WHO SPECIFICATIONS AND EVALUATIONS FOR PUBLIC HEALTH PESTICIDES

S-METHOPRENE

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DISCLAIMER[1]

WHO specifications are developed with the basic objective of promoting, as far as practicable, the manufacture, distribution and use of pesticides that meet basic quality requirements.

Compliance with the specifications does not constitute an endorsement or warranty of the fitness of a particular pesticide for a particular purpose, including its suitability for the control of any given pest or its suitability for use in a particular area. Owing to the complexity of the problems involved, the suitability of pesticides for a particular purpose and the content of the labelling instructions must be decided at the national or provincial level.

Furthermore, pesticides which are manufactured to comply with these specifications are not exempted from any safety regulation or other legal or administrative provision applicable to their manufacture, sale, transportation, storage, handling, preparation and/or use.

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Additionally, WHO wishes to alert users to the fact that improper storage, handling, preparation and/or use of pesticides can result in either a lowering or complete loss of safety and/or efficacy.

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[1] This disclaimer applies to all specifications published by WHO.

INTRODUCTION

WHO establishes and publishes specifications[2] for technical material and related formulations of public health pesticides with the objective that these specifications may be used to provide an international point of reference against which products can be judged either for regulatory purposes or in commercial dealings.

From 2002, the development of WHO specifications follows the **New Procedure**, described in the "Manual for development and use of FAO and WHO specifications for chemical pesticides." This **New Procedure** follows a formal and transparent evaluation process. It describes the minimum data package, the procedure and evaluation applied by WHO and the experts of the FAO/WHO Joint Meeting on Pesticide Specifications (JMPS).

WHO specifications now only apply to products for which the technical materials have been evaluated. Consequently, from the year 2002 onwards, the publication of WHO specifications under the **New Procedure** has changed. Every specification consists now of two parts, namely the specifications and the evaluation report(s):

Part One: The Specification of the technical material and the related formulations of the pesticide in accordance with chapters 4 to 9 of the above-mentioned manual.

Part Two: The Evaluation Report(s) of the pesticide, reflecting the evaluation of the data package carried out by WHO and the JMPS. The data are provided by the manufacturer(s) according to the requirements of chapter 3 of the above-mentioned manual and supported by other information sources. Evaluation reports include the name(s) of the manufacturer(s) whose technical material has been evaluated. Evaluation reports on specifications developed subsequently to the original set of specifications are added in chronological order to this report.

WHO specifications under the **New Procedure** do not necessarily apply to nominally similar products of other manufacturer(s), nor to those where the active ingredient is produced by other routes of manufacture. WHO has the possibility to extend the scope of the specifications to similar products but only when the JMPS has been satisfied that the additional products are equivalent to that which formed the basis of the reference specification.

Specifications bear the date (month and year) of publication of the current version. Evaluations bear the date (year) of the meeting at which the recommendations were made by the JMPS.

[2] Publications available on the Internet under the WHO Prequalification Unit – Vector Control Product Assessment Team (PQT/VCP) website, https://extranet.who.int/prequal/vector-control-products

PART ONE: SPECIFICATIONS

S-METHOPRENE

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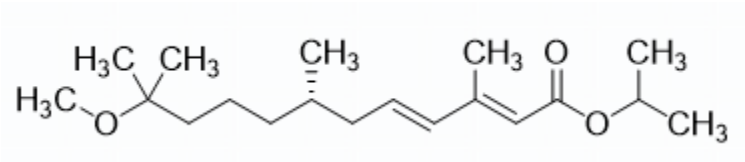
S-METHOPRENE INFORMATION

Name:	S-methoprene. The name S-methoprene refers to an enantio-enriched mixture, composed mainly of the single stereoisomer propan-2-yl (2E,4E,7S)-11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate, with only small proportions of the other stereoisomer, as defined by the WHO specification.
Synonyms:	None
Chemical names:	
IUPAC:	propan-2-yl (2*E*,4*E*,7*S*)-11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate
CA:	1-methylethyl (2*E*,4*E*,7*S*)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate
Structural formula:	
Molecular formula:	$C_{19}H_{34}O_3$
Relative molecular mass:	310.5
CAS Registry number:	65733-16-6
CIPAC number:	1026
Identity tests:	GC retention time, Chiral HPLC retention time, IR spectrum, ^{13}C-NMR, ^{1}H-NMR, Mass spectrum

S-METHOPRENE TECHNICAL MATERIAL

WHO specification 1026/TC (April 2025*)

This specification, which is PART ONE of this publication, is based on an evaluation of data submitted by the manufacturer whose name is listed in the evaluation report 1026/2025. This specification should be applicable to TC produced by this manufacturer, but it is not an endorsement of those products nor a guarantee that they comply with the specification. The specification may not be appropriate for TC produced by other manufacturers. The evaluation report (1026/2025), as PART TWO, forms an integral part of this publication.

1 Description

The material shall consist of S-methoprene together with related manufacturing impurities, in the form of an amber transparent liquid, and shall be free from visible extraneous matter and added modifying agents.

2 Active ingredient

2.1 Identity tests (1026/TC/(M)/2, CIPAC/5359, Note 1)
The active ingredient shall comply with an identity test and, where the identity remains in doubt, shall comply with at least one additional test.

2.2 Methoprene content (414/TC/M/3, CIPAC Handbook M, p. 116, 2006)
The methoprene shall be declared (not less than 940 g/kg), and when determined, the average measured content shall not be lower than the declared minimum content.

2.3 S-methoprene content (1026/TC/(M)/3, CIPAC/5359 Note 1)
The S-isomer content in the methoprene shall be declared (not less than 97%), and when determined, the average measured value shall not be lower than the declared minimum S-isomer content.

Note 1: Provisional CIPAC method not yet published. Prior to publication, it is available at https://cipac.org/index.php/m-p/pre-published-methods

* Specifications may be revised and/or additional evaluations may be undertaken. Ensure the use of current versions by checking at the WHO Prequalification Unit – Vector Control Product Assessment Team (PQT/VCP) website: https://extranet.who.int/prequal/vector-control-products/specifications-new-procedure.

PART TWO: EVALUATION REPORT

S-METHOPRENE

S-METHOPRENE

FAO/WHO EVALUATION REPORT 1026/2025

Recommendations

The Meeting recommended that the specification for S-methoprene TC proposed by Central Garden & Pet should be adopted by WHO.

Appraisal

The Meeting considered data and information submitted between Feb 2023 and Feb 2025 by Central Garden & Pet in support of a new WHO specification for S-methoprene TC.

S-methoprene is an insect juvenile growth regulator acting as a larvicide. It prevents metamorphosis from larval to pupa stage by mimicking juvenile hormone activities. It is used in agriculture and public health against mosquitoes, fleas, ants and other insects.

S-methoprene is not under patent.

S-methoprene has been evaluated by the WHO IPCS in 2001 and by JMPR last in 2019. The data submitted met the requirements of the Manual on development and use of FAO and WHO specifications for pesticides (2022, second edition).

Central Garden & Pet stated that their S-methoprene TC has been registered in the European Chemicals Agency (ECHA). A notice of approval has been received (ECHA, April 2022).

The Meeting was provided with confidential data on the manufacturing process, together with the manufacturing specification and batch analysis data on S-methoprene TC purity and all detectable impurities at or above 1 g/kg.

The 5 batches analysed in the batch study were produced in 2019. The mass balance in the 5 batches analysed ranged from 994 to 1002 g/kg. The specified minimum purity of the total methoprene content in the TC is 940 g/kg. The minimum enantiomeric purity of the S-isomer is 97%. The maximum limits for the impurities were supported by the batch data and are statistically justified.

The batch analysis study was performed according to the principles of GLP. The proposer used a modified CIPAC method 414/TC/M/3 for the determination of the total methoprene content. The determination of the enantiomeric purity of S-methoprene was based on a peer-validated reverse-phase HPLC in-house method. A bridging study was performed to compare the results of the in-house method with those obtained using the collaboratively validated provisional CIPAC method (CIPAC/5359). The results from the bridging study demonstrated that the results in the 5-batch study using the in-house method are similar to those using the provisional CIPAC method.

The residual solvents and impurities were determined using an in-house GC-FID method. These methods were considered acceptably validated.

The proposer indicated that none of the impurities in S-methoprene TC should be considered as relevant impurities, to which the Meeting agreed.

The Meeting was provided with data on vapour pressure, melting point, temperature of decomposition, solubility in water, octanol/water partition coefficient, hydrolysis characteristics, dissociation characteristics and solubility in organic solvent of pure S-methoprene. Test methods for determination of physicochemical properties of the active ingredient were OECD test methods or equivalent.

Supporting Information
for
Evaluation Report 1026/2025

Uses

S-methoprene is an insect juvenile growth regulator acting as a larvicide. It prevents metamorphosis from larval to pupa stage by mimicking juvenile hormone activities. It is used in agriculture and public health against mosquitoes, fleas, ants and other insects.

Identity of the active ingredient

Name

S-methoprene. The name S-methoprene refers to an enantio-enriched mixture composed mainly of the single stereoisomer propan-2-yl (2E,4E,7S)-11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate, with only small proportions of the other stereoisomer, as defined by the WHO specification.

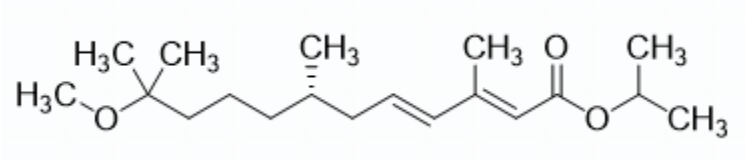
Synonyms

None

Chemical names

IUPAC	propan-2-yl (2*E*,4*E*,7*S*)-11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate
CA	1-methylethyl (2*E*,4*E*,7*S*)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate

Structural formula



Molecular formula

$C_{19}H_{34}O_3$

Relative molecular mass

310.5

CAS Registry number

65733-16-6

CIPAC number

1026

Identity tests

GC retention time, Chiral HPLC retention time, IR spectrum, ^{13}C-NMR, ^{1}H-NMR, Mass spectrum

Physico-chemical properties of S-methoprene

Table 1. Physico-chemical properties of pure S-methoprene

Parameter	Value(s) and conditions	Purity %	Method	Reference
Vapour pressure	5.74 x 10^{-3} Pa at 25° C 3.10 x 10^{-2} Pa at 40°C	98.56	OECD 104, gas saturation method	3588
Melting point	-76 to -73 °C	98.83	OECD 102	CSL-20-1162.01
Boiling point	322.49 °C	98.83	OECD 103	6011
Solubility in water	0.000515 g/l at 25 °C at pH 8.3	95.74	OECD 105	9907-F
Octanol/water partition coefficient	log POW = 6.25 at 40 °C	N.A.	OECD 117	6013
Hydrolysis characteristics	Half-life > 1 year at 25 °C at pH 4,7,9 No significant decrease occurred	95.74	OECD 111	9907-F 1650
Dissociation characteristics	The chemical structure of S-Methoprene indicates that the molecule is unlikely to dissociate in water. This was confirmed by the UV spectrophotometric method which found little or no change in absorbance as a function of pH.	95.74	OECD 112, spectrophotometric method	9907-F 1649
Solubility in organic solvents	≥500 g/l in ethanol, 2,2,4-Trimthylpentene and 1-Octanol at 25°C	95.74	OECD 105	9907-F

Table 2. Chemical composition and properties of S-methoprene technical material

Manufacturing process, maximum limits for impurities 1 g/kg, 5 batch analysis data	Confidential information supplied and held on file by FAO or WHO. Mass balances were 99.42-100.24 % and percentages of unknowns were <0.1 %.
Declared minimum S-methoprene content	940 g/kg (total assay) 97% S-methoprene stereoisomer
Relevant impurities 1 g/kg and maximum limits	None
Relevant impurities < 1 g/kg and maximum limits	None
Stabilizers or other additives and maximum limits	None

Parameter	Value and conditions	Purity %	Method reference	Study number
Melting temperature range of the TC and/or TK	-76 to -73 °C	98.83	OECD 102	CSL-20-1162.01
Solubility in organic solvents	≥500 g/l in ethanol, 2,2,4-trimthylpentene and 1-octanol at 25°C	95.74	OECD 105	9907-F

Hazard summary

S-methoprene has been evaluated by the WHO IPCS in 2001 and by JMPR last in 2019.

Formulations
The main formulation types available are GR and BR.

Methods of analysis and testing
The analytical methods for the active ingredient in TC are in-house validated methods. The total methoprene content is a validated GC-FID method, and the enantiomeric purity of the S-isomer is a validated reversed-phase HPLC method. Two GC-FID in-house validated methods were used to determine the residual solvents and manufacturing impurities.
Test methods for determination of physico-chemical properties of the technical active ingredient were OECD methods, as indicated in the specifications.

Containers and packaging
No special requirements for containers and packaging have been identified.

Expression of the active ingredient
The active ingredient is expressed and quantified as S-methoprene.

Annex 1. Hazard Summary Provided by the Proposer

Notes.
(i) The proposer confirmed that the toxicological and ecotoxicological data included in the summary below were derived from S-methoprene having impurity profiles similar to those referred to in the table above.

(ii) The conclusions expressed in the summary below are those of the proposer unless otherwise specified.

(iii) The data partially relate to the racemic form of methoprene.

Table 3. Toxicology profile of the S-Methoprene technical material, based on acute toxicity, irritation and sensitization

Species	Test	Purity % Note	Guideline, duration, doses and conditions	Result [S-methoprene, unless indicated differently]	Study number
Rat, Sprague Dawley, male and female	oral	90 %	Dose: 5,000 mg/kg Duration: 14 days	LD_{50} > 5000 mg/kg	LSC-7182 33
Rabbit /New Zealand White Rabbit) male and female	dermal	90 %	Dose: 2,000 mg/kg Duration: 14 days	LD_{50} > 2000 mg/kg	LSC-7182 35
Rabbit	inhalation	98.1 %	Dose: 5.19 mg/L Duration: 4 hr exposure and 14 day observation period	LC_{50} >5.19 mg/L	3630
Rabbit /New Zealand White Rabbit) male and female	skin irritation	90 %	72h, 0.5ml	Non irritating	LSC-7182 34
Rabbit /New Zealand White Rabbit) male and female	eye irritation	90 %	7d	Practically non irritating	LSC-7182 36
Guinea Pig (Hartley albino) Females	skin sensitisation	97.83 %	OECD 406 Induction:1,7,14 days / 6 hours Challenge: 28,35 days / 6 hours	Not sensitizing	015018

Table 4. Toxicology profile of S-Methoprene technical material based on repeated administration (subacute to chronic)

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [S-methoprene, unless indicated differently]	Study number
Rats (Sprague-Dawley) Males and females	Feeding, subchronlc toxicity	68.9	OECD 408 15 rats/sex four dose groups and control for 90 days Dose 0, 250, 500, 1000, 5000 ppm	NOAEL = 1000 ppm [R/S-methoprene]	LSC-1833 38101
Dogs (Beagles)	Feeding, subchronic toxicity	68.9	OECD 409 4 dogs/sex, three dose groups and control for 90 days	NOAEL = 12 mg/kg bw/day (8.6 mg/kg	LSC-1833 38101

Males and females			Dose 0, 250, 500, 5000 ppm, equivalent to 6.2, 12, 120 mg/kg bw/day	bw/day corrected for purity) [R/S-methoprene]	
Rabbits (Japanese) males and females	Dermal, subchronic toxicity	95.7	5 rabbits/sex, four dose groups and control for 30 days Dose 0, 100, 300, 900, 2700 mg/kg bw/day	LOAEL = 100 mg/kg bw/day (97 mg/kg bw/day corrected for purity) [R/S-methoprene]	NRI-PL-74-2465
Rats, males and females	Inhalation, subchronic toxicity	68.9	10 rats/sex, two dose groups and a control for 5 days/week for 3 weeks (5 h/day) Dose: 0, 2, 20 mg/L [R/S-methoprene]	NOAEC = 20 mg/L (1.4 mg/L corrected for purity)	322-003
Dogs (Beagles), males and females	Inhalation, subchronic	95.7	3 dogs/sex: three dose groups and a control for 6 days/week for 4 weeks (3 min/day) Dose: 0.0025, 0125, 0.0625 mg/kg bw/day [R/S-methoprene]	NOAEC = 0.062 mg/kg bw/day (0.06 mg/kg bw/day corrected for purity)	322-001
Mice (Charles River CD-1) Males and female	Feeding, carcinogenicity	86.9	OECD 451 50 mice/sex, three dose groups and control, for 18 months Dose 0, 250, 1000, 2500 ppm, equivalent to 0, 38, 150, 380 mg/kg bw/day [R/S-methoprene]	NOAEL = 150 mg/kg bw/day (130 mg/kg bw/day corrected for purity) Not carcinogenic	B1982
Rats (Charles River CD) Males and female	Feeding, carcinogenicity	86.9	50 rats/sex, three dose groups and control, for 24 months Dose 0, 250, 1000, 5000 ppm, equivalent to 0, 12, 50, 250 mg/kg bw/day [R/S-methoprene]	NOAEL = 50 mg/kg bw/day (44 mg/kg bw/day corrected for purity) Not carcinogenic	NRI-PL-74-2465 39501
Rat (albino, Charles River)	Teratology	68.9	OECD 414 19-22 pregnant/group, two dose groups and control Treated days 6-15 of gestation Dose: 0, 500, 1000 mg/kg bw/day [R/S-methoprene]	Maternal; NOAEL 1000 mg/kg/day Fetal NOAEL = 1000 mg/kg/day not teratogenic	B1982
Rabbits (Japanese)	Teratology	95.7	OECD 414 10 pregnant/group, three dose groups and control Treated days 7-18 of gestation Dose: 0, 50,200, 2000 mg/kg bw/day	Maternal; NOAEL = 200 mg/kg/day (190 ppm corrected for purity)	NRI-PL-74-2465 39501

			[R/S-methoprene]	Fetal NOAEL = 200 mg/kg/day (190 ppm corrected for purity) not teratogenic	
Mice (ICR lineage)	Teratology	95.7	OECD 414 20 – 23 pregnant females/group, three dose groups and control Treated days 7-14 of gestation Dose: 0, 50, 200, 600 mg/kg bw/day 10-14 pregnant females/group were allowed to deliver pups. Five liters/group evaluated after 21 days. Other liters were followed for additional 7 weeks. [R/S-methoprene]	Maternal NOAEL ≥ 600 mg/kg/day (highest dose tested; 570 ppm corrected for purity) Fetal NOAEL ≥ 600 mg/kg/day (highest dose tested; 570 ppm corrected for purity) not teratogenic	B1982
Rats (Long-Evans) Males and females	Feeding, 3-generation reproduction	86.9 – 87.5	20 rats/sex, two dose groups and control F_0 fed test diet 100 days before mating. F_1 and F_2 generation fed test diet for 70 day growth period (~ 400 days) Dose: 0, 500, 2500 ppm, equivalent to 0, 25, 75 mg/kg bw/day [R/S-methoprene]	NOAEL = 33 mg/kg bw/day (29 mg/kg bw/day corrected for purity)	73R-892
Mice	Endocrine Disruptor	n/a	Female mice (19-21 days old) dosed s.c. with 0.015 or 0.15 mg/kg/day for 3 days. Uterine weight determined. [R/S-methoprene]	Methoprene does not have estrogenic activity	ZR-515
Rats	Endocrine Disruptor	n/a	Castrated male rats (21 days old) dosed s.c. with approximately 0.37 and 3.7 mg/kg/day for 7 days. Seminal vesicles and ventral prostate weights determined. [R/S-methoprene]	Methoprene does not have androgenic activity	ZR-515

Table 5. Mutagenicity profile of the technical material based on in vitro and in vivo tests

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [S-methoprene, unless indicated differently]	Study number
S.typhimurium TA93. TA100, TA1535, TA1537, 7A1538	Reverse mutation, in vitro	90	OECD 471 10 – 10‘000 µg/plate with S9	negative	LSC-5854 39901

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [S-methoprene, unless indicated differently]	Study number
Chinese hamster ovary cells	Chromosomal aberrations	98	OECD 473 6.3-12 µg/mL for 10 h 12-25 µg/mL for 20 h without S9 15-60 µg/L for 2 h with S9 [R/S-methoprene]	negative	10439-0-437
Saccharomyces cerevisiae D7	Mitotic recombination, gene conservation, reverse mutation	90	OECD 480, 481 0.1 - 5% (v/v) with and without S9	negative	LSC-5854 39801
Mouse lymphoma assay	In Vitro Mammalian Cell Gene Mutation Tests Using the Thymidine Kinase Gene	98.13	OECD 490	negative	8452654

Table 6. Ecotoxicology profile of the technical material

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [S-methoprene, unless indicated differently]	Study number
Rainbow trout *(Salmo gairdneri)*	acute toxicity, static	90	EPA-660/3-75-009 96 h, 12-13 °C, pH 7.5	LC_{50} = 0.76 mg/L	100828.0884.6102.103
Daphnia magna	acute toxicity	90	EPA-660/3-75-009 48 h, 20 °C, pH 7.9-8.3	LC_{50} = 0.36 mg/L	10828.0884.6102.110
green algae *(Scenedesmus subspicatus)*	acute toxicity	n/a	OECD 201 96 h at 22 ± 0.2 °C pH 7.5 - 8.0	EC_{50} = 1.33 mg/L NOEC = 0.1 mg/L	236/w-94
Pimephales - promelas (fathead minnow)	early life-stage	91.4	EPA OPP 72-4 37 days, 25 ± 2 °C, pH 8.0 - 8.2	NOEC = 0.048 mg/L MATC = 0.063 mg/L	1792
Mallard duck	acute oral toxicity	90	Doses: 292-2250 mg/kg 14 days observation period	LD_{50} > 2250 mg/kg	102-116
Mallard duck	acute dietary toxicity	90	Doses: 562-5620 ppm Fed treated diet for 5 days followed by 3 day observation period.	LC_{50} > 5620 ppm	102-1156
Honey bee	Larval toxicity	97.14	OECD 237 Single exposure 6.3, 13, 25, 50, and 100 µg a.i./larva (nominal), 33-34, 89-98% RH, darkness	LD50 = 35 µg a.i./larva	14081.6110

Annex 2. References

Study number	Author(s)	Year	Study title. Study identification number. Report identification number. GLP [if GLP]. Company conducting the study.
3588	Moorman R	2009	The Determination of the Vapor Pressure of S-Methoprene. Study 3588. GLP. Stillmeadow, Inc., USA. Unpublished.
CSL-20-1162.01	Dreisch S	2020	(S)-Methoprene - Determination of physico-chemical properties Melting Point (EC A.1. and OECD 102). Study CSL-20-1162.01. GLP. consilab Gesellschaft für Anlagensicherheit mbH, Germany. Unpublished.
6011	Welch A	2021	Determination of the boiling point of (S)-Methoprene by Differential Scanning Calorimetry. Study 6011. GLP. Central Garden & Pet Company, USA. Unpublished.
9907-F	Clark AP	1991	Solubility Determination of (S)-Methoprene Pure Active ingredient in Water, Ethyl Alcohol, and 2,2,4-Trimethylpentane. Study 9907-F. GLP. Midwest Research Institute, USA. Unpublished.
6013	I-Hsiung Wang	2021	The Determination of the Partition Coefficient of S-Methoprene by HPLC. Study 6013. GLP. Central Garden & Pet Company, USA. Unpublished.
9907-F 1650	Clark A	1991	Preliminary test for hydrolysis of S-Methoprene pure active ingredient. Study 9907-F. Report 1650. GLP. Midwest Research Institute, USA. Unpublished.
9907-F 1649	Siemann L	1991	Determination of the Dissociation Constant of (S)-Methoprene. Study 9907-F. Report 1649. Midwest Research Institute, USA. Unpublished.
LSC-7182 33	Schindler JE and Brown JM	1984	Acute Oral Toxicity of S-Methoprene in Rats. Study LSC-7182, Report 33. SRI International, USA. Unpublished.
LSC-7182 35	Brown JM	1984	Acute Dermal Toxicity of S-Methoprene in Rabbits. Study LSC-7182. Report 35. SRI International, USA. Unpublished.
3630	Smedley JW	2003	An Acute Nose-Only Inhalation Toxicity Study in Rats with (S)-Methoprene Technical. Study 3630.1. GLP. Springborn Laboratories, USA. Unpublished.
LSC-7182 34	Schindler JE and Brown JM	1984	Primary Skin Irritation of S-Methoprene in Rabbits. Study LSC-7182, Report 34. SRI International, USA. Unpublished.
LSC-7182 36	Brown JM	1984	Primary Eye Irritation of S-Methoprene in Rabbits. Study LSC-7182, Report 36. SRI International, USA. Unpublished.
015018	Bassett J and Watson M	2003	(S)-Methoprene Technical: Dermal Sensitization Study (Closed-Patch Repeated Insult) in Guinea Pigs. Study 015018. GLP. Ricerca Biosciences, USA. Unpublished.
LSC-1833 38101	Jorgenson TA and Sasmore DP	1972	Toxicity Studies of Altosid™ Technical (1) Ninety-Day Subacute in Rats (2) Ninety-Day Subacute in Dogs. Study 38101. SRI Project LSC-1833. SRI International, USA. Unpublished.
29701	Nakasawa M	1975	Test of Altosid Toxicity - II. Rabbit Subacute Dermal Toxicity of Altosid. Study 29701. Project NRI-PL-74-2465. Nomura Research Laboratory, Japan. Unpublished.
38601	Olson WA and Willigan DA	1972	ALTOSID™ (Technical Grade) - Three-Week Subacute Inhalation Exposure – Rats. Study 38601. Project 777-103. Hazleton Laboratories, USA. Unpublished.
NRI-PL-74-2465	Nakasawa M	1975	28-Day Subchronic Inhalation Study – Dog. Project NRI-PL-74-2465. Nomura Research Laboratory, Japan. Unpublished.
322-003	Wazeter FX and Goldenthal EI	1975	Altosid - Eighteen Month Oral Carcinogenic Study in Mice. Study 322-003. Report 40001. International Research and Development Corporation; USA. Unpublished.
322-001	Wazeter FX and Goldenthal EI	1975	Altosid - Two Year Oral Toxicity Study in Rats. Study 322-001. Report 40201. International Research and Development Corporation; USA. Unpublished.

B1982	Haley S	1973	Teratogenic Study with ALTOSID Technical in Albino Rats. Study B1982. Report 39201. Industrial Bio-Test Laboratories, USA. Unpublished.
NRI-PL-74-2465 39501	Nakasawa M	1975	Test of Altosid Toxicity - III. Determination of Teratogenic Potential of Altosid Administered Orally to Rabbits. Study NRI-PL-74-2465. Report 39501. Nomura Research Laboratory, Japan. Unpublished.
B1982	Nakasawa M	1975	Determination of Teratogenic Potential of Altosid Administered Orally to Mice. Study B1982. Nomura Research Laboratory, Japan. Unpublished.
73R-892	Killeen JC and Rapp WR	1974	A Three Generation Reproduction Study of Altosid™ in Rats. Study 73R-892. Bio/dynamics Inc., USA. Unpublished.
ZR-515	Rooks WH	1972	Report on the Mammalian Endocrine Testing Performed on ZR-515. Report 40101.Syntex Research Center, USA. Unpublished.
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