Fatty amines, dialkyl methyl: Human health tier II assessment

30 June 2017

Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
1-Octadecanamine, N-methyl-N-octadecyl-	4088-22-6
9-Octadecen-1-amine, N-methyl-N-9-octadecenyl-, (Z,Z)-	7173-65-1
1-Hexadecanamine, N-hexadecyl-N-methyl-	16724-61-1
1-Tetradecanamine, N-methyl-N-tetradecyl-	41961-81-3
Amines, bis(hydrogenated tallow alkyl)methyl	61788-63-4
Amines, di-C14-18-alkylmethyl	67700-99-6
Amines, methylditallow alkyl	68603-65-6

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:**www.nicnas.gov.au**

Disclaimer

ACRONYMS & ABBREVIATIONS

Grouping Rationale

The chemicals in this group are structurally related tertiary amines with two linear aliphatic chains and an N-methyl group.

The chemicals in this group can have an alkyl chain between 12 and 18 carbon atoms. Some of the chemicals are derived from fatty acids and are comprised of a mixture where the carbon chain varies between 12 and 18 atoms (even numbers only). The individual components may also have unsaturation of the alkyl chain.

Commercially, high purity alkyl amines are isolated by fractional distillation of fatty alkylamine products. Alkyl amines are derived from natural sources and converted through catalytic hydrogenation of nitrile intermediates. The carbon chain distribution of the naturally derived chemicals will vary depending on the method of production and the source of the precursor chemicals. Data regarding the typical composition of chemicals similar to those in this group are limited to the following fatty amines:

- hydrogenated tallow amines (C12: 1 %, C14: 4 %, C16: 30.5 %, C18: 62 %, incl. unsat. C18: <5 %); and
- tallow alkylamines (C12: 1 %, C14: 3 %, C16: 32 %, C18: 61.5 %, incl. unsat. C18: >40 %).

An increasing percentage of unsaturation of the alkyl chains decreases the melting point of the chemical while the reactivity is expected to increase. The tertiary amine functional group is strongly basic and is the most relevant functional group for consideration of the toxicity of any endpoint.

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacturing information has been identified.

International

The following international uses have been identified through the European Union (EU) Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) dossiers; Galleria Chemica; the European Commission Cosmetic Ingredients and Substances (CosIng) database; and the United States (US) Personal Care Products Council International Nomenclature of Cosmetic Ingredients (INCI) Dictionary.

The chemical, N-hexadecyl-N-methyl-1-hexadecanamine (CAS No. 16724-61-1) is listed on the China Inventory of Cosmetic Ingredients. Bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) has reported cosmetic use as an antistatic or emulsifying agent in products such as hair conditioners. It may also be used as a surfactant in domestic or commercial products.

The chemical, di-C14-18-alkylmethyl amines (CAS No. 67700-99-6) has reported domestic use as an anti-static agent in fabric softeners.

Commercial uses are reported for the following:

- N-methyl-N-9-octadecenyl-, (Z,Z)-9-octadecen-1-amine (CAS No.7173-65-1) as corrosion inhibitors and when hydrophobing silica; and
- di-C14-18-alkylmethyl amines (67700-99-6) as corrosion inhibitors, foam stabilisers and emulsifiers.

Distearylmethylamine, N-methyl-N-9-octadecenyl-(Z,Z)-9-octadecen-1-amine (CAS No.7173-65-1) and di-C14-18-alkylmethyl amines (CAS No. 67700-99-6) have reported site-limited use as chemical intermediates.

Restrictions

Australian

The chemicals in this group are listed in the *Poisons Standard—Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) in Schedule 5 as follows (SUSMP, 2017):

'AMINES for use as curing agents for epoxy resins except when separately specified in these Schedules'.

Schedule 5 chemicals are labelled with 'Caution'. These are substances with a low potential for causing harm, the extent of which can be reduced through the use of appropriate packaging with simple warnings and safety directions on the label.

This restriction does not affect other uses.

International

The chemicals in this group are subject to restrictions on the following:

The EU Cosmetics Regulation 1223/2009 Annex III—List of substances which cosmetic products must not contain except subject to the restrictions laid down:

'Trialkylamines, trialkanolamines and their salts:

- maximum concentration of 2.5 % in leave-on products.

For use in leave-on and rinse-off products:

- Do not use with nitrosating systems
- Minimum raw material purity: 99 %
- Maximum secondary amine content: 0.5 % (applies to raw materials)
- Maximum nitrosamine content: 50 µg/kg

Should not be used with nitrosating systems and should be kept in nitrite-free environments.'

Existing Worker Health and Safety Controls

Hazard Classification

The chemicals are not listed on the Hazardous Chemical Information System (HCIS) (Safe Work Australia).

Exposure Standards

Australian

No specific exposure standards are available.

International

No specific exposure standards are available.

Health Hazard Information

Data are available for distearylmethylamine, bis(hydrogenated tallow alkyl) methyl amines (CAS No. 61788-63-4) and ditallow methylamine (DTMA). DTMA has been variously ascribed to two CAS numbers 67700-99-6 and 68603-65-6 (TSCATS, 1984), which are listed as separate chemicals in this group and the Australian Inventory of Chemical Substances (AICS).

Acute Toxicity

Oral

The chemicals had low toxicity in animal tests following oral exposure. The median lethal dose (LD50) in rats is >15000 mg/kg bw. Observed sub-lethal effects included piloerection and hunched posture, diarrhoea, oily hair, urine-stained anal-genital area, pallor of the extremities and abnormal gait (TSCATS, 1984; USEPA, 2003).

Wistar rats (n = 5/sex) were administered a single oral dose of distearylmethylamine at 2000 mg/kg bw. The LD50 value was reported to be >2000 mg/kg bw. Macroscopic examination revealed no visible changes (USEPA, 2003).

Sprague Dawley (SD) rats (n = 5/sex) were administered a single oral dose of distearylmethylamine at 5000 mg/kg bw. All animals survived the study and gained weight during the 14-day observation period. While all animals appeared subdued and lethargic four hours after treatment, this was only apparent in one female at 24 hours. Necropsy of all surviving animals showed no macroscopic abnormalities. The LD50 value was reported to be >5000 mg/kg bw (USEPA, 2003).

Rats (SD, n = 5/sex) were administered a single oral dose of 20 mL/kg dose of a 75 % w/v suspension of bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) in mineral oil. The LD50 value was reported to be >15000 mg/kg bw (USEPA, 2003).

Rats (SD, n = 5/sex) were administered a single 5000 mg/kg bw dose of bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) by gavage. The LD50 value was reported to be >5000 mg/kg bw (USEPA, 2003).

A 75% w/v mixture of DTMA in mineral oil was administered to rats (unspecified strain, number and sex) by gavage at 20 mL/kg. Animals were observed for a 14-day post-exposure period for mortality. The minimum lethal dose (LD1) was >15000 mg/kg, the highest dose tested (TSCATS, 1984).

Intragastric administration of 10 mL/kg and 20 mL/kg of 75 % w/v DTMA in mineral oil in dogs (unspecified breed, number and sex) caused mild to negligible emesis and catharsis along with mild transient gastric effects (hyperaemia, petechiae, and darkened mucosa). Mineral oil alone is a mild laxative (TSCATS, 1984).

Dermal

Distearylmethylamine and DTMA had low acute dermal toxicity in rabbits with LD50s > 2000 mg/kg bw (USEPA, 2003; TSCATS, 1984).

A single dose of distearylmethylamine was applied occluded to the clipped backs of New Zealand White (NZW) rabbits (n = 3/sex) at 2000 mg/kg bw for 24 hours. Prior to application of the chemical, the skin of three animals (two males, one female) was left intact and the skin of the other three was abraded by penetration of the horny layer of the epidermis without causing bleeding. Three animals developed diarrhoea during the observation period. By day four and seven following treatment, the condition of two of these animals (one abraded female and one intact male, respectively) deteriorated further and death occurred. The third animal recovered and survived through the observation period. Slight to moderate erythema and oedema were observed in all animals during the observation period. Necropsy of the animals identified a slight degree of crusting and fissuring of the epidermis, not extending to the dermis, in the skin of two abraded and one intact animals. Necropsy of the male animal that died on day seven determined that the stomach was impacted with dry food and the gastrointestinal tract was filled with fluid. No significant treatment-related effects were identified in major organs of the other animals and no tissues were retained. The LD50 was >2000 mg/kg bw (USEPA, 2003).

Undiluted DTMA was applied under occlusion to the clipped backs of rabbits (unspecified number, strain and sex) at a dose level of 2000 mg/kg bw for 24 hours. Animals were observed for a 14-day post-application period for mortality. The minimum lethal dose (LD1) was >2000 mg/kg bw, the highest dose tested (TSCATS, 1984).

Inhalation

No data are available.

Corrosion / Irritation

Skin Irritation

Based on the data available from irritation, dermal acute and repeated dose toxicity tests, the chemicals are considered to be mildly irritating to the skin.

In a non-guideline study, 50 % w/v aqueous and 5 % w/v aqueous dispersions of DTMA were applied under occlusion to the clipped intact and abraded backs of rabbits (unspecified strain, number and sex) at a dose of 0.4 mL/patch for 24 hours. The test sites were graded 30 minutes and 48 hours after patch removal; mild skin irritation was observed (TSCATS, 1984).

Eye Irritation

Limited data are available.

In an eye irritation study, 20 % DTMA produced essentially no irritation in rabbits (unspecified breed, number and sex) when 0.01 mL was applied to the cornea (TSCATS, 1984).

Observation in humans

Skin irritation tests showed little or no irritation when humans were exposed to 1.0 and 2.0 % w/v aqueous dispersions of DTMA (0.3 mL/occluded patch) in a single 24-hour exposure or three 24-hour exposures over a 6-day period (TSCATS, 1984).

Sensitisation

Skin Sensitisation

Based on the limited information available for one of the chemicals, the chemicals are not expected to be sensitising to human or guinea pig skin.

In a Buehler sensitisation study with limited reported study details, 30 % w/v DTMA in 80 %/20 % ethanol/water solution was applied (0.4 mL per occluded patch) to the clipped backs of 20 guinea pigs (unspecified strain and sex) for six hours, once a week, during a three-week induction period. No evidence of skin sensitisation was observed following a challenge with 20 % w/v DTMA in 80 %/20 % ethanol/water solution for a single 6-hour occluded exposure conducted two weeks after completion of the induction (TSCATS, 1984).

Observation in humans

Volunteer subjects (n = 192) received nine exposures to 2 % w/v aqueous DTMA (0.3 mL/occluded patch) applied for a 24- hour period, three times a week during a 3-week induction period. No evidence of skin sensitisation was observed following a challenge with 2 % w/v DTMA as a single 24-hour occluded patch, conducted two weeks after the completion of the induction period (TSCATS, 1984).

Repeated Dose Toxicity

Oral

Based on the available data from experimental studies in animals, the chemicals are not considered to cause serious health effects following repeated oral exposure.

In a subacute gavage study, non-pregnant female NZW rabbits (n = 4/dose) were administered distearylmethylamine at 100, 250, 500, 750 and 1000 mg/kg bw/day) in a volume of 2 mL/kg for 13 days and observed for another ten days. Signs of respiratory distress in two animals in the lowest dose groups were concluded to be non-treatment related. A no observed effect level (NOEL) was not established because treatment-related minimal suppression of weight gain and food intake was observed at all dose levels (USEPA, 2003).

In a subchronic dietary study, groups of SD rats (n = 20/sex/dose) were fed diets containing distearylmethylamine at concentrations of 0.15, 0.5 and 1.5 % w/w daily for 13 weeks. Due to marked depression of body weight gain at the highest concentration, from week 5 until termination (week 13) the dietary concentrations were changed to 0.15, 0.4 and 1.0 % w/w daily (approximately 130, 375 and 1000 mg/kg bw/day). Accumulation of histiocytes with foamy cytoplasm was found in the lamina propria of the jejunum, in the mesenteric lymph nodes, and to a lesser extent in the other tissues of animals exposed to 130 mg/kg bw/day. Focal degenerative changes were found in some of the histiocyte aggregates in the mesenteric lymph node of high dose rats, and a few animals had peritonitis. This histiocytosis was present in all treated groups and was sufficiently marked even in the low dose group rats to cause a visible enlargement of the mesenteric node at necropsy, thereby precluding this as the 'no-effect' level. Effects in organs remote from the gastrointestinal tract and associated tissues included the presence of foamy interstitial cells (undetermined origin) in the ovary and alopecia in the skin. Ovarian changes were detected in all treated groups, but alopecia was restricted largely to rats in the high dose group. Histiocytosis in the jejunum and mesenteric lymph nodes indicated uptake of dietary lipid material by the local reticuloendothelial system, and changes in the ovary and skin suggested possible systemic disturbances in lipid metabolism. The lowest observed effect level (LOEL) was established at 130 mg/kg bw/day. Effects seen at medium and/or high doses included lower overall body weight gains, decreased food consumption, decreased food conversion efficiencies, reduced packed cell volumes and reductions in the absolute weights of most weighed organs. Effects seen in all treated animals include increases in total leukocyte counts, reductions in haemoglobin concentration and increased relative weights of the liver, testes, kidneys and lungs (USEPA, 2003).

In a subchronic study, rats (unspecified strain, number and sex) were fed 0.6, 6 and 30 mg/kg bw/day DTMA in their diet for 13 weeks. Pathology findings consisted of accumulations of histiocytes (macrophages) in the mesenteric lymph nodes of rats dosed with 6 or 30 mg/kg bw/day. The severity of the histiocytosis was dose-related and the mesenteric lymph nodes of most rats in the 30 mg/kg bw/day group were enlarged at necropsy. No histiocytosis was found in rats exposed at the lowest dose. Therefore, the no observed effect level (NOEL) was established at 0.6 mg/kg bw/day (TSCATS, 1984).

Dermal

Based on the available data from experimental studies in animals, the chemicals are not considered to cause serious health effects following repeated dermal exposure.

In a subchronic dermal study in NZW rabbits (n = 5/sex/dose) conducted in accordance with good laboratory practice (GLP), distearylmethylamine was administered at 0, 5 or 50 mg/kg bw/day for five consecutive days per week for 13 weeks. The test substance (or polyethylene glycol 600 for controls) was applied to a non-abraded shaved dorso-lumbar region of each animal and left for seven hours before removal by washing. Signs of moderate irritation were observed in animals treated with 50 mg/kg bw/day and minimal irritation was observed in animals treated with 5 mg/kg bw/day. Other effects included notably higher incidence of leukocyte foci in the liver and epithelioid cells in the mesenteric lymph nodes of animals in the highest dose group (compared to controls), slight changes in mean body weight gain, reduced food consumption and unusually low haemoglobin concentration, red blood cell count and packed cell volume in two females in the highest dose group. Four animal necropsies (two controls and two treated animals) suggested that gastrointestinal disease was affecting these animals . The no observed adverse effect level (NOAEL) for systemic toxicity was established at 50 mg/kg bw/day (TSCAT, 1984).

In a range-finding dermal study conducted in NZW rabbits (n = 1/sex/dose), distearylmethylamine was administered at 0, 50, 100, 200 or 500 mg/kg bw/day for five consecutive days and the animals were maintained untreated for an additional two days. The test substance (or polyethylene glycol 600) was applied to a non-abraded, shaved dorso-lumbar region of each animal through a syringe and left for 7 hours before removal by washing. Three animals in the two highest treatment groups were killed for humane reasons because of severe local irritation at the test site. Skin irritation was characterised as moderate to severe erythema and oedema with fissuring in both males and females in the 200 and 500 mg/kg/day treatment groups. Mild to severe erythema and oedema in the 50 and 100 mg/kg/day treatment groups remained constant from day three through to termination (USEPA, 2003).

In a subchronic dermal study, rabbits (strain unspecified, n = 5/sex/group) were treated topically with DTMA at dose levels of 5 or 50 mg/kg bw/day, five days per week for 13 weeks. A control group received the vehicle, polyethylene glycol 600. No treatment-related clinical changes were observed. A slight decrease in body weight gain was recorded for 50 mg/kg bw/day animals during the last seven weeks. Moderate irritation (erythema, oedema, desquamation, fissuring and atonia with wrinkling) was seen in 50 mg/kg bw/day animals. A mild dermal response was seen in most 5 mg/kg bw/day animals. Pathology findings were consistent with a moderate degree of irritation at the application site in 50 mg/kg bw/day animals. Examination of other tissues revealed intralobular leukocyte foci in the liver and epithelioid cells in the mesenteric lymph nodes of several 50 mg/kg bw/day rabbits. The NOEL was 5 mg/kg bw/day (USEPA, 2003).

Inhalation

No data are available.

Genotoxicity

Although the available data are limited to three of the chemicals in this group, the information indicates that the chemicals in this assessment are not considered to be genotoxic.

Negative results were found in bacterial reverse mutation, mammalian mutation and unscheduled DNA synthesis tests:

- several Ames mutagenicity tests with distearylmethylamine, bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) and DMTA in *Salmonella typhimurium* strains TA 98, TA 100, 1535, 1537, 1538 with and without metabolic activation exposed at 4–5000 μg, 0.33–100 μg and concentrations unspecified respectively;
- a L5178Y TK +/-mouse lymphoma assay conducted using DTMA, no concentrations reported and on bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) at concentrations of 0.33–100 μg/plate in tetrahydrofuran with and without metabolic activation; and
- an unscheduled DNA synthesis test on DTMA, no concentrations reported and bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) at concentrations of 32.1–340 μg/mL in rat hepatocytes (TSCATS, 1984; USEPA, 2003).

In vivo test for chromosomal aberrations in rats exposed to the following chemicals in corn oil were negative:

- DTMA (TSCATS, 1984); and
- bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) administered by oral gavage to animals (5/sex/group) at doses of 1.5, 5 or 15 g/kg bw for five days (USEPA, 2003).

Carcinogenicity

No data are available.

Reproductive and Developmental Toxicity

Based on the very limited available data, these chemicals are not expected to show specific reproductive toxicity. Developmental toxicity was only observed at high doses causing maternal toxicity.

Rabbits (n = 16/group, breed unspecified) were treated with DTMA by gavage at dose levels of 50, 250 or 1000 mg/kg bw/day from day six to day 18 of gestation inclusive. A control group received the vehicle, corn oil. Reproductive performance, clinical conditions, the outcome of gestation and gross necropsy changes were assessed. Administration of 250 mg/kg bw/day DTMA produced slight maternal toxicity but no embryolethality, direct embryonic growth retardation or teratogenic effects. No direct retardation of embryonic growth or teratogenic effects were noted at 1000 mg/kg bw/day DTMA. However, due to a possible association of treatment at 1000 mg/kg bw/day with embryolethality, the NOEL was established as 250 mg/kg bw/day (TSCATS, 1984).

Risk Characterisation

Critical Health Effects

The toxicity data for the chemicals in this group showed moderate local effects including irritation following prolonged exposure.

Public Risk Characterisation

One of the chemicals in this group, bis(hydrogenated tallow alkyl)methyl amines (CAS No. 61788-63-4) has been identified as an antistatic, hair conditioning, surfactant or emulsifying agent in cosmetics. Cosmetic products are not likely to have extreme pH levels and thus public exposure to high concentrations of these chemicals are not expected from cosmetic use.

Occupational Risk Characterisation

Based on the available data, the chemicals do not warrant classfication in the HCIS (Safe Work Australia).

NICNAS Recommendation

Current risk management measures are considered adequate to protect public and workers' health and safety, provided that all requirements are met under workplace health and safety, and poisons legislation as adopted by the relevant state or territory. No further assessment is required.

Regulatory Control

Public Health

Products containing the chemicals should be labelled in accordance with state and territory legislation (SUSMP, 2017).

Work Health and Safety

Compliance with the standard worker health and safety requirements for chemicals provides an appropriate level of protection. No specific recommendations were made for these chemicals. Should new information become available, this may need to be reconsidered.

Advice for consumers

Products containing the chemicals should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from exposure to the chemicals should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemicals are used.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemicals are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of these chemicals has not been undertaken as part of this assessment.

References

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Last Update 30 June 2017

Chemical Identities

Chemical Name in the Inventory and Synonyms	**1-Octadecanamine, N-methyl-N-octadecyl-** N,N-distearyl methylamine N-methyldioctadecylamine distearylmethylamine
CAS Number	4088-22-6
Structural Formula	

	
Molecular Formula	C37H77N
Molecular Weight	536.02

Chemical Name in the Inventory and Synonyms	**9-Octadecen-1-amine, N-methyl-N-9-octadecenyl-, (Z,Z)-** N,N-dioleylmethylamine N-methyldioleylamine
CAS Number	7173-65-1
Structural Formula	

	
Molecular Formula	C37H73N
Molecular Weight	531.99

Chemical Name in the Inventory and Synonyms	**1-Hexadecanamine, N-hexadecyl-N-methyl-** dihexadecylamine, N-methyl- dipalmitylmethylamine
CAS Number	16724-61-1
Structural Formula	

	
Molecular Formula	C33H69N
Molecular Weight	479.91

Chemical Name in the Inventory and Synonyms	**1-Tetradecanamine, N-methyl-N-tetradecyl-** methylditetradecylamine methyldimyristylamine
CAS Number	41961-81-3
Structural Formula	

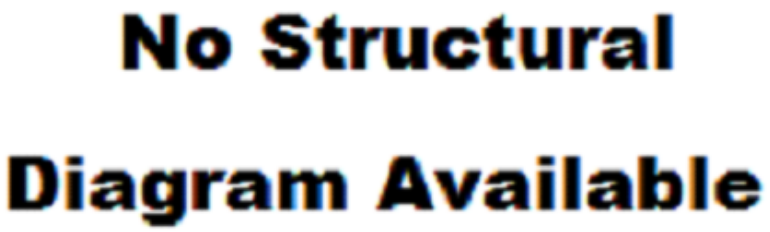
	
Molecular Formula	C29H61N
Molecular Weight	423.80

Chemical Name in the Inventory and Synonyms	**Amines, bis(hydrogenated tallow alkyl)methyl** dihydrogenated tallow methylamine
CAS Number	61788-63-4
Structural Formula	**No Structural Diagram Available**

Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Amines, di-C14-18-alkylmethyl** (C14-18) dialkylmethylamine
CAS Number	67700-99-6
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Amines, methylditallow alkyl** ditallowmonomethylamine
CAS Number	68603-65-6
Structural Formula	

	
Molecular Formula	Unspecified
Molecular Weight	Unspecified

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