

B19-1.0 AMMONIUM SULFAMATE**B19-1.1 Background Information**

IUPAC: Ammonium sulfamidate

CAS: Monoammonium sulfamate

CASRN: 7773-06-0

AMMONIUM SULFAMATE USAGE:

Ammonium sulfamate was used to control woody plants, trees, herbaceous perennials, and annual broadleaf weeds and grasses (EXTOXNET, 1996).

Ammonium sulfamate was the active ingredient of herbicide product Ammate®. It was applied at the CFB Gagetown in 1958 (JW, 2006). An unknown quantity of ammonium sulfamate was applied over a total area of 166 ha (Table B19-1).

Table B19-1 Ammonium Sulfamate Usage at CFB Gagetown^a

Year	Total Area Treated (ha)	Herbicide Active Ingredient Application Rate (kg/ha)
1958	166	No Information

^a Adapted from JW, 2006.

B19-2.0 CHEMICAL AND PHYSICAL PROPERTIES

Formula: H₆N₂O₃S

Activity: Inorganic non-selective systemic herbicide, absorbed by the leaves, stems, and freshly-cut wood surfaces (Tomlin, 1994).

Notes: Ammonium sulfamate is a non specific contact herbicide and was discontinued by Du-Pont in 1988. It was classified under U.S. EPA toxicity class III - slightly toxic (EXTOXNET, 1996).

Structure:

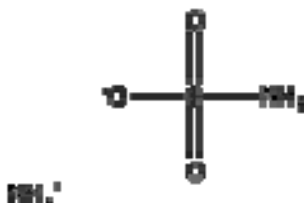
**Figure B19-1 Ammonium Sulfamate CASRN: 7773-06-0**

Table B19-2 Chemical and Physical Properties of Ammonium Sulfamate

Chemical/Physical Property	Result	Reference
Colour/Form	Colourless/Crystalline solid.	Kidd and James, 1991
Dissociation Constant (pKa)	No Information	
Henry's Law constant	1.929×10^{-22} atm•m ³ /mol at 25°C	JW, 2006
Log K _{ow}	-4.34	JW, 2006
Melting Point	131-132°C	Kidd and James, 1991
Molecular Weight	114.12	JW, 2006
Odour	Odourless	Kidd and James, 1991
Vapour Pressure	1.51×10^{-5} mm Hg at 25°C	JW, 2006
Water Solubility	1,000g/L at 25°C	JW, 2006
	680g/L at 25°C	Kidd and James, 1991

B19-3.0 PMRA EVALUATION

No information found.

B19-4.0 TOXICOLOGICAL SUMMARY

B19-4.1 Human Health Effects

Ammonium sulfamate has low inherent toxicity. There are no reports of toxic exposures in humans (HSDB, 2005).

Table B19-3 Human Health Effects Resulting from Acute and Chronic Exposure to Ammonium Sulfamate^{a,b}

Exposure	Effects	Response
Acute	HEENT	Can be irritating to eyes nose and throat in powder form.
	Respiratory	May cause respiratory tract irritation.
	Gastrointestinal	May cause gastrointestinal distress.
	Dermalogic	Repeated applications of 4% ammonium sulfamate solution caused no skin irritation.

^a Rumack and Hall, 2006.

^b MEDITEXT®, 2006.

B19-4.2 Health Effects by Route of Exposure

B19-4.2.1 Oral Exposure

B19-4.2.1.1 Death

Table B19-4 Mammalian LD₅₀ Values Resulting from Oral Exposure to Ammonium Sulfamate

Test Organism (Species/Sex)	LD ₅₀ (mg/kg)	Reference
Acute		
Mice	1,438 mg/kg	Maki <i>et al.</i> , 1973
Mice	3,100 mg/kg	Lewis, 1996
Rats	2g/kg	Lewis, 1996

B19-4.2.1.2 Systemic Effects

Table B19-5 Mammalian Systemic Effects Resulting from Oral Exposure to Ammonium Sulfamate

Test Organism (Species)	Daily Dose (Duration)	Response	Reference
Sub-chronic			
Rats	0, 100, 250, 500 mg/kg /day 6 days a week for 90 days	Body weight was significantly less than the controls after the end of 60 days for adult rats at 500 mg/kg /day. Gradually reduced food intake and increased water intake was also observed.	Gupta <i>et al.</i> , 1979

Another 105 day rat feeding study was reported by the U.S. EPA's Integrated risk information system, only the lowest and no observable response level values were reported. No other information was found.

B19-4.2.1.3 Neurological Effects

No data found.

B19-4.2.1.4 Mammalian Reproductive/Developmental Effects

A 3 generation rat reproduction study was reported by the U.S. EPA's Integrated risk information system. The only information available was a no observable effect level value. No other information was given.

B19-4.2.1.5 No Observed Adverse Effect Levels in Mammals

Table B19-6 Mammalian NOELs and LOELs from Oral Exposure to Ammonium Sulfamate

Test Organism (Species)	Effect	Value (mg/kg/day)	Endpoint	Reference
Sub-chronic				
Rats	NOEL	214.3	Systemic toxicity	Gupta <i>et al.</i> , 1979
	LOEL	428.6		
Chronic				
Rats	NOEL	500	Systemic toxicity	Rosen <i>et al.</i> , 1965
	LOEL	1,000		

Table B19-7 Ammonium Sulfamate Mammalian Reproductive and Developmental NOEL and LOEL Values

Test Organism (Species)	Effect	Daily Value (mg/kg/day)	Endpoint	Reference
Rats	NOEL	25	Reproductive/developmental toxicity	Du Pont, 1966

B19-4.2.2 Dermal Exposure

Exttoxnet reported that from Du Pont's technical data sheet, there was no skin irritation, nor any signs of systemic toxicity observed when 20 and 50% water-based ammonium sulfamate solutions were applied to the shaved skin of rats

B19-4.2.2.1 Death

No data found.

B19-4.2.2.2 Systemic Effects

No data found

B19-4.2.2.3 Neurological Effects

No data found.

B19-4.2.2.4 Reproductive/Developmental Effects

No data found.

B19-4.2.2.5 No Observed Adverse Effect Level

No data found.

B19-4.2.3 Inhalation Exposure

The dust of ammonium sulfamate is irritating to the nose and throat and can cause coughing or difficulty breathing if it is inhaled (HSDB, 2005). Inhalation of 5,000 mg/m³ of air will pose immediate danger to life or health (OHSI, 1986).

B19-4.2.3.1 Death

No data found.

B19-4.2.3.2 Systemic Effects

No data found.

B19-4.2.3.3 Neurological Effects

No data found.

B19-4.2.3.4 Reproductive/Developmental Effects

No data found.

B19-4.2.3.5 No Observed Adverse Effect Level

No data found.

B19-4.3 Carcinogenicity

In a three-generation rat reproduction study, no harmful effects at a feeding level of 25 mg/kg/day ammonium sulfamate were observed. This may suggest that ammonium sulfamate is not carcinogenic at that level (Van Driesche, 1984). Due to limited data that existed, U.S. EPA has not classified the carcinogenicity status of ammonium sulfamate (U.S. EPA, 1988).

B19-4.4 Populations at Special Risk

No data found.

B19-4.5 Toxicokinetics

Ammonium sulfamate is a salt. From structure activity analysis, it was observed that ammonium sulfamate will readily dissociate systemically to its biodegradable radicals. The ammonium and sulfate radicals enter the general metabolic pool of an organism to be excreted (Gupta *et al.*, 1979).

B19-4.6 Exposure Limits

Table B19-9 Existing RfD Values for Ammonium Sulfamate Exposures

Reference Dose (mg/kg/day)	Reference	Endpoint	Study	Reference	NOEL (mg/kg/day)	Uncertainty Factor	Study Classification
Acute/Short-term (1-7 days)							
No information found	--	--	--	--	--	--	--
Intermediate-term (7 days- Several months)							
No information found	--	--	--	--	--	--	--
Long-term (6 months to lifetime)							
0.2	U.S. EPA, 1991	Decrease in body weights	90 day Rat Feeding Study	Gupta <i>et al.</i> , 1979	214.3	1,000	Acceptable, confidence in the RfD is medium

For the risk assessment purposes of this report a chronic RfD of 0.2 mg/kg/day (U.S. EPA, 1991) was selected.

B19-5.0 ENVIRONMENTAL FATE AND EXPOSURE**B19-5.1 Air**

Ammonium sulfamate has low vapour pressure (JW, 2006) and thus volatilization would only occur to a limited extent. Furthermore, ammonium sulfamate also has a low Henry's Law constant of 1.929×10^{-22} atm m³/mol at 25°C (JW, 2006). This indicates that ammonium sulfamate has little to no tendency to escape from an aqueous solution. Hence, ammonium sulfamate will not be expected to be found in air with the exception of potential spray drift.

B19-5.2 Water

Ammonium sulfamate is hygroscopic, which means that it is inherently moisture absorbent, and highly water soluble. The use of ammonium sulfamate should be avoided near water reservoirs, ponds, streams, or lakes. Equipment used for the application of ammonium sulfamate should not be drained or washed near water sources (Van Driesche, 1984).

B19-5.3 Sediment and Soil

Ammonium sulfamate could potentially persist in soils for a period between 6 to 8 weeks (JW, 2006). Its dissipation is dependent upon soil type, climatic conditions, and the levels of microorganisms in the soils (Pimentel, 1971). Dissipation of ammonium sulfamate is faster in humid soils when compared to soils in drier climatic conditions (WSSA, 1989). Ammonium sulfamate can be decomposed by soil microbes in a period between 6 to 8 weeks (Hartley *et al.*, 1983), but at higher concentrations, ammonium sulfamates are known to sterilize soil microorganisms. Hence, application of ammonium sulfamate may cause the soils to become nonproductive (Berg, 1987). The OSU Extension Pesticide Properties Database reported a soil half-life of 14 days for ammonium sulfamate (Vogue *et al.*, 1994). Ammonium sulfamate does not bind, or adsorb, to soil particles. However, it will dissolve readily in soil moisture, and will migrate/leach through the soil to groundwater. Due to ammonium sulfamate's high potential to contaminate groundwater supplies, a restriction was imposed on ammonium sulfamate applications to limit its use where leaching could contaminate aquifers and wells (EXTOXNET, 1996).

B19-6.0 SUMMARY

Ammonium sulfamate was used as an herbicide to control woody plants, trees, herbaceous perennials, and annual broadleaf weeds (EXTOXNET, 1996a). Du Pont discontinued the manufacture and sales of ammonium sulfamate in 1988. Ammonium sulfamate no longer has any registered uses as an active ingredient. The information regarding the total amount of ammonium sulfamate used at CFB Gagetown was not found.

Based on a limited number of studies, it was shown that ammonium sulfamate would induce low acute, chronic and reproductive/developmental toxicities.

B19-7.0 REFERENCES

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