintained in compliance with the Animal Welfare Act (Pub. L-94-279) 9 CFR Part 3.

A group of six albino rabbits was clipped over a wide area. A 0.5 gm portion of the material was applied to the skin covering approximately one square inch. Surgical gauze patches measuring not less than 1" x 1" and two single layers thick were then placed over the treated area and an impervious material was wrapped snugly around the trunk of the animal to hold the patch in place.

The wrappings were removed at the end of a four hour contact period and the treated site was examined. The site was then washed with water to avoid continued exposure to the material. Readings were also made after twenty-four and forty-eight hours.

Project Number: 80-1892A

Ethyl Corporation - ADMA 6, D.O.T. Skin Corrosivity Study.

Method of Evaluating: Corrosion was considered to have resulted if the material in contact with the rabbit skin had caused destruction or irreversible alteration of the tissue. Tissue destruction was considered to have occurred if, at any of the readings, there was ulceration or necrosis. Tissue destruction was not considered to have occurred if merely sloughing of the epidermis, erythema, edema or fissuring was evident.

Observations of skin irritation, if any, encountered during the testing of the material were noted and are contained in the table of results as part of this report.

Results: See Table 1.

Conclusion: Based on the accompanying table, the subject material would be classified as corrosive to the skin of albino rabbits within the definition of the Act-Reference: Section 173.240 (a) (1) and Appendix A to that part.

After 48 hours several animals exhibited even greater edema covering 3"-4" in circumference with areas of necrosis.

Karl L. Gabriel

Karl L. Gabriel, V.M.D., Ph.D.
Director

Draize Scale For Scoring Skin Reactions

Erythema and Eschar Formation

| | |
|---------------------------------------|---|
| No erythema | 0 |
| Very slight erythema | 1 |
| Well defined (mild) erythema | 2 |
| Moderate to severe erythema | 3 |
| Severe erythema with eschar formation | 4 |

Edema Formation

| | |
|---|---|
| No edema | 0 |
| Very slight edema | 1 |
| Slight edema (edges well defined) | 2 |
| Moderate edema (Raised 1 mm) | 3 |
| Severe edema (Raised greater than 1 mm) | 4 |

Project Number: 80-1892A

TABLE 1

DOT Skin Corrosivity Study

Material: Ethyl Corporation - ADMA 6, as supplied.

| Rabbit Number | <u>READING TIMES</u> | | |
|------------------|---|--|---|
| | <u>4 Hours</u> | <u>24 Hours</u> | <u>48 Hours</u> |
| 1 | Very slight erythema Very slight edema No corrosion | Very slight erythema Slight edema No corrosion | Moderate erythema Moderate edema No corrosion |
| 2 | Very slight erythema No edema No corrosion | Very slight erythema Slight edema No corrosion | Severe erythema Moderate edema Corrosion |
| 3 | No erythema No edema No corrosion | No erythema Slight edema No corrosion | Moderate erythema Moderate edema Corrosion |
| 4 | Very slight erythema No edema No corrosion | No erythema Very slight edema No corrosion | Mild erythema Severe edema Corrosion |
| 5 | No erythema No edema No corrosion | No erythema Slight edema No corrosion | Severe erythema Moderate edema Corrosion |
| 6 | No erythema No edema No corrosion | No erythema Very slight edema No corrosion | Mild erythema Moderate edema Corrosion |

M B Research Laboratories, Inc.

TEST FOR ORAL TOXICITY IN RATS

FOR: ETHYL CORPORATION

Project Number: MB 79-3573

Objective : To determine oral toxicity
and/or oral LD 50

steinsburg and wentsz roads
post office box 203
spinnerstown, pennsylvania 18968
215-536-4110

Test started: 4/12/79
Test ended : 5/30/79

MATERIALS

Sample label : ADMA 6, Lot #600-118

Sample rec'd.: 3/16/79

Description : Clear Liquid

N,N-dimethyl-1-hydrodecylamine

ANIMALS

Supplier(s) : Ace Animals

Weight range : 200 - 300 g
Sex : 50 Males

Histar rats, at least 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rats were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. Each animal was identified by an indelible body mark.

The animals were housed 5/cage in suspended wire mesh cages (20" x 10" x 7"). Fresh Purina rat chow and water were freely available except for 16-20 hours prior to dosing when food was removed. The animal room reserved exclusively for rodents on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Treatment - The test material was given orally by syringe and 13 gauge blunt end needle. One group of 10 male rats was dosed at 5.0 g/kg initially. Based on the results of the initial dose, 4 additional groups of 10 male rats were dosed at various levels in order to determine the LD 50 of the test material. For liquid materials, the dose was based on the sample weight as calculated from the specific gravity. The vehicle, if any, was chosen because of its lack of known toxicity, lack of physiological effect and because it is relatively unreactive with other chemical substances.

Observations - The rats were observed 3-4 hours after dosing and once daily for 14 days. Mortality, toxicity and pharmacological effects were recorded. Body weights were recorded pretest and in the survivors at 14 days.

Termination - At 14 days the survivors were sacrificed. All animals were examined for gross pathology.

The LD 50 was calculated, if possible, according to the method of Litchfield, J.J. Jr. and F. Wilcoxon (JPET 96:99, 1949).

RESULTSLD 50: 0.62 (0.40 - 0.95) g/kg

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death | | | | |
|------------|--------------|--------------|--------------|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 6 |
| | 0.15 | 0/10 | | | | | |
| | 0.30 | 1/10 | | | 1 | | |
| | 0.60 | 4/10 | | 1 | | 2 | 1 |
| | 1.22 | 10/10 | | 9 | 1 | | |
| | 5.0 | 10/10 | 4 | 6 | | | |

- TOXICITY : @ 0.15 g/kg: All animals survived this dose level. Isolated instances of chromorhinorrhea, lethargy, chromodacryorrhea, ptosis and piloerection were noted. Six animals were normal throughout the observation period.
- @ 0.30 g/kg: One animal died at this dose level on Day 3. Predeath signs included: chromorhinorrhea, diarrhea, lethargy, ataxia, piloerection, chromodacryorrhea and hyperactivity. Diarrhea and chromorhinorrhea were noted in 5 or more animals 3-4 hours post dose. Isolated instances of diarrhea, lethargy, chromorhinorrhea and respiratory noise were sporadically noted on Days 1 thru 10. Nine animals were normal on Days 11 thru 14.
- @ 0.60 g/kg: Four animals died at this dose level. One animal died on Day 2, two animals on Day 4 and one animal on Day 6. Predeath signs in the Day 2 death included: ptosis, lethargy, ataxia and flaccid muscle tone. Predeath signs in the Day 4 deaths included: chromodacryorrhea, chromorhinorrhea, lethargy, ptosis, diarrhea, ataxia, emaciation and piloerection. Predeath signs in the Day 6 death included: lethargy, ptosis, chromorhinorrhea, diarrhea, ataxia, emaciation and piloerection. The surviving animals exhibited signs of piloerection, chromodacryorrhea, diarrhea, chromorhinorrhea, ptosis, ataxia, emaciation and flaccid muscle tone. Six animals were normal on Days 8 thru 14.
- @ 1.22 g/kg: All animals died at this dose level. Nine animals died on Day 2 and one animal on Day 3. Predeath signs included: chromorhinorrhea, ptosis, diarrhea, lethargy, piloerection, ataxia and chromodacryorrhea.
- @ 5.0 g/kg: All animals died at this dose level. Four animals died on Day 1 and six animals on Day 2. Predeath signs included: lethargy, diarrhea, ptosis, chromorhinorrhea, ataxia, chromodacryorrhea, piloerection and tachypnea.

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-3573

Sample #: ADMA 6

BODY WEIGHTS - g:

| @ 0.15 g/kg: | An. # | Day 0 | Day 14 | @ 0.30 g/kg: | An. # | Day 0 | Day 14 |
|--------------|-------|-------|------------|--------------|-------|-------|------------|
| | 41M | 200 | 317 | | 21M | 300 | 406 |
| | 42M | 201 | 301 | | 22M | 288 | 360 |
| | 43M | 218 | 307 | | 23M | 280 | 363 |
| | 44M | 205 | 321 | | 24M | 262 | 371 |
| | 45M | 207 | 342 | | 25M | 253 | 376 |
| | 46M | 200 | 297 | | 26M | 282 | 325 |
| | 47M | 210 | 341 | | 27M | 291 | DEAD DAY 3 |
| | 48M | 209 | 320 | | 28M | 290 | 422 |
| | 49M | 201 | 299 | | 29M | 282 | 357 |
| | 50M | 229 | 348 | | 30M | 298 | 387 |
| @ 0.60 g/kg: | 31M | 251 | DEAD DAY 4 | @ 1.22 g/kg: | 11M | 299 | DEAD DAY 2 |
| | 32M | 272 | 370 | | 12M | 293 | DEAD DAY 2 |
| | 33M | 271 | DEAD DAY 2 | | 13M | 278 | DEAD DAY 2 |
| | 34M | 266 | 374 | | 14M | 300 | DEAD DAY 3 |
| | 35M | 261 | DEAD DAY 4 | | 15M | 299 | DEAD DAY 2 |
| | 36M | 284 | 400 | | 16M | 299 | DEAD DAY 2 |
| | 37M | 257 | 356 | | 17M | 276 | DEAD DAY 2 |
| | 38M | 230 | 350 | | 18M | 300 | DEAD DAY 2 |
| | 39M | 242 | DEAD DAY 6 | | 19M | 298 | DEAD DAY 2 |
| | 40M | 278 | 393 | | 20M | 290 | DEAD DAY 2 |
| @ 5.0 g/kg: | 1M | 268 | DEAD DAY 1 | | | | |
| | 2M | 287 | DEAD DAY 2 | | | | |
| | 3M | 266 | DEAD DAY 1 | | | | |
| | 4M | 247 | DEAD DAY 2 | | | | |
| | 5M | 217 | DEAD DAY 2 | | | | |
| | 6M | 284 | DEAD DAY 1 | | | | |
| | 7M | 296 | DEAD DAY 2 | | | | |
| | 8M | 264 | DEAD DAY 2 | | | | |
| | 9M | 288 | DEAD DAY 1 | | | | |
| | 10M | 256 | DEAD DAY 2 | | | | |

| NECROPSY OBSERVATIONS: g/kg | 0.15 An. with Sign S | 0.30 An. with Sign D S | 0.60 An. with Sign D S | 1.22 An. with Sign D | 5.0 An. with Sign D |
|-----------------------------|-------------------------------|---------------------------------|---------------------------------|-------------------------------|------------------------------|
| Normal | 9 | 8 | 6 | | |
| Exudate, nose/mouth, red | | | | 1 | 2 |
| Exudate, nose/mouth, yellow | | 1 | | 9 | 10 |
| Exudate, anogenital brown | | 1 | 4 | 10 | 10 |
| Intestines, areas red | | | 1 | 1 | |
| Intestines, areas yellow | | | 2 | | |
| * Stomach areas red | | | 2 | 7 | 7 |
| * Liver mottled | | | | | 7 |
| Lungs areas dark | 1 | | 3 | | |
| Kidney mottled | | | | | 4 |
| Spleen small | | | | | 1 |

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-3573

Sample #: ADMA 6

| NECROPSY OBSERVATIONS: g/kg (continued) | 0.15 | | 0.30 | | 0.60 | | 1.22 | | 5.0 | |
|--|---------------|---|---------------|---|---------------|---|---------------|---|---------------|---|
| | An. with Sign | | An. with Sign | | An. with Sign | | An. with Sign | | An. with Sign | |
| | S | D | S | D | S | D | S | D | S | D |
| *Heart dilated | | | | | 3 | | 1 | | 5 | |
| *Intestines gelatinous | | | 1 | | 2 | | 9 | | 8 | |
| Stomach bloated | | | | | 1 | | | | | |
| Fluid in pleural cavity | | | | | 1 | | | | | |
| *Lungs bright red | | | | | | | 9 | | 9 | |
| Spleen mottled | | | | | | | | | 5 | |
| Spleen - tip dark | | | | | | | | | 3 | |
| Spleen pale | | | | | | | | | 1 | |

CODE: D = death, S = sacrifice

CONCLUSION

The test material is toxic but not highly toxic as defined in 16 CFR 1500.3. The test material is not a Class B Poison as defined in 49 CFR 173.343.

SUMMARY OF DATA

24/30 animals died at the three highest dose levels; 0.60, 1.22 and 5.0 g.kg. All animals died at the two highest levels. Significant predeath toxic signs included ptosis, lethargy, ataxia, flaccid muscle tone, chromodacryorrhea, chromorhinorrhea, diarrhea, emaciation, piloerection and tachypnea.

In general, normal body weight changes were noted in the survivors.

Significant necropsy observations in the animals which died included dilated hearts, bright red lungs and gastrointestinal irregularities.

Respectfully submitted,

Oscar M. Moreno
Oscar M. Moreno, Ph.D.

Manuel Moreno
Study Director

John D. Miller 5/31/79 6/19/79
Quality Assurance & Dates of Inspection

Elizabeth J. Altman
Archivist

Submitted: 6/12/79

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

MB Research Laboratories, Inc.

steinsburg and w... roads
post office box 203
spinnerstown, pennsylvania 18968
215-536-4110

TEST FOR EYE IRRITATION

FOR: ETHYL CORPORATION *N,N-dimethyl-1-hexadecanamine*

Project number: MB 79-3573
Sample number : ADMA 6, Lot #600-118
Description : Clear Liquid

Material received: 3/16/79
Test started : 3/27/79
Test ended : 3/30/79

ANIMALS

Six New Zealand white rabbits, approximately .8 to 11 weeks of age. were used. The animals selected were in good health when received from our local supplier and remained in good health during the equilibration period in this laboratory. The rabbits were housed in suspended wire cages in a temperature controlled room reserved exclusively for rabbits on acute tests. Tap water and fresh Purina rabbit chow were freely available. The cages and room were kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member. The eyes of all rabbits selected for testing were free from damage and irritation.

TEST PROCEDURE

One-tenth of a milliliter or 0.1 ml equivalent of the test material was instilled into the conjunctival sac of one eye of each of the 6 rabbits. The lids were held together briefly to insure adequate distribution of the material over the surface of the eye. The untreated eye of each rabbit served as a control. The ocular reactions were graded at 24, 48 and 72 hours after dosing.

The eye irritation potential was determined as defined in 16 CFR 1500.3 and 1500.42.

RESULTS

The individual scores are appended.

CONCLUSION

The test material is an irritant.

Respectfully submitted,

Oscar M. Moreno

Oscar M. Moreno, Ph.D.
President
4/05/79

Rabbit Eye Irritation Study
Individual Daily Scores

Material: ADMA 6, Lot #
600-118

Project No: MB 79-3573

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 |
|------------|------|-------------------------------------|-----------|-------|-------|-------|
| 1 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | (2) Iris Total = (C) x 5 | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 4 | 4 |
| | F | Conjunctiva | Discharge | 3 | 2 | 2 |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | 16 | 14 | 14 |
| | | Totals Added (1 + 2 + 3) | | | 16 | 14 |
| 2 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | (2) Iris Total = (C) x 5 | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 2 | 2 | 2 |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | 14 | 12 | 12 |
| | | Totals Added (1 + 2 + 3) | | | 14 | 12 |
| 3 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | (2) Iris Total = (C) x 5 | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 |
| | F | Conjunctiva | Discharge | 1 | 2 | 1 |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | 10 | 12 | 10 |
| | | Totals Added (1 + 2 + 3) | | | 10 | 12 |

**Rabbit Eye Irritation Study
Individual Daily Scores**

Material: ADMA 5, Lot #
600-118

Project No: MB 79-3573

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 | |
|------------|------|-------------------------------------|-----------|---------|-------|-------|----|
| 4 | A | Cornea | Opacity | 0 | 0 | 0 | |
| | B | Cornea | Area | 0 | 0 | 0 | |
| | | (1) Cornea Total = (AxB)x5 | | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 | |
| | | (2) Iris Total = (C) x 5 | | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 2 | 1 | |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 | |
| | F | Conjunctiva | Discharge | 1 | 2 | 1 | |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | | 12 | 14 | 10 |
| | | Totals Added (1 + 2 + 3) | | | 12 | 14 | 10 |
| | 5 | A | Cornea | Opacity | 0 | 0 | 0 |
| | | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | | 0 | 0 | 0 |
| C | | Iris | | 0 | 0 | 0 | |
| | | (2) Iris Total = (C) x 5 | | | 0 | 0 | 0 |
| D | | Conjunctiva | Redness | 1 | 1 | 1 | |
| E | | Conjunctiva | Chemosis | 3 | 3 | 3 | |
| F | | Conjunctiva | Discharge | 3 | 3 | 2 | |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | | 14 | 14 | 12 |
| | | Totals Added (1 + 2 + 3) | | | 14 | 14 | 12 |
| 6 | | A | Cornea | Opacity | 0 | 0 | 0 |
| | | B | Cornea | Area | 0 | 0 | 0 |
| | | (1) Cornea Total = (AxB)x5 | | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 | |
| | | (2) Iris Total = (C) x 5 | | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 1 | 1 | |
| | E | Conjunctiva | Chemosis | 3 | 3 | 3 | |
| | F | Conjunctiva | Discharge | 2 | 2 | 1 | |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | | 14 | 12 | 10 |
| | | Totals Added (1 + 2 + 3) | | | 14 | 12 | 10 |

SCALE FOR SCORING OCULAR LESIONS**

(1) CORNEA

(A) OPACITY--DEGREE OF DENSITY (AREA MOST DENSE TAKEN FOR READING)

| | |
|--|----|
| NO OPACITY | 0 |
| SCATTERED OR DIFFUSE AREA, DETAILS OF IRIS CLEARLY VISIBLE | 1* |
| EASILY DISCERNIBLE TRANSLUCENT AREAS, DETAILS OF IRIS SLIGHTLY OBSCURED | 2* |
| OPALESCENT AREAS, NO DETAILS OF IRIS VISIBLE, SIZE OF PUPIL BARELY DISCERNIBLE | 3* |
| OPAQUE, IRIS INVISIBLE | 4* |

(B) AREA OF CORNEA INVOLVED

| | |
|---|---|
| ONE QUARTER (OR LESS) BUT NOT ZERO | 1 |
| GREATER THAN ONE QUARTER, BUT LESS THAN HALF | 2 |
| GREATER THAN HALF, BUT LESS THAN THREE QUARTERS | 3 |
| GREATER THAN THREE QUARTERS, UP TO WHOLE AREA | 4 |

SCORE EQUALS A x B x 5 TOTAL MAXIMUM = 80

(2) IRIS

(A) VALUES

| | |
|--|----|
| NORMAL | 0 |
| FOLDS ABOVE NORMAL, CONGESTION, SWELLING, CIRCUMCORNEAL INJECTION (ANY OR ALL OF THESE OR COMBINATION OF ANY THEREOF) IRIS STILL REACTING TO LIGHT (SLUGGISH REACTION IS POSITIVE) | 1* |
| NO REACTION TO LIGHT, HEMORRHAGE, GROSS DESTRUCTION(ANY OR ALL OF THESE) | 2* |

SCORE EQUALS A x 5 TOTAL MAXIMUM = 10

(3) CONJUNCTIVAE

(A) REDNESS(REFERS TO PALPEBRAL AND BULBAR CONJUNCTIVAE EXCLUDING CORNEA AND IRIS)

| | |
|---|----|
| VESSELS NORMAL | 0 |
| VESSELS DEFINITELY INJECTED ABOVE NORMAL | 1 |
| MORE DIFFUSE, DEEPER CRIMSON RED, INDIVIDUAL VESSELS NOT EASILY DISCERNIBLE | 2* |
| DIFFUSE BEEFY RED | 3* |

(B) CHEMOSIS

| | |
|---|----|
| NO SWELLING | 0 |
| ANY SWELLING ABOVE NORMAL(INCLUDES NICTITATING MEMBRANE) | 1 |
| OBVIOUS SWELLING WITH PARTIAL EVERSION OF LIDS | 2* |
| SWELLING WITH LIDS ABOUT HALF CLOSED | 3* |
| SWELLING WITH LIDS ABOUT HALF CLOSED TO COMPLETELY CLOSED | 4* |

(C) DISCHARGE

| | |
|--|---|
| NO DISCHARGE | 0 |
| ANY AMOUNT DIFFERENT FROM NORMAL(DOES NOT INCLUDE SMALL AMOUNTS OBSERVED IN INNER CANTHUS OF NORMAL ANIMALS) | 1 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS JUST ADJACENT TO LIDS | 2 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS, AND CONSIDERABLE AREA AROUND THE EYE | 3 |

SCORE EQUALS (A + B + C) x 2 TOTAL MAXIMUM = 20

THE MAXIMUM TOTAL SCORE IS THE SUM OF ALL SCORES OBTAINED FOR THE CORNEA, IRIS, AND CONJUNCTIVAE. TOTAL MAXIMUM SCORE POSSIBLE = 110

*AN ANIMAL SHALL BE CONSIDERED AS EXHIBITING A POSITIVE REACTION
 **DRAIZE, J.H. ET AL. J. PHARM. EXP. THER. 82:377-390, 1944

CONCLUSIONS

| | |
|---------------|---------------------------------------|
| NON-IRRITANT | 0 OR 1 RABBIT(S) WITH POSITIVE SCORES |
| INDETERMINATE | 2 OR 3 RABBITS WITH POSITIVE SCORES |
| IRRITANT | 4 TO 6 RABBITS WITH POSITIVE SCORES |

GSRI / GULF SOUTH RESEARCH INSTITUTE
ATCHAFALAYA BASIN LABORATORIES
Telephone Area Code 318 365-2411 Post Office Box 1177 New Iberia, Louisiana 70560

April 23, 1981
GSRI Project No. 413-988-46-01
per Letter of Authorization dated 3-6-81

N,N-dimethyl-1-hexanamine

ACUTE DERMAL TOXICITY STUDY IN RABBITS WITH ADMATM-6; LOT NO. 600-139

Submitted to:

Ethyl Corporation
451 Florida Blvd.
Baton Rouge, Louisiana 70801

QAV
RF
4/24/81

Submitted by:

Michael N Pinkerton
Michael N. Pinkerton
Study Director

Approved by:

A. Krishna Reddy
A. Krishna Reddy, Ph.D., D.A.B.T.
Manager, Department of Toxicology

FEDERAL HAZARDOUS SUBSTANCES ACT
ACUTE DERMAL TOXICITY STUDY IN
RABBITS WITH ADMATM-6; LOT NO. 600-139

PURPOSE

The objective of this study was to evaluate the dermal toxicity of ADMATM-6, Lot No. 600-139 following a single dermal exposure to the intact and abraded skin of albino rabbits and to determine the dermal LD₅₀, if possible, as per the protocol presented in Appendix I.

TEST MATERIAL

The test material used in this study was a colorless liquid supplied by Ethyl Corporation and was identified as ADMATM-6, Lot No. 600-139. The test material arrived on March 19, 1981 and the test material and container weighed 1180.17 grams.

METHODS

New Zealand albino rabbits were obtained from Ray Nichols Rabbitry, Lumberton, Texas. The rabbits were individually housed in stainless steel cages, which were elevated above the droppings, in an environmentally controlled room with 10 to 12 air changes per hour. There was a 12 hour light; 12 hour dark illumination cycle. Food consisting of fresh Wayne Feeds Rabbit Ration and tap water from water bottles was available ad libitum. Each rabbit was individually identified by I.D. numbers written inside the ear with indelible ink. Each cage was identified by cage number, animal number, dose level, test material, sex and starting date. Each cage rack was identified by study number.

After a quarantine period of 13 days, four dose level groups, composed of four rabbits (2M:2F), weighing between 2460 grams and 2868 grams were randomly selected for this study using a table of random numbers. The study was initiated on March 31, 1981. The following four dose levels were used for this study: 1.0, 1.995, 3.98, and 7.94 grams per kilogram of animal body weight.

The test sites were prepared 24 hours prior to treatment by clipping the trunk (dorsal, ventral, and lateral sides) of each animal free of hair with an Oster[®] small animal clipper exposing approximately 10.5% of the body surface area. Immediately prior to treatment, all male and female rabbits were further prepared by making longitudinal abrasions with a hypodermic needle two to three centimeters apart over the entire

exposure area. The abrasions were sufficiently deep to penetrate the stratum corneum but not deep enough to produce bleeding. For every animal at each dose level, a single application of undiluted ADMA™-6, Lot No. 600-139 was introduced by syringe injection under a sleeve of impervious, nonreactive plastic (2 mils thick) at the posterior end of the sleeve. The anterior end of the sleeve was secured with Johnson and Johnson Zonas® porous adhesive tape. The test material was applied, and the posterior end was secured with Johnson and Johnson Zonas® porous adhesive tape. The trunk of the animal was then gently massaged to spread the test material evenly over the exposure area. Additionally, a protective outer covering of white cotton towel (15 cm X 45 cm) was wrapped around the plastic sleeve and secured in place with Johnson and Johnson Zonas® porous adhesive tape.

After treatment the animals were returned to their respective cages for the 24 hour exposure period. At the end of the exposure period, the occlusive wrap was removed and any unabsorbed test material was estimated. The animals were scored for erythema and edema reactions according to the Federal Hazardous Substances Act Grading Code at 16 CFR 1500.41 (Table 1). The exposure area was cleaned by wiping with a moistened sponge. The animals were observed several times during the treatment day and daily thereafter for a total of 14 days. Observations were taken for the nature, onset, severity and duration of all visible signs of systemic toxicity and times of death. Body weights were taken on the day of treatment (day 0) as well as day 1, 7 and 14. At the end of the 14 day test period all surviving rabbits were killed using a euthanasia solution and necropsies were performed. The study was terminated on April 14, 1981. All raw data collected from the conduct of this study are presented in Appendix II.

The raw data and a copy of the final report will be stored in the GSRI archives, or its location will be indicated in the GSRI archives.

RESULTS

During the course of this study 8/16 animals (1 rabbit @ 1.0g/kg; 1 rabbit @ 1.995g/kg; 3 rabbits @ 3.98g/kg; 3 rabbits @ 7.94g/kg dose levels) exhibited a weakened and sluggish condition. One rabbit of the weakened group (3.98g/kg dose level) exhibited a slight nasal discharge.

In addition, four rabbits of the weakened group (2 rabbits @ 3.98g/kg and 2 rabbits @ 7.94g/kg dose levels) exhibited slight paralysis of the rear legs. All other rabbits exhibited no abnormal behavior or general appearance during the conduct of this study.

Mortality was noted in 3/16 rabbits (male B8163 @ 3.98g/kg; female B8156 @ 3.98g/kg; male B8175 @ 7.94g/kg dose levels) during the conduct of this study.

Necropsies performed on early death animals exhibited the following:

Male B8163, 3.98g/kg: Animal emaciated;
urinary bladder: filled with
yellowish (semi-firm) exudate.

Female B8156, 3.98g/kg: Heart: approximately 1.5 times normal
size.

Male B8175, 7.94g/kg: Animal emaciated: No other abnormalities
noted.

At Day 0 (approximately 4 hours after dosing) no leakage of ADMATM-6; Lot No. 600-139 was noted. Upon removal of bandages at study Day 1 no test material was noted to be unabsorbed.

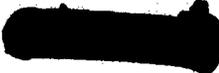
In general all rabbits exhibited a body weight loss (Index at Day 0 of study) at study Day 1, 7, and 14.

Necropsies performed on all surviving rabbits exhibited a thick scab formation at the site of application. No other abnormalities were noted.

SUMMARY AND CONCLUSIONS

Due to the mortality ratio exhibited in this study an LD₅₀ value cannot be calculated by the method described in the attached protocol (Appendix I). However, since there was no mortality noted at the 1.995g/kg dose level ADMATM-6; Lot No. 600-139 is not classified as toxic when applied dermally to the intact and abraded skin of albino rabbits according to the Federal Hazardous Substances Act Regulations of the Consumer Product Safety Commission (CPSC) at 16 CFR 1500.3.

Ethyl Corporation
413-988-46-01

 23 81

Performed by:


Project Leader

4/23/81

Date

Submitted by:

Michael N. Pankerton
Study Director

4/23/81

Date

Approved by:


Toxicologist

4/23/81

Date

Table 1
EVALUATION OF SKIN REACTIONS

Federal Hazardous Substance Act Grading Code*

Erythema and Eschar Formation

- 0 No erythema
- 1 Very slight erythema (barely perceptible)
- 2 Well-defined erythema
- 3 Moderate to severe erythema
- 4 Severe erythema (beet redness) to slight eschar formation (injuries in depth)

Edema Formation

- 0 No edema
- 1 Very slight edema (barely perceptible)
- 2 Slight edema (edges of area well-defined by definite raising)
- 3 Moderate edema (raised approximately 1 millimeter)
- 4 Severe edema (raised more than 1 millimeter and extending beyond the area of exposure)

*The Federal Hazardous Substances Act Grading Code is found at 16 CFR 1500.41.

APPENDIX I

ACUTE DERMAL TOXICITY STUDY IN ALBINO RABBITS WITH
ADMA-6 (LOT NO. 600-139)

PURPOSE: To evaluate the single-dose dermal toxicity and/or to determine the dermal LD₅₀ of the test material by the criteria of the Federal Hazardous Substances Act (FHSA) Regulations of the Consumer Product Safety Commission (CPSC) at 16 CFR 1500.40 (1973).

PROTOCOL NO.: A04 FHSA 81 - E (single dose)
 X A03 FHSA 81 - E (LD₅₀)

PROJECT NO.: 413-988-46-01

SPONSOR: Ethyl Corporation, 451 Florida Boulevard, Baton Rouge, Louisiana, 70801.

FACILITY CONDUCTING STUDY: Department of Toxicology, Life Sciences Division, Gulf South Research Institute, New Iberia, Louisiana, 70560.

PERSONNEL:

Study Director: Mr. Michael N. Pinkerton
Toxicologist: Dr. A. Krishna Reddy
Project Leader: Mr. Mark S. DeRouen
Prosecutor: Mr. Mark S. DeRouen
Quality Assurance: ~~Ms. Judy Novak~~ * MR Warren Hebert
3/31/81

TEST MATERIAL: ADMATM-6, LOT NO. 600-139 MSD

TEST SPECIES: New Zealand Albino rabbits

ANIMAL SUPPLIER: B&D Commercial Rabbitry, Malvern, Arkansas
 Camm, Wayne, New Jersey
 X Ray Nichols Rabbitry, Lumberton, Texas

DIET ANALYSIS: X The study director has determined on the basis of the available evidence that no analysis for feed and water contaminants is necessary.

 The study director has determined that an analysis for feed and water contaminants is necessary for the following reasons:
Acceptable contaminant levels will be given in a protocol amendment.

ROUTE OF ADMINISTRATION: Dermal application

REGULATORY AGENCY: X This study will probably not be submitted to a regulatory agency.
 This study will probably be submitted to a regulatory agency.

STUDY DATES: Proposed _____ to _____
Actual 3/31/81 to 4/14/81

00112

PROTOCOL CHANGES OR REVISIONS: Any deviation or change in this protocol will be fully documented on the raw data, including the reason for the change, the authority of said change, and the date thereof. The revisions will be reported to the sponsor and will be maintained with the protocol for the study. Similarly the sponsor will be notified as soon as it is practical whenever an event occurs that is unexpected and may have an effect on the validity of the study.

Approval:

Patricia H Weir
Sponsor

2/6/81
Date

Michael N Pinkerton
Study Director

2/2/81
Date

I. MATERIALS AND METHODS

A. Test Materials

1. Properties: Physico-chemical properties of the test material that are relevant to the dosage preparation such as stability, solubility and flammability characteristics, if known, should be provided by the sponsor. Basic information on appropriate storage and disposal conditions, precautions during handling and any information available on the hazards of the material should be provided by the sponsor.

Upon receipt of the test material, GSRI's project personnel will document the receipt of test material and record a description of physical properties such as color, consistency, and other characteristics and note the description on the container label. GSRI project personnel will also document in the project files the actual amount of test material received or, where it is not feasible, some approximation as to the amount.

2. Storage: The test material will be stored under conditions specified by the sponsor.

3. Dosage Preparation: The test material may be prepared into an appropriate dosage form as advised by the sponsor.

4. Disposal: Unused portions of the test material will be disposed of as recommended by the sponsor or returned to the sponsor, as requested.

B. Animal Husbandry

1. Test Animals: Number of Animals:

A. Trial Test - 10

B. Actual Test - 16

Number of Test Groups:

A. Trial Test - 1

B. Actual Test - 4

Number of Animals/Group:

A. Trial Test - 10 (5M:5F)

B. Actual Test - 4 (2M:2F)

Species: Rabbit

Strain: New Zealand Albino

Age: Young adults at least 8 weeks old

0065



Weight: 2.3-3.0 kg

Supplier: B&D Commercial Rabbitry
Malvern, Arkansas;

Camm
Wayne, New Jersey

Ray Nichols Rabbitry, Lumberton,
Texas

Transport: ~~Air transportation to Lafayette~~
~~airport~~; air conditioned van to GSRI,
New Iberia, La.

2. Rationale for Test Species Selection: The young adult albino rabbit of both sexes is the species recommended by the CPSC for acute dermal toxicity studies according to 16 CFR 1500.3 (1973).

3. Quarantine: The test animals will be quarantined a minimum of seven days to establish adequate health criteria and for acclimation to the housing facility. The rabbits determined to be in suitable health and released from quarantine by the colony veterinarian will be used in the study.

4. Group Assignment: The animals will be assigned to the various treatment groups in a manner that minimizes bias by using a table of random numbers.

5. Identification: Each animal will be individually identified by I.D. numbers written inside the ear with indelible ink. Each cage will be identified by animal number, sex, type of test, chemical name, dose, and date started. Each cage rack will be identified by the study number.

6. Food and Water: Throughout the quarantine and test periods fresh Wayne Feeds Rabbit Ration and tap water from water bottles will be made available ad libitum. Water and feed containers will be checked daily and refilled if necessary. Two times per week the water and feed containers will be completely emptied and freshly cleaned containers filled with fresh tap water and feed will be placed in the cage.

7. Housing: Animals will be individually housed in stainless steel cages, which are elevated above the droppings, in an environmentally controlled room. There will be a 12 hour light: 12 hour dark illumination

cycle. The cages will be cleaned twice a week and cage racks will be cleaned biweekly. The room and cages will be maintained in accordance with the standards of the American Association for Accreditation of Laboratory Animal Care (AAALAC). The animals will be handled in accordance with the guidelines set forth in the "Guide for the Care and Use of Laboratory Animals," DHEW Publication No. (NIH) 78-23.

II. EXPERIMENTAL DESIGN

A. Dose Levels and Groups

1. A trial test will be conducted using five animals per sex by administering a single dose of the test material at 2.0 g/kg. If the results of this test reveal that the LD_{50} of the test material is greater than 2.0 g/kg no further testing will be undertaken at other dose levels. If mortality is produced, a final test will be conducted to determine the LD_{50} .

2. In a final test aimed at determining the LD_{50} , the test material will be administered in a single dose on a g/kg of body weight basis at 4 dose levels to groups of 4 animals (2M:2F) each. Dose levels may be chosen by consultation with the sponsor based on any background toxicity information on the test material and/or a range finding study. At least one dose will exceed the expected LD_{50} and at least one dose will be less than the expected LD_{50} , if possible. Dose levels will be spaced appropriately so as to produce test groups with a mortality rate between 10 percent and 90 percent and to permit the calculation of the LD_{50} with a 95 percent confidence interval.

B. Test Material Preparation

If the test material is a liquid, it will be applied neat. If the test material is a solid, it will be slightly moistened with physiological saline (0.9% NaCl, w/v) and applied as a moistened solid or paste. If the test material is a finely divided powder, it will be used neat.

C. Test Site Preparation

At least 24 hours prior to dosing, the trunk (dorsal, ventral and lateral sides) of each test animal will be clipped free of hair to expose at least 10% of the body surface area.

Immediately prior to dosing, one-half of the test animals in each dose group will be further prepared by abrading the intact skin of the test site with a hypodermic needle. The abrasions will be approximately

2-3 cm apart and will run the length of the prepared site. The abrasions will be sufficiently deep to penetrate the stratum corneum but not deep enough to produce bleeding.

D. Route of Administration

One group of ten rabbits (5M:5F) or four groups of four rabbits (2M:2F) will be administered the test material at room temperature by dermal application. A sleeve of impervious nonreactive material (such as plastic, 2 mils thick) will be used to hold the test material in contact with the skin, to retard evaporation of volatile substances, and to prevent ingestion of the test material.

In the case of liquids, the sleeve will be constructed to fit snugly around the trunk of the animal, the anterior edge of the sleeve will be secured in place by Johnson & Johnson Zonas[®] porous tape, the test solution will be applied by syringe to the bare skin under the sleeve, the posterior edge of the sleeve will be secured and the trunk of the animal will be gently massaged to spread the test material evenly over the exposure area. A white cotton towel (15 cm x 45 cm) will then be wrapped over the plastic and secured with Johnson & Johnson Zonas[®] porous tape.

In the case of materials that readily adhere to the skin, the test material will be applied to the exposure area and the trunk then wrapped as above.

In the case of solids, the test material will be applied evenly as a paste over the exposure area and the trunk then wrapped as above. In the case of finely divided powders, the test material will be evenly distributed on cotton gauze which will then be secured to the exposure area. The trunk will then be wrapped as above.

Any leakage during the first few hours will be collected and reapplied. This route is selected because accidental human exposure will be dermal contact and absorption.

E. Grading of Response

Twenty four (24) hours after dosing the wrappings will be removed, the percentage of material remaining (if any) estimated by volume or weight and the skin reactions recorded according to the Federal Hazardous Substances Act Grading Code at 16 CFR 1500.41. The exposure area will then be cleaned by thorough wiping with a moistened sponge.

F. Observations

1. Recording of Data: All raw data will be recorded promptly in ink on prepared data sheets and will be signed and dated by the Project Technician. Any changes to be made on the original data will be crossed with a single line so as not to obscure the original entry, and initialed and dated. An explanation will be provided for the correction.

2. Recording Schedule: The animals will be observed several times during the treatment day and daily thereafter for a total of 14 days. At the end of 24 hours after dosing, the test animals will be scored for dermal reactions (erythema and edema). The nature, onset, severity and duration of all visible signs of toxicity and the time of death after dosing will be recorded.

G. Body Weights

Body weights will be recorded immediately before administration of the test material and at 1, 7, and 14 days post administration.

H. Termination and Necropsy

At the end of the 14 day observation period the surviving rabbits will be killed by a euthanasia agent. A necropsy will be conducted on each animal at the time of death or, in the case of survivors, on day 14. All gross abnormalities will be recorded.

III. DATA EVALUATION

The acute dermal LD₅₀ and its 95 percent confidence interval will be calculated from the mortality data using the methods of Litchfield and Wilcoxon (1), Weil (2) or Reed and Muench (3).

IV. FINAL REPORT

The final report will contain in detail a complete description of the experimental design, any abnormal appearance and behavior of the test animals, body weights, mortality data, gross pathological findings, statistical methods, interpretation of the data, and conclusions. Raw data and the protocol will be appended to the report.

V. QUALITY ASSURANCE

A. Reviews

The Quality Assurance Unit will review the study at least once during the experimental phase and will review all original and calculated data, along with the study report, before submission of the final report to the sponsor to assure that all procedures used in the conduct of this

study are in compliance with the "Good Laboratory Practices Regulations" of FDA as published in the Federal Register, Vol. 43, No. 247, December 22, 1978.

B. Archives

All raw data and a copy of the final report will be stored in the GSRI archives, or its location will be indicated in the GSRI archives, for a period of at least five years following submission of the final report to a government regulatory agency by the sponsor.

VI. EMERGENCY PROCEDURES

To protect the health of project personnel, emergency safety and health procedures will be developed on the basis of any hazard/toxicity data, such as the chemical class or type, furnished by the sponsor.

VII. REFERENCES

- (1) Litchfield, Jr., J.T. and Wilcoxon, F., J. Pharmacol. Exp. Therap. 96:99-115, 1949.
- (2) Weil, C.S., Biometrics 8:249-263, 1952.
- (3) Reed, L.J. and Muench, H. Am. J. Hygiene 27:493-497, 1938.

APPENDIX II

Project No: 413-988-46-01 Sponsor: Ethyl Protocol No: A03 FHS 81-E (LD₅₀)

Test Material: ADMATM-6 (LOT NO. 600-139) Species: Rabbit: New Zealand Albino

Physical Properties: colorless liquid No. of Animals ordered: 28 M: 28 F 10 wks old
Age/Weight/Date of Birth: 1909-2009

Specific Gravity: 0.797 g/cc Date of Animal Order: 3/11/81

Date of Chemical Receipt: 3/19/81 Date of Animal Receipt: 3/17/81

Weight of Container and Test Material: 1180.17 g/cc Quarantine Dates: 3/17/81 - 3/30/81

grams ^{corrected} _{MSD 3/31/81} Study Dates: 3/31/81 - 4/14/81

Number of Animals Selected for Test: 8 M: 8 F

Age/Weight at the Beginning of Test: 2460 - 2868

Building & Room No: 27: 10

Date and Means of Study Authorization: Letter received 2/26/81

Sponsor's Study Director: Patricia Weir

GSRI Study Director: Michael N. Pinkerton

Project Technician: Mark S. DeRouen

Animal Care Staff: Silverius Maloney

Dose Preparation Calculations:
$$\text{Dose (cc)} = \frac{\text{wt. of animal (kg)}}{\text{specific gravity (0.797 g/cc)}} \times \text{dose level (g/kg)}$$

Animals were shaved 24 hours prior to dosing with Oster[®] animal clippers (≈ 10% around trunk) MSD 3/30/81

Deviations from Protocol:

Mr. Warren Hebert was the QA representative instead of T. J. Hawk. MSD 2/31/81

ACUTE DERMAL TOXICITY
DAILY OBSERVATION RECORD

Date } 3/31/81
Bosed } 11:20 AM

ADMA-6 (LOT. NO. 600-13)

Project No.: 413-988-46-01

Sponsor: Ethyl

Test Material: YB

| Sex | Animal No. | Dose g/tra | Dose cc | Pharmacotoxic Signs | | | | | | | Body Weights | | AT NECESSARY | | | | |
|-----|------------|-------------|-------------|---------------------|------------|------------|------------|------------|------------|------------|--------------|------------|--------------|------------|------------|------------|----------------------------|
| | | | | Study Day | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Reactions | Study Day | 0 | 1 |
| M | B3143 | 1.0 | 3.09 | N | N | N | N | N | N | N | N | N | 2/4 | 2440 | 2397 | 2244 | |
| M | B8161 | 1.0 | 3.38 | N | N | AAA | AAA | AAA | AAA | AAA | AAA | AAA | 2/4 | 2690 | 2569 | 2286 | |
| F | B8144 | 1.0 | 3.30 | N | N | N | N | N | N | N | N | N | 2/4 | 2518 | 2540 | 2385 | MSD 4/16 |
| F | B8184 | 1.0 | 3.46 | N | N | N | N | N | N | N | N | N | 2/4 | 2758 | 2649 | 2416 | Entered Laboratory 2/25/81 |
| M | B8141 | 1.995 | 7.18 | N | N | N | N | N | N | N | N | N | 2/4 | 2868 | 2156 | 2599 | Corrected MSD 4/26 |
| M | B8167 | 1.995 | 7.01 | N | N | N | N | N | N | N | N | N | 2/4 | 2800 | 2611 | 2532 | |
| F | B8162 | 1.995 | 6.86 | N | N | N | N | N | N | N | N | N | 2/4 | 2741 | 2598 | 2489 | |
| F | B8148 | 1.995 | 6.68 | N | N | N | N | AAA | AAA | AAA | AAA | AAA | 2/4 | 2670 | 2472 | 2150 | |
| MSD | B3141 | MSD 3/31/81 | MSD 3/31/81 | MSD 3/31/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 |
| MSD | B3142 | MSD 3/31/81 | MSD 3/31/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 | MSD 4/1/81 |

Observations/Date

Observations Used: A/B erythema/edema

* abraded

MSD: Michael N. Pinkerton
MSD: M. DeKoven

N: no abnormalities (general appearance/behavior)

MSD: Alice N. Pinkerton

sluggish / weakened
MS = Michael DeLuca
slight paralysis of rear legs

DAY 0: No leakage noted MSD 3/31/81

DAY 1: No amt. of test material was noted to be unabsorbed MSD 4/1/81

ACUTE DERMAL TOXICITY
DAILY OBSERVATION RECORD

Date }
Dosed } 3/21/81 11:20AM

Project No.: 413-988-46-01 Sponsor: Ethylg Test Material: ADMA-6 [Lot # 600-137]

| Sex | Animal No. | DOSE g/kg | Dose Cc | Pharmacotoxic Signs | | | | | | | | | | Body Weights (g) | | | |
|-----|------------|-----------|---------|---------------------|----------|-------|--------------|-----|---------|--------------|----------|-----|----------|------------------|--------|-----|--------|
| | | | | 8 | 9 | 10 | Study Day 12 | 13 | 14 | Study Day At | Mcropsy | | | | | | |
| M | B8143* | 1.0 | 3.09 | N/S | N/S | N/S | N/P | N/S | N/S | N/S | N/S | N/S | | | 2270 | | |
| M | B8161 | 1.0 | 3.38 | AAA/S | AAA/S | AAA/S | AAA/S | N/S | N/S | N/S | N/S | N/S | | | 2240 | | |
| F | B8144* | 1.0 | 3.20 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | | | 2409 | | |
| F | B8184 | 1.0 | 3.46 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | | | 2555 | | |
| M | B8141* | 1.995 | 7.18 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | | | 2523 | | |
| M | B8167 | 1.995 | 7.01 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | | | 2661 | | |
| F | B8162* | 1.995 | 6.86 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | | | 2560 | | |
| F | B8148 | 1.995 | 6.68 | AAA/S | AAA/S | AAA/S | AAA/S | N/S | N/S | N/S | N/S | N/S | | | 2345 | | |
| MSD | 3/21/81 | MSP | 3/21/81 | MSP | 4/1/81 | MSP | 4/1/81 | MSP | 4/1/81 | MSP | 4/1/81 | MSP | 4/1/81 | MSP | 4/1/81 | MSP | 4/1/81 |
| MSP | 2/21/81 | MSP | 2/21/81 | MSP | 11:30 AM | MSP | 6:00 PM | MSP | 2:20 AM | MSP | 11:25 PM | MSP | 11:00 AM | MSP | 4/1/81 | MSP | 4/1/81 |

Initials/Date

Revisions Used:

* Aborted
 AAA: Intact
 AA: Mild
 A: Moderate
 P: Severe
 N: No abnormalities
 AAA: Sluggish, weakened (slight)
 AA: Sluggish, weakened: nasal discharge
 P: Slight paralysis of rear legs
 S: Slight formation at site of application

ACUTE DERMAL TOXICITY
DAILY OBSERVATION RECORD

Date Dosed 3/31/81 11:20 AM

Project No.: 413-988-46-01

Sponsor: Ethyl

Test Material: ADMA-6 (Lot No. 600-174)

Body Heights (g)
Study Day At Necropsy

Pharmacotoxic Signs

| Sex | Animal No. | DOSE g/kg | Dose CC | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Body Height (g) |
|-----|------------|-----------|---------|--------|--------|--------|-----|-----|-----|-----|-----------------------------|
| ✓ | B8163 | 3.98 | 13.69 | DIED | X | X | X | X | X | X | 1670g ^{MSD} 7/4/81 |
| ✓ | B8171 | 3.98 | 13.52 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | 2489 |
| ✓ | B8156 | 3.98 | 13.81 | AAAP/S | DIED | X | X | X | X | X | 1860g ^{MSD} 7/5/81 |
| ✓ | B8172 | 3.98 | 12.53 | AAAP/S | AAAP/S | AAAP/S | N/S | N/S | N/S | N/S | 2382 |
| ✓ | B8173 | 7.94 | 26.43 | AAAP/S | N/S | N/S | N/S | N/S | N/S | N/S | 2348 |
| ✓ | B8175 | 7.94 | 25.20 | AAAP/S | AAAP/S | DIED | X | X | X | X | 1459g ^{MSD} 7/4/81 |
| ✓ | B8174 | 7.94 | 27.44 | N/S | N/S | N/S | N/S | N/S | N/S | N/S | 2346 |
| ✓ | B8176 | 7.94 | 26.97 | AAAP/S | AAAP/S | AAAP/S | N/S | N/S | N/S | N/S | 1962 |
| MSD | 3/31/81 | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD |
| MSD | 3/31/81 | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD |
| MSD | 3/31/81 | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD |

Observations Used:

x abraded
 MSB: Michael A. Spinkerton
 MSB: Mark S. DeLuna
 abnormalities (general appearance/behavior)
 MSB: weakened; nasal discharge
 MSB: weakened
 MSB: weakened
 slight paralysis of rear legs
 scab formation at site of application

Observations Used: x abraded
 Date: No leakage was noted MSD 3/31/81
 DMI: No ant. of test material was noted to be unabsorbed 4/1/81



QUALITY ASSURANCE UNIT REPORT
Project No. 413-938-46-01

The study entitled "Acute Dermal Toxicity Study in Rabbits With
ADMATM-6; Lot No. 600-139" on the
test material ADMATM-6; Lot No. 600-139 was conducted in
accordance with the criteria that are described in Protocol No.
A03-FHSA 81-E(4) and FHSA guidelines. The
study was also conducted in strict compliance with Food and Drug Admini-
stration Good Laboratory Practices, which are described in 21CFR 58.1-58.195.

The study was inspected on March 31, 1981 (study day(s) 0).
The final report (28 pages) was subjected to intense scrutiny by the
Quality Assurance Unit for accuracy and inclusion of information, adherence
to protocol, presentation of data, interpretations and conclusions.

GSRI sincerely believes that this study was conducted in accordance
with the best possible professional standards, and the reliability of
the results are hereby certified.

Waven P. Helst, Jr.
Quality Assurance Unit

4-23-81
Date

MBR Research Laboratories, Inc.

TEST FOR ORAL TOXICITY IN RATS

FOR: ETHYL CORPORATION

Project Number: MB 79-4334

Objective : To determine oral toxicity and/c oral LD 50

steinsburg and waltz roads
post office box 205
spinnerstown, pennsylvania 18968
215-536-4110

Test started: 2/11/80
Test ended : 2/11/80

MATERIALS

Sample label : ADMA-8 *N,N-dimethyl-1-octadecanamine*
Sample rec'd.: 12/21/79

Description : Clear Liquid, Specific Gravity = 0.90

ANIMALS

Supplier(s) : Ace Animals

Weight range : 200 - 298 g
Sex : 60 Males

Wistar rats, at least 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rats were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. Each animal was identified by an indelible body mark.

The animals were housed 5/cage in suspended wire mesh cages (20" x 19" x 7"). Fresh Purina rat chow and water were freely available except for 16-20 hours prior to dosing when food was removed. The animal room reserved exclusively for rodents on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Treatment - The test material was given orally by syringe and 18 gauge blunt end needle. One group of 10 male rats was dosed at 5.0 g/kg initially. Based on the results of the initial dose, five additional groups of 10 male rats were dosed at various levels in order to determine the LD 50 of the test material. For liquid materials, the dose was based on the sample weight as calculated from the specific gravity. The vehicle, if any, was chosen because of its lack of known toxicity, lack of physiological effect and because it is relatively unreactive with other chemical substances.

Observations - The rats were observed 3-4 hours after dosing and once daily for 14 days. Mortality, toxicity and pharmacological effects were recorded. Body weights were recorded pretest and in the survivors at 14 days.

Termination - At 14 days the survivors were sacrificed. All animals were examined for gross pathology.

The LD 50 was calculated, if possible, according to the method of Litchfield, D.T. Jr. and F. Wilcoxon, JPET 96:99, 1949.



TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-4334

Sample #: ADMA-8

RESULTS

LD 50: 1.23 (1.08 - 1.40) g/kg of body weight

SLOPE: $\frac{LD\ 84/LD\ 50 + LD\ 50/LD\ 16}{2} = 1.245$

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death | | | | | | | |
|------------|--------------|--------------|--------------|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| | 0.96 | 3/10 | | | | 2 | | | 1 | |
| | 1.22 | 3/10 | | 1 | | | | 1 | 1 | |
| | 1.54 | 10/10 | 1 | 3 | 2 | 3 | 1 | | | |
| | 1.95 | 10/10 | | 5 | 4 | | | | 1 | |
| | 3.12 | 10/10 | 1 | 6 | 3 | | | | | |
| | 5.0 | 10/10 | 1 | 6 | 2 | | | | | 1 |

BODY WEIGHTS AND DOSE VOLUME:

| @ 0.96 g/kg: | An. # & Sex | Dose Volume cc | Day 0 | Day 14 |
|--------------|----------------|-------------------|-------|------------|
| | 51-M | 0.29 | 273 | 350 |
| | 52-M | 0.28 | 267 | DEAD DAY 4 |
| | 53-M | 0.28 | 264 | DEAD DAY 4 |
| | 54-M | 0.27 | 254 | DEAD DAY 6 |
| | 55-M | 0.26 | 248 | 407 |
| | 56-M | 0.29 | 268 | 365 |
| | 57-M | 0.31 | 288 | 368 |
| | 58-M | 0.30 | 281 | 388 |
| | 59-M | 0.30 | 277 | 355 |
| | 60-M | 0.32 | 298 | 343 |
| | MEAN | | 271.8 | 368.0 |
| | S.D. | | 15.1 | 22.5 |
| @ 1.22 g/kg: | 41-M | 0.30 | 217 | 284 |
| | 42-M | 0.28 | 206 | 238 |
| | 43-M | 0.30 | 224 | 318 |
| | 44-M | 0.31 | 228 | 299 |
| | 45-M | 0.33 | 241 | 324 |
| | 46-M | 0.32 | 236 | 299 |
| | 47-M | 0.32 | 239 | DEAD DAY 2 |
| | 48-M | 0.31 | 231 | DEAD DAY 5 |
| | 49-M | 0.32 | 237 | 343 |
| | 50-M | 0.31 | 227 | DEAD DAY 5 |
| | MEAN | | 228.8 | 310.3 |
| | S.D. | | 11.0 | 23.3 |
| @ 1.54 g/kg: | 31-M | 0.35 | 207 | DEAD DAY 4 |
| | 32-M | 0.36 | 209 | DEAD DAY 1 |
| | 33-M | 0.37 | 216 | DEAD DAY 2 |
| | 34-M | 0.34 | 200 | DEAD DAY 4 |
| | 35-M | 0.36 | 209 | DEAD DAY 2 |
| | 36-M | 0.38 | 225 | DEAD DAY 5 |
| | 37-M | 0.36 | 213 | DEAD DAY 3 |
| | 38-M | 0.34 | 200 | DEAD DAY 4 |
| | 39-M | 0.44 | 257 | DEAD DAY 3 |
| | 40-M | 0.36 | 210 | DEAD DAY 2 |
| | MEAN | | 214.6 | |

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-4334

Sample #: ADMA-8

BODY WEIGHTS AND DOSE VOLUME (cont'd):

| @ 1.95 g/kg: | An. # & Sex | Dose Volume cc | Day 0 | Day 14 |
|--------------|----------------|-------------------|-------|------------|
| | 21-M | 0.43 | 200 | DEAD DAY 3 |
| | 22-M | 0.43 | 200 | DEAD DAY 6 |
| | 23-M | 0.44 | 202 | DEAD DAY 3 |
| | 24-M | 0.46 | 212 | DEAD DAY 2 |
| | 25-M | 0.46 | 214 | DEAD DAY 2 |
| | 26-M | 0.52 | 239 | DEAD DAY 2 |
| | 27-M | 0.45 | 209 | DEAD DAY 3 |
| | 28-M | 0.43 | 200 | DEAD DAY 3 |
| | 29-M | 0.44 | 201 | DEAD DAY 2 |
| | 30-M | 0.43 | 200 | DEAD DAY 2 |
| | MEAN | | 207.7 | |
| | S.D. | | 12.3 | |
| @ 3.12 g/kg: | 11-M | 0.78 | 226 | DEAD DAY 1 |
| | 12-M | 0.87 | 250 | DEAD DAY 3 |
| | 13-M | 0.82 | 235 | DEAD DAY 2 |
| | 14-M | 0.72 | 207 | DEAD DAY 2 |
| | 15-M | 0.69 | 200 | DEAD DAY 2 |
| | 16-M | 0.75 | 216 | DEAD DAY 3 |
| | 17-M | 0.71 | 205 | DEAD DAY 2 |
| | 18-M | 0.76 | 219 | DEAD DAY 2 |
| | 19-M | 0.84 | 241 | DEAD DAY 3 |
| | 20-M | 0.69 | 200 | DEAD DAY 2 |
| | MEAN | | 219.9 | |
| | S.D. | | 17.7 | |
| @ 5.0 g/kg: | 1-M | 1.11 | 200 | DEAD DAY 2 |
| | 2-M | 1.20 | 215 | DEAD DAY 1 |
| | 3-M | 1.27 | 228 | DEAD DAY 2 |
| | 4-M | 1.17 | 210 | DEAD DAY 3 |
| | 5-M | 1.43 | 257 | DEAD DAY 2 |
| | 6-M | 1.31 | 236 | DEAD DAY 7 |
| | 7-M | 1.14 | 205 | DEAD DAY 2 |
| | 8-M | 1.26 | 227 | DEAD DAY 3 |
| | 9-M | 1.25 | 224 | DEAD DAY 2 |
| | 10-M | 1.16 | 209 | DEAD DAY 2 |
| | MEAN | | 221.1 | |
| | S.D. | | 17.0 | |

S.D. = Standard Deviation

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-4334

Sample #: ADMA-8

T O X I C S I G N S

| An. # & Sex | HOUR | DAY | T O X I C S I G N S | | | | | | | | | | | | | | | | |
|-------------|------|-------|---------------------|--------|---|---|---|---|---|---|---|----|----|----|----|----|--|--|--|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | |
| 31-M | BD | BD | WEBDL | WEBDLJ | Z | | | | | | | | | | | | | | |
| 32-M | BD | Z | | | | | | | | | | | | | | | | | |
| 33-M | BD | BD | Z | | | | | | | | | | | | | | | | |
| 34-M | BD | EDBLW | WEBDLJ | Z | | | | | | | | | | | | | | | |
| 35-M | D4 | Z | | | | | | | | | | | | | | | | | |
| 36-M | B | BDE | BDEJ | BDEJLF | Z | | | | | | | | | | | | | | |
| 37-M | B | BDE | Z | | | | | | | | | | | | | | | | |
| 38-M | E | BDE | WBDLEJ | Z | | | | | | | | | | | | | | | |
| 39-M | B | BDLEW | Z | | | | | | | | | | | | | | | | |
| 40-M | B | Z | | | | | | | | | | | | | | | | | |

CODE: B = lethargy F = piloerection W = emaciation
 D = diarrhea J = chromodacryorrhea Z = dead
 E = ataxia L = chromorrhorrhea 4 = hyperactive

NECROPSY OBSERVATIONS:

| | 31-M | 32-M | 33-M | 34-M | 35-M | 36-M | 37-M | 38-M | 39-M | 40-M |
|-------------------------------|------|------|------|------|------|------|------|------|------|------|
| Nose/mouth stained red | 2 | | 1 | 1 | | 1 | 1 | 1 | 2 | |
| Nose/mouth stained brown | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 |
| Anogenital area stained brown | 1 | 2 | 2 | 1 | 3 | 1 | 2 | 1 | 1 | 2 |
| Lungs congested | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |
| Heart dilated | 3 | 3 | 3 | 3 | 1 | 3 | 2 | 3 | 2 | 2 |
| Stomach distended | 3 | 3 | 3 | 3 | 1 | 3 | 2 | 3 | 2 | 2 |
| Intestines distended by mucus | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 |

CODE: D = death
 1 = slight or scattered
 2 = moderate or few
 3 = pronounced or many

Project #: MB 79-4334
 Sample #: ADMA-8

TEST FOR ORAL TOXICITY IN RATS

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T O X I C S I G N S

| An. # & Sex | HOUR | DAY | T O X I C S I G N S | | | | | | | | | | | | | | | | |
|-------------|------|-----|---------------------|--------|--------|---|---|---|---|---|---|----|----|----|----|----|--|--|--|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | |
| 21-M | BD | BD | | | | | | | | | | | | | | | | | |
| 22-M | B | BD | BLJQED | Z | | | | | | | | | | | | | | | |
| 23-M | B | BD | BLJQED | BLJQED | BLJQED | Z | | | | | | | | | | | | | |
| 24-M | B | BD | BLJQED | Z | | | | | | | | | | | | | | | |
| 25-M | B | BD | Z | | | | | | | | | | | | | | | | |
| 26-M | B | BD | Z | | | | | | | | | | | | | | | | |
| 27-M | B | BD | Z | | | | | | | | | | | | | | | | |
| 28-M | B | BD | BLJQED | Z | | | | | | | | | | | | | | | |
| 29-M | B | BD | BLJQED | Z | | | | | | | | | | | | | | | |
| 30-M | B | BD | Z | | | | | | | | | | | | | | | | |

CODE: B = lethargy F = piloerection Q = ptosis
 D = diarrhea J = chromodacryorrhea Z = dead
 E = ataxia L = chromorhinorrhea 5 = increased locomotor activity

NECROPSY OBSERVATIONS:

| | 21-M | | 22-M | | 23-M | | 24-M | | 25-M | | 26-M | | 27-M | | 28-M | | 29-M | | 30-M | |
|-------------------------------|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|
| | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| Nose/mouth stained brown | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | |
| Anogenital area stained brown | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | |
| Lungs congested | | | 1 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | |
| Lungs hemorrhagic | 2 | | | | | | | | | | | | | | | | | | | |
| Heart dilated | 2 | | 1 | | 2 | | 1 | | 1 | | 1 | | 2 | | 2 | | 1 | | 1 | |
| Stomach distended | 3 | | 2 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | |
| Intestines distended by mucus | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | |

CODE: D = death
 1 = slight or scattered
 2 = moderate or few
 3 = pronounced or many

Project #: MB 79-4334
 Sample #: ADMA-8

TEST FOR ORAL TOXICITY IN RATS
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TOXIC SIGNS

| An. # & Sex | 3-4 | DAY | | | | | | | | | | | | | | | | | |
|-------------|-----|-----|-------|--------|---|---|---|---|---|---|----|----|----|----|----|--|--|--|--|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | | |
| 11-M | B | Z | | | | | | | | | | | | | | | | | |
| 12-M | B | BD | BQJE | BQJEDZ | | | | | | | | | | | | | | | |
| 13-M | BF | BD | Z | | | | | | | | | | | | | | | | |
| 14-M | B | BD | Z | | | | | | | | | | | | | | | | |
| 15-M | B | BD | Z | | | | | | | | | | | | | | | | |
| 16-M | B | BDL | BQFDE | Z | | | | | | | | | | | | | | | |
| 17-M | B | BDL | Z | | | | | | | | | | | | | | | | |
| 18-M | B | BDL | Z | | | | | | | | | | | | | | | | |
| 19-M | B | BDL | BEL | Z | | | | | | | | | | | | | | | |
| 20-M | B | BDL | Z | | | | | | | | | | | | | | | | |

CODE: B = lethargy
 D = diarrhea
 E = ataxia
 f = piloerection
 J = chromodacryorrhea
 L = chromorhinorrhea
 Q = ptosis
 Z = dead

NECROPSY OBSERVATIONS:

| | 11-M | | 12-M | | 13-M | | 14-M | | 15-M | | 16-M | | 17-M | | 18-M | | 19-M | | 20-M | | |
|-------------------------------|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|---|
| | D | | D | | D | | D | | D | | D | | D | | D | | D | | D | | |
| Nose/mouth stained brown | | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 |
| Anogenital area stained brown | | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 |
| Lungs congested | 2 | | 1 | | 1 | | 1 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 |
| Heart dilated | 2 | | 1 | | 2 | | 2 | | 1 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 |
| Stomach distended | 2 | | 3 | | 2 | | 3 | | 2 | | 2 | | 2 | | 3 | | 3 | | 3 | | 3 |
| Intestines distended by mucus | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 | | 3 |

CODE: D = death
 1 = slight or scattered
 2 = moderate or few
 3 = pronounced or many

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-4334

Sample #: ADMA-8

T O X I C S I G N S

| An. # & Sex | @ 5.0 g/kg | HOUR | DAY | | | | | | | | | | | | | | | | |
|-------------|------------|------|--------------|-------|-------|-------|--------|---|---|---|---|----|----|----|----|----|--|--|--|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | |
| 1-M | | 3-4 | BQLDJE6 Z | | | | | | | | | | | | | | | | |
| 2-M | | | BLQF Z | | | | | | | | | | | | | | | | |
| 3-M | | | BQLDJE6 Z | | | | | | | | | | | | | | | | |
| 4-M | | | EBLD ELDO Z | | | | | | | | | | | | | | | | |
| 5-M | | | EBLD Z | | | | | | | | | | | | | | | | |
| 6-M | | | DBFJLE6 DJLB | JLQBD | LJQ87 | LJQ87 | LJBQW7 | Z | | | | | | | | | | | |
| 7-M | | | DOBFLJE Z | | | | | | | | | | | | | | | | |
| 8-M | | | QDFLE BD | Z | | | | | | | | | | | | | | | |
| 9-M | | | QDFLE Z | | | | | | | | | | | | | | | | |
| 10-M | | | QDFLE Z | | | | | | | | | | | | | | | | |

CODE: B = lethargy F = piloerection Q = tremors Z = dead
 D = diarrhea J = chromodacryorrhea Q = ptosis 6 = decreased respiration
 E = ataxia L = chromorhinorrhea W = emaciation 7 = anogenital area stained brown

NECROPSY OBSERVATIONS:

| | 1-M | | 2-M | | 3-M | | 4-M | | 5-M | | 6-M | | 7-M | | 8-M | | 9-M | | 10-M | | |
|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|------|---|--|
| | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| Nose/mouth stained red | | | | | | | | | | | | | | | | | | | | | |
| Nose/mouth stained brown | | | | | | | | | | | | | | | | | | | | | |
| Nose/mouth stained yellow | | X | | | | | | | | | | | | | | | | | | | |
| Anogenital area stained red | | | | | | | | | | | | | | | | | | | | | |
| Anogenital area stained brown | | | | | | | | | | | | | | | | | | | | | |
| Anogenital area stained yellow | | X | | | | | | | | | | | | | | | | | | | |
| Lungs congested | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Lungs hemorrhagic | | | | | | | | | | | | | | | | | | | | | |
| Heart dilated | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Stomach distended | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | |
| Stomach distended by blackish material | | | | | | | | | | | | | | | | | | | | | |
| Intestines distended by mucus | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Intestines distended by blackish material | | | | | | | | | | | | | | | | | | | | | |

CODE: D = death
 1 = slight or scattered
 2 = moderate or few
 3 = pronounced or many

TEST FOR ORAL TOXICITY IN RATS

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Project #: MB 79-4334

Sample #: ADMA-8

CONCLUSION

The LD 50 is 1.23 g/kg of body weight.

SUMMARY OF DATA

Deaths occurred at all levels between 0.96 and 5.0 g/kg of body weight. The slope was very steep indicating a low margin of safety. Deaths were delayed to Day 2 and 3 in the majority of cases.

The following toxic signs were seen in most animals between 3-4 hours post dose observation and Day 9 or death: lethargy, flaccidity, diarrhea, ataxia, piloerection, chromodacryorrhea, chromorhinorrhea, tremors, ptosis, emaciation, oily anogenital area, rough coat, hyperactivity, decreased respiration, and anogenital area stained brown.

Body weights were within expected limits in the survivors.

At necropsy in the animals found dead heart, lung and gastrointestinal abnormalities were noted.

QUALITY ASSURANCE EVALUATION

The quality assurance unit reviewed various aspects of the raw data and final report on the following dates;

May 5, 1980

Jon S. Harwick 5-3-80
Jon Harwick
Quality Assurance

Respectfully submitted,

Oscar M. Moreno 5/2/80
Oscar M. Moreno, Ph.D.

Deborah L. Cooper 5/1/80
Deborah L. Cooper, Study Director

Jon S. Harwick 5-5-80, 5-5-80
Quality Assurance & Dates of Inspection

Elizabeth J. Altenbach 4-15-80
Elizabeth J. Altenbach, Archivist
Submitted: 5/13/80

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

[REDACTED]

MB Research Laboratories, Inc.

[REDACTED]

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

FOR: ETHYL CORPORATION

Project number : MB 79-4334

Objective : To determine dermal toxicity

steinsburg and wentz roads

post office box 703

spinnerstown, pennsylvania 18968

215-536-4110

Test started : 1/11/80

Test ended : 2/13/80

MATERIALS

Sample label : ADMA 8 *N,N-dimethyl-1-octadecanamine* Sample received : 12/21/79

Description : Clear Liquid, Specific Gravity = 0.90

ANIMALS

Supplier(s) : Perfection, Nicholas Helf,
Ace Animals

Weight range : 2.1 - 3.0 kg

Sex : 4 Males-8 Females

New Zealand White rabbits, approximately 8 weeks old when received, were equilibrated for at least one week in this laboratory. Apparently healthy rabbits were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Site Preparation - Immediately prior to dosing, the fur was clipped from the abdomen of the animals. The clipped area was 200 square cm, approximately 10% of the body surface. Abrasions were made in one half of the rabbits. The abrasions, extending the length of the exposure site, scratched the stratum corneum but did not reach the derma or produce bleeding.

Treatment - Four rabbits were dosed at 1.0 g/kg. For liquid materials the dose was based on the sample weight as calculated from the specific gravity. The test material was applied once dermally to the prepared site under gauze patches. The patches were secured with adhesive tape and the trunks were wrapped with impervious material. The test material was kept in contact with the skin for 24 hours, at which time the wrappings were removed. An estimate of the amount of material remaining was recorded. The exposure site was wiped, but not washed to remove excess material. Two additional groups of four rabbits were dosed at log intervals. Dosing was stopped because the results of 3 doses permitted the calculation of the LD 50.

Observation - Dermal reactions were scored at 24 hours by the Draize scoring system (attached). The rabbits were observed daily for 14 days for signs of



TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

Project # : MB 79-4334

Page -2-

Sample # : ACMA 8

toxicity, pharmacological effects and mortality. Body weights were recorded pretest and in the survivors at 14 days.

Termination - If there were deaths during the study, all animals in the high dose group were examined for gross pathology. In the lower dose levels, only animals which died during the study were examined for gross pathology.

The LD 50, if possible, was calculated according to the method of Litchfield J.T. Jr. & F Wilcoxon (J. Pharm. & Exp. Therap. 96:99, 1949).

RESULTS

LD 50: 8.0 (3.0 - 21.2) g/kg of body weight

| MORTALITY: | Dose g/kg | Dead/Treated | Day of Death | | |
|------------|--------------|--------------|--------------|---|----|
| | | | 5 | 9 | 10 |
| | 1.0 | 0/4 | | | |
| | 4.0 | 1/4 | | | 1 |
| | 16.0 | 3/4 | 1 | 2 | |

BODY WEIGHTS, DOSE VOLUME AND SKIN GRADES:

| Dose | An. # & Sex | Dose Volume cc | Weights - kg | | Day 1 Dermal Reactions | | % Remaining |
|--------------|----------------|-------------------|--------------|---------------------|---------------------------|-------|----------------|
| | | | 0 | 14 | Erythema | Edema | |
| @ 1.0 g/kg: | 1-F | 2.7 | 2.4 | 2.4 | 2 | 4 | 75 |
| | 2-F ab | 2.9 | 2.6 | 2.7 | 2 | 2 | 75 |
| | 3-F | 2.9 | 2.6 | 2.7 | 1 | 2 | 75 |
| | 4-F ab | 2.3 | 2.1 | 2.3 | 1 | 2 | 75 |
| @ 4.0 g/kg: | 5-F | 10.7 | 2.4 | 2.4 | 0 | 2 | 50 |
| | 6-F ab | 12.4 | 2.8 | 2.6 | 1 | 1 | 50 |
| | 7-F | 13.3 | 3.0 | DEAD DAY 10 | 0 | 1 | 50 |
| | 8-F ab | 9.3 | 2.1 | 1.8 | 1 | 1 | 50 |
| @ 16.0 g/kg: | 9-M* | 42.7 | 2.4 | SACRIFICED DAY 9 | 2 | 4 | 75 |
| | 10-M ab | 48.0 | 2.7 | 2.0 | 3 | 4 | 75 |
| | 11-M | 41.0 | 2.3 | DEAD DAY 5 | 1 | 2 | 75 |
| | 12-M ab | 41.0 | 2.3 | DEAD DAY 9 | 2 | 4 | 75 |

*50
abs. via
ADVA
08*

9-M* - Sacrificed Day 9 due to moribund condition

CODE: % Remaining = the amount of material remaining on the skin, gauze and occlusive binding at 24 hours, after the occlusive binding was removed.

ab = abraded

| | |
|-----------------------------|---|
| Erythema: None | 0 |
| Very slight | 1 |
| Well defined | 2 |
| Moderate to severe | 3 |
| Severe (includes sl eschar) | 4 |
| Edema: None | 0 |
| Very slight | 1 |
| Slight (raised edges) | 2 |
| Moderate (raised 1 mm) | 3 |
| Severe (raised > 1 mm) | 4 |

Project #: MB 79-4334
 Sample #: ADMA 8

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS
 Page -3-

T O X I C S I G N S

| An. # & Sex | HOUR | DAY | | | | | | | | | | | | | |
|----------------|------|-----|---|---|---|---|----|---|---|---|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| @ 1.0 g/kg | | | | | | | | | | | | | | | |
| 1-F | | B | B | B | D | B | BQ | | | | | | | | |
| 2-F | | | | B | D | | | | | | | | | | |
| 3-F | | | | | | | | | | | | | | | |
| 4-F | | | | | D | | | | | | | | | | |
| @ 4.0 g/kg | | | | | | | | | | | | | | | |
| 5-F | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| 6-F | | | | | | | | | | | | | | | |
| 7-F | | | | | | | | | | | | | | | |
| 8-F | | | | | | | | | | | | | | | |
| @ 16.0 g/kg | | | | | | | | | | | | | | | |
| 9-M | | | | | | | | | | | | | | | |
| 10-M | | | | | | | | | | | | | | | |
| 11-M | | | | | | | | | | | | | | | |
| 12-M | | | | | | | | | | | | | | | |

CODE: B = lethargy
 D = diarrhea
 E = ataxia
 K = negative righting reflex
 M = dyspnea
 Q = ptosis

AT ALL TIMES NOT MENTIONED, ALL ANIMALS APPEARED NORMAL.

W = emaciation
 X = few feces
 Y = yellow nasal discharge
 Z = dead
 i = excess material in face area
 2 = excess material on body

3 = mucus in stool

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

Project #: MB 79-4334

Page -4-

Sample #: ADMA 8

NECROPSY OBSERVATIONS: @ 16.0 g/kg

| | 9-M* | 10-M | 11-M | 12-M |
|--|----------|----------|----------|----------|
| | <u>D</u> | <u>S</u> | <u>D</u> | <u>D</u> |
| Skin surfaces soiled | X | X | | |
| Lungs congested | 2 | | 3 | |
| Heart dilated | 2 | | 2 | |
| Body wasted | X | X | | X |
| Treated skin ulcerated | | 3 | X | X |
| Lungs contained white nodules | | | X | |
| Abdominal surfaces and inner surface of left leg <u>scalded</u> ¹ | | | X | |

CODE: D = death, S = sacrifice
 2 = moderate or few
 3 = pronounced or many

7-F at 4.0 g/kg was inadvertently not necropsied
 9-M*, Sacrificed Day 9 due to moribund conditions

CONCLUSION

The LD 50 is 8.0 g/kg of body weight.

SUMMARY OF DATA

0/4, 1/4 and 3/4 animals died using this test substance at dose levels of 1.0, 4.0 and 16.0 g/kg of body weight.

Skin reactions were generally slight at the two lower dose levels but became somewhat more pronounced at 16.0 g/kg.

Common toxic signs, occurring more frequently at higher dose levels, included lethargy, ptosis, nasal discharge and few feces.

Most body weight changes were within expected limits, although a few animals did lose significant amounts of weight.

Animals dying before Day 14 had respiratory, cardiac and skin abnormalities.

Respectfully submitted,

Oscar M. Moreno 3-27-80

Oscar M. Moreno, Ph.D.

Mary Teresa Moreno 3-26-80

Mary Teresa Moreno, Study Director

Terry L. Master 3-14-80, 3-10-80

Quality Assurance & Dates of Inspection

Terry L. Master

Elizabeth J. Altenbach 3-19-80

Elizabeth J. Altenbach, Archivist

Submitted: 3/28/80

The raw data is filed at MB Research by project number.
 The final report is filed by sponsor name and project number.

TEST FOR ACUTE DERMAL/LD 50 IN ALBINO RABBITS

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Project #: MB 79-4333

Sample #: ADMA C10

NECROPSY OBSERVATIONS

| | <u>@ 1.0</u> | <u>D</u> | <u>S</u> | <u>S</u> | <u>S</u> | <u>S</u> | <u>@ 2.02</u> | <u>D</u> | <u>@ 4.0</u> | <u>D</u> | <u>D</u> | <u>D</u> | |
|--|--------------|------------|------------|------------|------------|----------|---------------|-------------|--------------|------------|------------|------------|------------|
| | <u>g/kg</u> | <u>1-F</u> | <u>2-M</u> | <u>3-M</u> | <u>4-F</u> | | <u>g/kg</u> | <u>16-M</u> | <u>g/kg</u> | <u>5-F</u> | <u>6-F</u> | <u>7-M</u> | <u>8-F</u> |
| Normal | | | X | X | X | | | 2 | | | | | |
| Lungs congested | | | | | | | | | | | | | |
| Lungs edematous | | 3 | | | | | | | | 2 | | | |
| Heart dilated | | X | | | | | | | | X | | | |
| Liver nodules | | X | | | | | | | | | | | |
| Kidney abscesses | | X | | | | | | | | | | | |
| Guts distended by gas | | X | | | | | | | | | | | |
| Right pleural cavity contained fluid | | | | | | | | | | | | | |
| Treated skin ulcerated | | | X | X | X | | | | | | | | |
| Treated skin partially crusted | | X | X | X | | | | | | | | | |
| Treated skin red and slightly thickened by edema | | | | | | | | | | | | | |
| Thymus reduced by 1/2 | | | | | | | | | | X | X | X | X |
| Treated skin coated by large crusted area (10 x 20 cm) | | X | | | | | | | | X | X | X | X |

CODE: D = death, S = sacrifice
 2 = few or moderate
 3 = pronounced or many

Sample # ADMA 8

Project # 79-4334

Prot. # 11

Page 07

Q. A. _____

Handwritten: update
update

| DOSE g/kg | AN.# SEX ID | R W | AN. SUP. REC. | V L CC | Wt - kg JAN 30 16 | %R | DATE/TIME | | OBSERVATIONS | | | | | | | | | | | |
|--------------|--------------------------|--------|---------------------|--------------|-------------------------|-----|-----------|----|--------------|----|----|----|----|----|----|----|----|----|----|----|
| | | | | | | | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | |
| 4.0 | 59 21 1/15/50 | 0 A | 26 Dec | 10.7 | 0 | 14 | 0 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | 6ab 22 1/11/50 | 0 A | 26 Dec | 12.4 | 2.4 | 2.6 | 1 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | 7 23 ab 24 | 0 A | 26 Dec | 13.3 | 3.0 | 1.8 | 1 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | 24 ab 24 | 0 A | 26 Dec | 9.3 | 2.1 | 1.8 | 1 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | AN. SEX BY: RECPT. AB | | INIT. | | AD | AB | AB | AB | AB | AB | AB | AB | AB | AB | AB | AB | AB | AB | AB | AB |
| | | | VERIF. | | | | | | | | | | | | | | | | | |

Handwritten: Animal #7 not rechecked

Prot. # 159

Sample # ADMA 8

Project # 79-4334 SAMPLE PREP. g/ cc in (%) BY DATE TIME
used as rec'd.

| DOSE g/kg | AN.# SEX ID | R W | AN. SUP. REC. | V L CC | Mt - kg | %R | OBSERVATIONS | | | | | | | | | | | | | |
|--------------|-------------------|--------|---------------------|--------------|---------|-----|--------------|-------|---|---|---|---|---|---|---|----|----|----|----|----|
| | | | | | | | DATE/TIME | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 16.0 | 229 | ♂ | 10 abp 230 | 12.7 | 13 Feb | | 31 Jan | 1 Feb | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 229 | ♂ | 10 abp 230 | 2.4 | 0 | 75 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 230 | ♂ | 10 abp 230 | 2.7 | 2.0 | 75 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 231 | ♂ | 10 abp 230 | 41.0 | 2.3 | 75% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 232 | ♂ | 10 abp 230 | 41.0 | 2.3 | 75% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 233 | ♂ | 10 abp 230 | INIT. | SK | BY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

- ① - excess material in face area - x-tubes
- ② - excess material in body - ③ - mucous in stool

AD #9 - sacrificed due to microbial condition
 Necropsy ~~ADMA 8~~ ADMA 8

5:55am
4:30

AMPLE ADMA 8

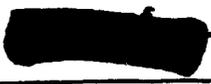
PROJECT # 79-4334

Sacrifice agent:

Page

Q.A.

| DATE | 8 Feb | 13 Feb | 14 Feb | 18 Feb | | | | | | | | | | | | | | | | |
|--|-------|--------|--------|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| TEST DAY | 2 | 14 | 5 | 9 | | | | | | | | | | | | | | | | |
| SACRIFICE/DEATH S/D | SD | SD | D | D | | | | | | | | | | | | | | | | |
| DOSE g/kg | 16.0 | 16.0 | 16.0 | 16.0 | | | | | | | | | | | | | | | | |
| ANIMAL NUMBER/SEX | 90♂ | 100♂ | 110♂ | 120♂ | | | | | | | | | | | | | | | | |
| NORMAL | | | | | | | | | | | | | | | | | | | | |
| SKIN SURFACES SOILED | ✓ | ✓ | | | | | | | | | | | | | | | | | | |
| LUNG(S): CONGESTION | 2 | | 3 | | | | | | | | | | | | | | | | | |
| LUNG(S): EDEMATOUS | | | | | | | | | | | | | | | | | | | | |
| LUNG(S): HEMORRHAGIC | | | | | | | | | | | | | | | | | | | | |
| LUNG ABSCESS(ES) | | | | | | | | | | | | | | | | | | | | |
| HEART DILATED | 2 | | 2 | | | | | | | | | | | | | | | | | |
| PERICARDITIS | | | | | | | | | | | | | | | | | | | | |
| LIVER ABSCESS(ES) | | | | | | | | | | | | | | | | | | | | |
| LIVER NODULE(S) | | | | | | | | | | | | | | | | | | | | |
| KIDNEY(S) ABSCESS(ES) | | | | | | | | | | | | | | | | | | | | |
| INTESTINAL CONTENTS FLUID | | | | | | | | | | | | | | | | | | | | |
| BODY WASTED (part not seen) | ✓ | ✓ | | ✓ | | | | | | | | | | | | | | | | |
| TREATED SKIN ULCERATED | | 3 | ✓ | ✓ | | | | | | | | | | | | | | | | |
| TREATED SKIN CRUSTED | | | | | | | | | | | | | | | | | | | | |
| TREATED SKIN SCALY | | | | | | | | | | | | | | | | | | | | |
| <p><i>lungs contained w/ nodules</i> <i>inner surface of left lung</i> <i>abdominal surfaces scalded</i></p> <p>1 = scattered or slight 2 = few or moderate 3 = many or pronounced</p> <p>Verif.</p> | | | | | | | | | | | | | | | | | | | | |



lungs contained w/ nodules
inner surface of left lung
abdominal surfaces scalded

- GM - G. Moore
- SEW - S. Weatherby
- JM - J. Miller
- BT - B. Tenser
- DRC - D. Carven
- JM - J. Harvick
- JD - J. DiDonato
- MH - T. Moore
- NR - N. Ratcliffe
- ML - M. Lofland
- DC - D. Cooper
- BA - B. Altenbach
- AS - A. Blasko
- SK - S. Kovak

Verif. [Signature]

From the desk of

O. M. MORENO, PhD

ADMA 8

$$LD_{50} = 8.0 (3.0 - 21.2)$$

$$1.0 = 9/4$$

$$84 = 22.5$$

$$4.0 = 1/4$$

$$16 = 2.85$$

$$16.0 = 3/4$$

$$S \quad \frac{2.81 + 2.81}{2} = 2.81$$

$$\sqrt{8} = 2.83$$

$$\frac{2.77}{2.83} = 0.979$$

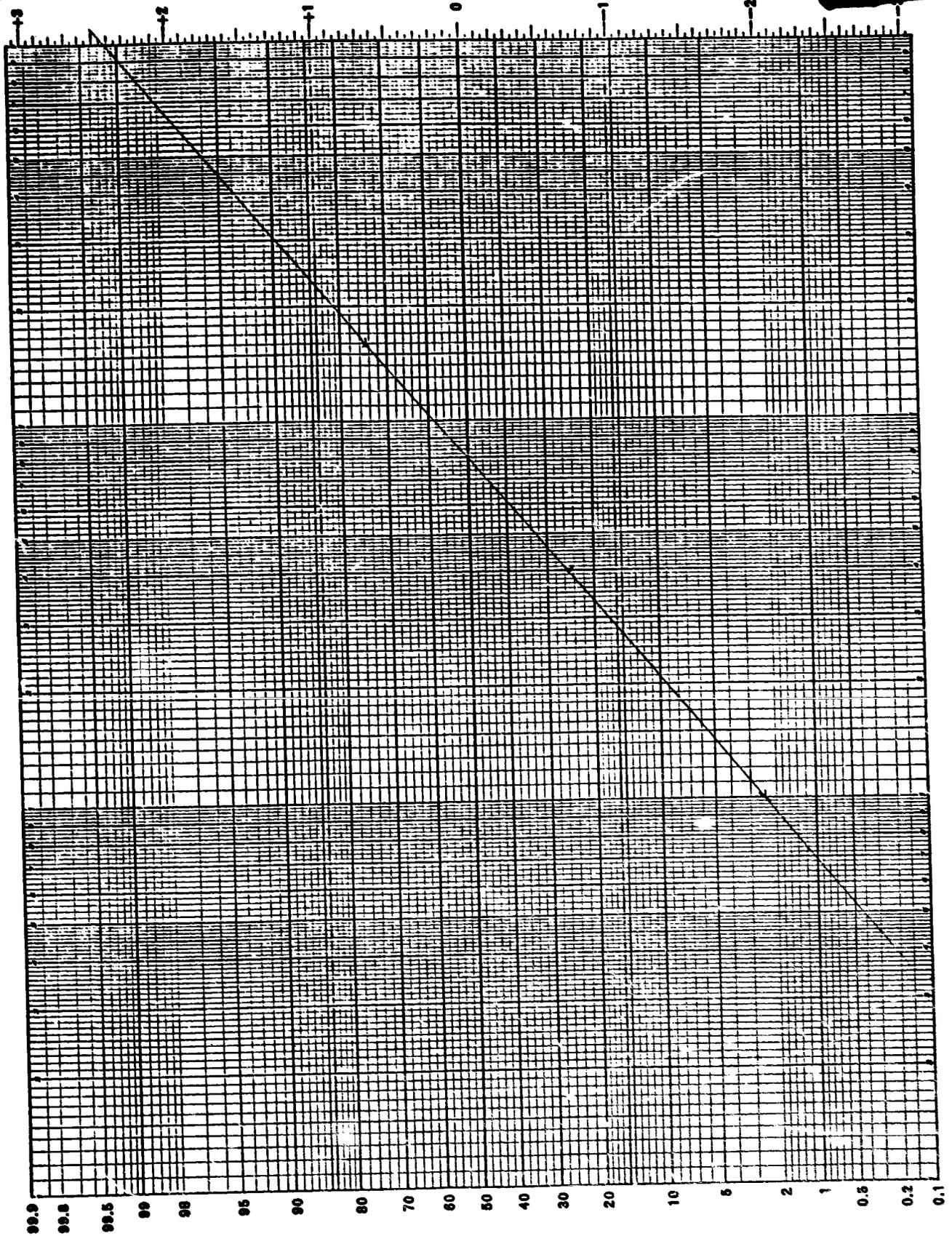
$$f \quad LD_{50} = 2.65$$

NO. 32.376. LOGARITHMIC NORMAL.

Codex
GRAPH PAPER

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ADMA 8



M B Research Laboratories, Inc.

TEST FOR MATERIAL CORROSIVITY IN RABBITS-DOT

FOR: ETHYL CORPORATION

Project number: MB 79-4334

Objective : To identify corrosive materials as defined in 49 CFR 173.240

steinsburg and wentz roads

post office box 703

spinnerstown, pennsylvania 18068

215-536-4110

Test started : 1/29/80

Test ended : 1/30/80

MATERIALS

Sample label : ADMA 8 *N,N-dimethyl-1-octadecanamine* Sample received: 12/21/79

Description : Clear Liquid

ANIMALS

Supplier(s) : Ace Animals

Sex

: 2 Males-4 Females

New Zealand White rabbits, approximately 8 weeks old when received, were equilibrated for at least one week in this laboratory. Six apparently healthy rabbits were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21° C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Site Preparation - The fur was clipped from the back and sides of the animals. The skin of each animal remained intact.

Treatment - Six rabbits were dosed once dermally at one intact site/animal. 0.5 g (if the material was solid) or 0.5 ml (if the material was liquid) was applied beneath 2.5 cm square gauze patches. The patches were secured with adhesive tape and the trunks were wrapped with impervious material. The test material was kept in contact with the skin for 4 hours, at which time the wrappings were removed.

Observations and Calculations - Dermal reactions were scored at 4, 24 and 48 hours by the Draize scoring system (attached). The skin was evaluated for corrosivity. Corrosivity, as defined in the DOT regulations, is destruction or irreversible alteration of the tissue. Tissue destruction is considered to have occurred if there is ulceration or necrosis. In addition, the mean values (6 rabbits) for erythema/eschar and edema on intact skin at 4, 24 and 48 hours (a total of 6 values) were added and divided by 3 to give a modified primary irritation index. If this value was 5 or more, the material was considered to be a primary irritant.

TEST FOR MATERIAL CORROSIVITY IN RABBITS-DOT

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Project #: MB 79-4334

Sample #: ADMA 8

RESULTS

INDIVIDUAL SCORES

| | Rabbit Number | | | | | | Mean Score |
|-----------------|----------------|-----------------|------------------|----|-----------------|-----------------|------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| Erythema | | | | | | | |
| 4 Hours | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 Hours | 2 ^w | 2 ^w | 2 ^w | 2 | 3 ^w | 3 ^w | 2.33 |
| 48 Hours | 4 ^w | >4 ^w | >4 ^{wr} | >4 | >4 ^w | >4 ^w | |
| Edema | | | | | | | |
| 4 Hours | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 Hours | 2 | 2 | 3 | 3 | 3 | 3 | 2.67 |
| 48 Hours | 2 | 2 | 3 | 4 | 3 | 3 | 2.83 |

SUM OF MEAN SCORES =

MODIFIED PRIMARY IRRITATION INDEX = SUM OF MEAN SCORES/3 =

- r = orange spots in treated area
- w = white area surrounded by the erythema
- >4 = moderate eschar

| | Value |
|--|-------|
| Erythema: No erythema | 0 |
| Very slight erythema (barely perceptible) | 1 |
| Well defined erythema | 2 |
| Moderate to severe erythema | 3 |
| Severe erythema (beet redness) to slight eschar formation (injuries in depth) | 4 |
| Edema : No edema | 0 |
| very slight edema (barely perceptible) | 1 |
| Slight edema (edges of area well defined by definite raising) | 2 |
| Moderate edema (raised approximately 1 millimeter) | 3 |
| Severe edema (raised more than 1 mm and extending beyond the area of exposure) | 4 |

TEST FOR MATERIAL CORROSIVITY IN RABBITS-DOT

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Project #: MB 79-4334

Sample #: ADMA 8

CONCLUSION

This test substance was corrosive. The modified primary irritation index could not be calculated because some scores exceeded the maximum defined by Draize.

SUMMARY OF DATA

Erythema increased in severity from non-existent at 4 hours to severe with eschar formation at 48 hours in all animals.

Edema was generally slight to moderate at 24 and 48 hours.

QUALITY ASSURANCE EVALUATION

The quality assurance unit reviewed various aspects of the data and final report on the following dates:

February 6, 1980

Terry J. Master
Terry J. Master
Quality Assurance

Respectively submitted,

Oscar M. Moreno 2-3-80
Oscar M. Moreno, Ph.D.

Mary Teresa Moreno 3-1-80
Study Director, Mary Teresa Moreno

Terry J. Master 2-28-80
Quality Assurance & Dates of Inspection

Elizabeth J. Altenbach 2-25-80
Archivist, Elizabeth J. Altenbach
Submitted: 3/04/80

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

MB Research Laboratories, Inc.

steinsburg and wentsz roads
post office box 203
spinnerstown, pennsylvania 18968
215-536-4110

TEST FOR EYE IRRITATION IN RABBITS

FOR: ETHYL CORPORATION

Project number: MB 79-4334

Test started : 2/05/80
Test ended : 2/08/80

Objective : To identify ocular irritation potential

MATERIALS

Sample label : ADMA 8 *N,N-dimethyl-1-ocadecanamine* Sample received: 12/21/79

Description : Clear Liquid

ANIMALS

Supplier(s) : Perfection Breeders
Ace Animals

Sex : 2 Males
4 Females

New Zealand White rabbits, at least 8 weeks old when received, were equilibrated for at least one week in this laboratory. Six apparently healthy rabbits, free from evidence of ocular irritation or damage, as determined by sodium fluorescein 24 hours pretest were selected for the test.

The animals were identified by cage tags noting the test material, starting date, animal number and sex. In addition, odd numbered animals in each cage were identified with an indelible ear mark.

The animals were housed 2/cage in suspended wire mesh cages (30" x 18" x 18"). Any extraneous material which might produce eye irritation was excluded from the area. Fresh Purina rabbit chow and water were freely available. The animal room, reserved exclusively for rabbits on acute tests, was maintained at 20 - 21°C and was kept clean in accordance with the standards of AAALAC of which this laboratory is an approved member.

METHODS

Treatment - The test material (0.1 ml or 0.1 ml equivalent) was placed once in the conjunctival sac of one eye of each of six rabbits. The lids were held together briefly to insure adequate distribution of the test material. The untreated eye of each rabbit served as a control.

Observations - The general health of the rabbits was monitored during the observation period. The ocular reactions of the cornea, iris, and conjunctiva were graded at 1, 2, and 3 days after dosing. In addition, eyes were examined on day three using sodium fluorescein. The eyes were graded by the Draize scoring system (attached). The scores were interpreted as defined in 16 CFR 1500.42.

TEST FOR EYE IRRITATION IN RABBITS

Project #: MB 79-4334

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Sample #: ADMA 8

CONCLUSION

The test material is an irritant.

SUMMARY OF DATA

Conjunctival irritation, primarily chemosis, occurred in all animals throughout the test period. It did not clear in any eyes by Day 3. This irritation was often accompanied by blistered upper and lower eyelids and swelling of the outer tissues surrounding the eye.

QUALITY ASSURANCE EVALUATION

The quality assurance unit reviewed various aspects of the data and final report on the following dates:

February 11, 1980

Terry J. Master
Terry J. Master
Quality Assurance

Respectfully submitted,

Oscar M. Moreno 3-3-80
Oscar M. Moreno, Ph.D.

Mary Teresa Moreno 3-1-80
Study Director, Mary Teresa Moreno

Terry J. Master 2-28-80
Quality Assurance & Dates of Inspection
Terry L. Master

Elizabeth J. Altenbach 3-25-80
Elizabeth J. Altenbach, Archivist
Submitted: 3/04/80

The raw data is filed at MB Research by project number.
The final report is filed by sponsor name and project number.

**Rabbit Eye Irritation Study
Individual Daily Scores**

Material: ADMA 8

Project No. MB 79-4334

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 |
|------------|------|---------------------|-------------------------------------|-------|-------|-------|
| 1 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 4*b | 4*bc | 4*bc |
| | F | Conjunctiva | Discharge | 2 | 1 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 14 | 12 | 12 |
| | | | Totals Added (1 + 2 + 3) | 14 | 12 | 12 |
| | | UV Fluorescein Scan | | | 0 | |
| 2 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3* | 3*b | 4*bc |
| | F | Conjunctiva | Discharge | 2 | 1 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 10 | 12 |
| | | | Totals Added (1 + 2 + 3) | 12 | 10 | 12 |
| | | UV Fluorescein Scan | | | 0 | |
| 3 | A | Cornea | Opacity | 0 | 0 | 0 |
| | B | Cornea | Area | 0 | 0 | 0 |
| | | | (1) Cornea Total = (AxB)x5 | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 |
| | | | (2) Iris Total = (C) x 5 | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 |
| | E | Conjunctiva | Chemosis | 3* | 3* | 3*bc |
| | F | Conjunctiva | Discharge | 2 | 2 | 1 |
| | | | (3) Conjunctiva Total = (D+E+F) x 2 | 12 | 12 | 10 |
| | | | Totals Added (1 + 2 + 3) | 12 | 12 | 10 |
| | | UV Fluorescein Scan | | | 0 | |

b = upper lid appears blistered

c = lower lid appears blistered

* = swelling of outer tissues surrounding the eye

Rabbit Eye Irritation Study
Individual Daily Scores

Material: ADMA 8

Project No: MB 79-4334

| Rabbit No. | Item | Tissue | Reading | Day 1 | Day 2 | Day 3 | |
|------------|---------------------|-------------------------------------|-----------|----------------|------------------|-----------------|----|
| 4 | A | Cornea | Opacity | 0 | 0 | 0 | |
| | B | Cornea | Area | 0 | 0 | 0 | |
| | | (1) Cornea Total = (AxB)x5 | | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 | |
| | | (2) Iris Total = (C) x 5 | | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 | |
| | E | Conjunctiva | Chemosis | 3* | 3* | 3* | |
| | F | Conjunctiva | Discharge | 2 | 2 | 1 | |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | | 12 | 12 | 10 |
| | | Totals Added (1 + 2 + 3) | | | 12 | 12 | 10 |
| | UV Fluorescein Scan | | | | | 0 | |
| 5 | A | Cornea | Opacity | 0 | 0 | 0 | |
| | B | Cornea | Area | 0 | 0 | 0 | |
| | | (1) Cornea Total = (AxB)x5 | | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 | |
| | | (2) Iris Total = (C) x 5 | | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 1 | 1 | 1 | |
| | E | Conjunctiva | Chemosis | 3 ^a | 3 ^{abc} | 3 ^{bc} | |
| | F | Conjunctiva | Discharge | 2 | 1 | 2 | |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | | 12 | 10 | 12 |
| | | Totals Added (1 + 2 + 3) | | | 12 | 10 | 12 |
| | UV Fluorescein Scan | | | | | 0 | |
| 6 | A | Cornea | Opacity | 0 | 0 | 0 | |
| | B | Cornea | Area | 0 | 0 | 0 | |
| | | (1) Cornea Total = (AxB)x5 | | | 0 | 0 | 0 |
| | C | Iris | | 0 | 0 | 0 | |
| | | (2) Iris Total = (C) x 5 | | | 0 | 0 | 0 |
| | D | Conjunctiva | Redness | 2 | 2 | 1 | |
| | E | Conjunctiva | Chemosis | 3* | 4* | 4 ^{bc} | |
| | F | Conjunctiva | Discharge | 2 | 1 | 1 | |
| | | (3) Conjunctiva Total = (D+E+F) x 2 | | | 14 | 14 | 12 |
| | | Totals Added (1 + 2 + 3) | | | 14 | 14 | 12 |
| | UV Fluorescein Scan | | | | | 0 | |

a = deep red on upper eye lid

b = upper lid appears blistered

c = lower lid appears blistered

* = swelling of outer tissues surrounding the eye

SCALE FOR SCORING OCULAR LESIONS**

(1) CORNEA

| | |
|--|--------------------|
| (A) OPACITY- DEGREE OF DENSITY (AREA MOST DENSE TAKEN FOR READING) | |
| NO OPACITY | 0 |
| SCATTERED OR DIFFUSE AREA, DETAILS OF IRIS CLEARLY VISIBLE | 1* |
| EASILY DISCERNIBLE TRANSLUCENT AREAS, DETAILS OF IRIS SLIGHTLY OBSCURED | 2* |
| OPALESCENT AREAS, NO DETAILS OF IRIS VISIBLE, SIZE OF PUPIL BARELY DISCERNIBLE | 3* |
| OPAQUE, IRIS INVISIBLE | 4* |
| (B) AREA OF CORNEA INVOLVED | |
| ONE QUARTER (OR LESS) BUT NOT ZERO | 1 |
| GREATER THAN ONE QUARTER, BUT LESS THAN HALF | 2 |
| GREATER THAN HALF, BUT LESS THAN THREE QUARTERS | 3 |
| GREATER THAN THREE QUARTERS, UP TO WHOLE AREA | 4 |
| SCORE EQUALS A x B x 5 | TOTAL MAXIMUM = 80 |

(2) IRIS

| | |
|--|--------------------|
| (A) VALUES | |
| NORMAL | 0 |
| FOLDS ABOVE NORMAL, CONGESTION, SWELLING, CIRCUMCORNEAL INJECTION (ANY OR ALL OF THESE OR COMBINATION OF ANY THEREOF) IRIS STILL REACTING TO LIGHT (SLUGGISH REACTION IS POSITIVE) | 1* |
| NO REACTION TO LIGHT, HEMORRHAGE, GROSS DESTRUCTION(ANY OR ALL OF THESE) | 2* |
| SCORE EQUALS A x 5 | TOTAL MAXIMUM = 10 |

(3) CONJUNCTIVAE

| | |
|--|--------------------|
| (A) REDNESS(REFERS TO PALPEBRAL AND BULBAR CONJUNCTIVAE EXCLUDING CORNEA AND IRIS) | |
| VESSELS NORMAL | 0 |
| VESSELS DEFINITELY INJECTED ABOVE NORMAL | 1 |
| MORE DIFFUSE, DEEPER CRIMSON RED, INDIVIDUAL VESSELS NOT EASILY DISCERNIBLE | 2* |
| DIFFUSE BEEFY RED | 3* |
| (B) CHEMOSIS | |
| NO SWELLING | 0 |
| ANY SWELLING ABOVE NORMAL(INCLUDES NICTITATING MEMBRANE) | 1 |
| OBVIOUS SWELLING WITH PARTIAL EVERSION OF LIDS | 2* |
| SWELLING WITH LIDS ABOUT HALF CLOSED | 3* |
| SWELLING WITH LIDS ABOUT HALF CLOSED TO COMPLETELY CLOSED | 4* |
| (C) DISCHARGE | |
| NO DISCHARGE | 0 |
| ANY AMOUNT DIFFERENT FROM NORMAL(DOES NOT INCLUDE SMALL AMOUNTS OBSERVED IN INNER CANTHUS OF NORMAL ANIMALS) | 1 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS, JUST ADJACENT TO LIDS | 2 |
| DISCHARGE WITH MOISTENING OF THE LIDS AND HAIRS, AND CONSIDERABLE AREA AROUND THE EYE | 3 |
| SCORE EQUALS (A + B + C) x 2 | TOTAL MAXIMUM = 20 |

THE MAXIMUM TOTAL SCORE IS THE SUM OF ALL SCORES OBTAINED FOR THE CORNEA, IRIS, AND CONJUNCTIVAE. TOTAL MAXIMUM SCORE POSSIBLE = 110
 *AN ANIMAL SHALL BE CONSIDERED AS EXHIBITING A POSITIVE REACTION
 **DRAIZE, J.H. ET AL. J. PHARM. EXP. THER. 82:377-390, 1944

CONCLUSIONS

| | |
|---------------|---------------------------------------|
| NON-IRRITANT | 0 OR 1 RABBIT(S) WITH POSITIVE SCORES |
| INDETERMINATE | 2 OR 3 RABBITS WITH POSITIVE SCORES |
| IRRITANT | 4 TO 6 RABBITS WITH POSITIVE SCORES |

ULTRAVIOLET FLUORESCENCE SCAN SCORING CODE

- 0 = NEGATIVE
- 1 = POSITIVE WITH AN AREA 1/4 OR LESS
- 2 = POSITIVE WITH AN AREA GREATER THAN 1/4, BUT LESS THAN 1/2
- 3 = POSITIVE WITH AN AREA GREATER THAN 1/2, BUT LESS THAN 3/4
- 4 = POSITIVE WITH AN AREA GREATER THAN 3/4, UP TO WHOLE AREA

SAMPLE # ADMA 8

EYE IRRITATION FOR ETAYL

MAT. REC'D 21 Dec 77 Prot. # 2038

PROJECT # 79-4334

TEST STARTED Feb 80 Page of

TEST ENDED 8 Feb 80 Q.A. 23/24

DESC. AS REC'D Cleaned

STUDY DIR. ntn

DOSE: DATE/TIME 5 Feb 80/12 05

| | |
|---------|-----------|
| .1 g | .1 ml eq. |
| vol. cc | wt. - g |
| .1 ml ✓ | BY GP |

House 2/cage; Dose 6 ES at 0.1 ml or 0.1 ml equiv. No Wash. Score at 1, 2, and 3 days. NaFl 24 Hrs. Pre and 3 days. "blistered" = Cover lid approx. Blistered
 B = Upper lid appears "blistered"
 * Swelling of outer tissues surrounding the eye
 A = Disposed in upper eye lid

| INIT. | Sw | STL | STH | VERIF | Sw | 2 | Sw | Sw | |
|--------------|----|--------------------|------|-----------|-------|--------------------|-------|------|--------------|
| TIME DATE | 6 | 7 | 8 | TIME DATE | 4 Feb | 6 | 7 | 8 | |
| DAY PRE | 1 | 2 | 3 | DAY PRE | 1 | 2 | 3 | | |
| AN.#1 | 0 | 0 | 0 | OPAC | 0 | 0 | 0 | 0 | AN.#4 |
| SEX ♀ | 0 | 0 | 0 | AREA | 0 | 0 | 0 | 0 | SEX ♀ |
| RECD. 15 Jan | 0 | 0 | 0 | IRIS | 0 | 0 | 0 | 0 | RECD. 15 Jan |
| SUP. P | 0 | 1 | 1 | RED | 0 | 1 | 1 | 1 | SUP. A |
| ROW 11C | 0 | 4*B | 4*BC | CHEM | 0 | 3* | 3* | 3* | ROW 71A |
| EYE | 0 | 2 | 1 | DISC | 0 | 2 | 2 | 1 | EYE |
| LT | 0 | XXXXXXXXXXXXXXXXXX | 0 | NAFL | 0 | XXXXXXXXXXXXXXXXXX | 0 | 0 | LT |
| | A | A | A | SYST | A | A | A | A | |
| AN.#2 | 0 | 0 | 0 | OPAC | 0 | 0 | 0 | 0 | AN.#5 |
| SEX ♀ | 0 | 0 | 0 | AREA | 0 | 0 | 0 | 0 | SEX ♀ |
| RECD. 15 Jan | 0 | 0 | 0 | IRIS | 0 | 0 | 0 | 0 | RECD. 15 Jan |
| SUP. P | 0 | 1 | 1 | RED | 0 | 1 | 1 | 1 | SUP. A |
| ROW 11C | 0 | 3* | 3*B | CHEM | 0 | 3A* | 3A*Bc | 3*BC | ROW 72A |
| EYE | 0 | 2 | 1 | DISC | 0 | 2 | 1 | 2 | EYE |
| LT | 0 | XXXXXXXXXXXXXXXXXX | 0 | NAFL | 0 | XXXXXXXXXXXXXXXXXX | 0 | 0 | LT |
| | A | A | A | SYST | A | A | A | A | |
| AN.#3 | 0 | 0 | 0 | OPAC | 0 | 0 | 0 | 0 | AN.#6 |
| SEX ♀ | 0 | 0 | 0 | AREA | 0 | 0 | 0 | 0 | SEX ♀ |
| RECD. 15 Jan | 0 | 0 | 0 | IRIS | 0 | 0 | 0 | 0 | RECD. 15 Jan |
| SUP. A | 0 | 1 | 1 | RED | 0 | 2 | 2 | 1 | SUP. A |
| ROW 71A | 0 | 3* | 3* | CHEM | 0 | 3* | 4* | 4*BC | ROW 72A |
| EYE | 0 | 2 | 2 | DISC | 0 | 2 | 1 | 1 | EYE |
| LT | 0 | XXXXXXXXXXXXXXXXXX | 0 | NAFL | 0 | XXXXXXXXXXXXXXXXXX | 0 | 0 | LT |
| | A | A | A | SYST | A | A | A | A | |

AN. SEX BY: N.L.

JM = J. Miller ML = M. Loffland JM = S. Moreno MTM = T. Moreno
 SK = S. Kovacs JB = J. Gruber SEW = S. Weatherby NH = N. Ratcliffe
 M-AZE: S-SLIGHT: U-ULCER: FOR EXPLANATION OF OTHER CODES SEE PROTOCOL

TM = T. Master DRC = D. Cervon SM = S. Meister
 JH = J. Hurvick BA = B. Allbach
 JB = J. DiDonato AB = A. Blasko

BY = B. Yeuser
 CC = C. Cooper