SODIUM IODIDE

This dossier on sodium iodide presents the most critical studies pertinent to the risk assessment of sodium iodide in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

Screening Assessment Conclusion – sodium iodide is classified as a **tier 1** chemical and requires a hazard assessment only.

1 BACKGROUND

Sodium iodide is a metal iodide salt with a Na(+) counterion. It is an inorganic sodium salt and an iodide salt. Biodegradation is not applicable to inorganic compounds and bioaccumulation is not expected. Sodium iodide is of low toxicity concern to aquatic life.

2 CHEMICAL NAME AND IDENTIFICATION

Chemical Name (IUPAC): Sodium iodide

CAS RN: 7681-82-5

Molecular formula: NaI

Molecular weight: 149.89 g/mol

Synonyms: Ioduril, Sodium iodide (NaI), Natriumiodid

3 PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for the substance are shown in Table 1.

Table 1: Overview of the Physico-chemical Properties of Sodium Iodide

Property	Value	Klimisch score	Reference
Physical state at 20°C and 101.3 kPa	White odorless crystalline solid	1	ECHA
Melting point	659°C @ 101.3 kPa	1	ECHA
Boiling point	1,304°C @ 101.3 kPa	2	ECHA
Density	3.5 g/cm^3 @ 25°C	1	ECHA
Vapor pressure	133.32 Pa @ 767°C	2	ECHA
Partition coefficient (log K_{ow})	-1.301 @ 25°C	1	ECHA

Property	Value	Klimisch score	Reference
Water solubility	165 g/L @ 25°C	1	ECHA
Dissociation Constant (pKa)	0.067 @ 25°C	1	ECHA

4 DOMESTIC AND INTERNATIONAL REGULATORY INFORMATION

A review of international and national environmental regulatory information was undertaken (Table 2). This chemical is listed on the Australian Inventory of Chemical Substances – AICS (Inventory). No conditions for its use were identified. No specific environmental regulatory controls or concerns were identified within Australia and internationally for sodium iodide.

NICNAS has assessed sodium iodide in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to the environment[1] .

Table 2 Existing International Controls

Convention, Protocol or other international control	Listed Yes or No?
Montreal Protocol	No
Synthetic Greenhouse Gases (SGG)	No
Rotterdam Convention	No
Stockholm Convention	No
REACH (Substances of Very High Concern)	No
United States Endocrine Disrupter Screening Program	No
European Commission Endocrine Disruptors Strategy	No

5 ENVIRONMENTAL FATE SUMMARY

Sodium iodide dissociates in aqueous media to sodium (Na+) and iodide (I-) ions. Biodegradation is not applicable to inorganic compounds. There are no bioaccumulation studies on sodium iodide. The low Log K_{ow} (-1.301) suggests sodium iodide will not bioaccumulate to a substantial degree ((ECHA)[Kl Score = 1]. Further, both ions are essential to living. Sodium (Na+) ions are essential to all living organisms, and its intracellular and extracellular concentrations are actively regulated (Ganong, 1995). Iodine is essential for thyroid hormone synthesis in vertebrate species. Ingested iodine is converted to iodide (I-) and absorbed. The minimum daily iodine intake that will maintain normal thyroid function is 150 mg in adult humans (Ganong, 1995).

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=7681-82-5%2C+

6 ENVIRONMENTAL EFFECTS SUMMARY

A. Summary

Sodium iodide is of low toxicity concern to aquatic organisms.

A. Aquatic Toxicity

Acute Studies

Table 1 lists the results of acute aquatic toxicity studies on sodium iodide.

Table 1 Acute Aquatic Toxicity Studies on Sodium Iodide

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Danio rerio	96-hr LC_{50}	>100	2	ECHA
Daphnia magna	48-hr EC_{50}	0.17[1]	2	ECHA

1 – this value is questionable since the acute value is approximately two to three orders of magnitude lower than chronic data for the same species (see below). Furthermore, acute testing conducted on a similar substance (potassium iodide) for the same species yielded a 48-hr EC50 of 7.5 mg/L (ECHA)[Kl Score = 2].

Chronic Studies

Based on the prediction done using ECOSAR version, the long term toxicity on fish was predicted for test substance. On the basis of no effects observed in a freshwater system, the NOEC value for the substance is estimated to be 66.356 mg/l for fish for 28 days of exposure duration (ECHA) [Kl. Score =2].

The 21-day NOEC in a Daphnia reproduction test is 91 mg/L (ECHA) [Kl. score = 2]. In another Daphnia reproduction test, the 21-day NOEC was 14 mg/L (ECHA) [Kl. score = 2].

The 8-day LOEC to green algae Scenedesmus quadricauda was 2,370 mg/L (ECHA) [Kl. score = 2].

B. Terrestrial Toxicity

No studies are available.

7 CATEGORISATION AND OTHER CHARACTERISTICS OF CONCERN

A. PBT Categorisation

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2008).

Sodium iodide dissociates completely to sodium and iodide ions in aqueous solutions. Biodegradation is not applicable to these inorganic ions. For the purposes of this PBT assessment, the persistence criteria is not considered applicable.

The low Log K_{ow} (-1.301) suggests sodium iodide will not bioaccumulate to a substantial degree. In addition, sodium ions are essential all living organisms and its intracellular and extracellular concentrations are actively regulated. The iodide ion is essential for thyroid function which is found in all vertebrates. Thus, sodium iodide does not meet the screening criteria for bioaccumulation.

The lowest NOEC value on sodium iodide is >0.1 mg/L for invertebrates and algae. While the the lowest acute E(L)C50 value is <1 mg/L for the same species of invertebrates on which acute testing was performed, this value must be questioned since it is orders of magnitude lower than chronic test data. For the purposes of this assessment, sodium iodide is not considered to be meet the criteria for toxicity.

Therefore, sodium iodide is not a PBT substance.

B. Other Characteristics of Concern

No other characteristics of concern were identified for sodium iodide.

8 SCREENING ASSESSMENT

Chemical Name	CAS No.	Overall PBT Assessment [1]	Chemical Databases of Concern Assessment Step		Persistence Assessment Step		Bioaccumulative Assessment Step	Toxicity Assessment Step			Risk Assessment Actions Required[3]
			Listed as a COC on relevant databases?	Identified as Polymer of Low Concern	P criteria fulfilled?	Other P Concerns	B criteria fulfilled?	T criteria fulfilled?	Acute Toxicity [2]	Chronic Toxicity[2]	
Sodium iodide	7681-82-5	Not a PBT	No	No	NA	No	No	No	1	1	1

Footnotes:

1 - PBT Assessment based on PBT Framework.

2 - Acute and chronic aquatic toxicity evaluated consistent with assessment criteria (see Framework). The low value for a single acute toxicity test is not consistent with results from chronic testing for the same species. Thus, the acute test data for D. magna is not considered appropriate for use in tiered classification.

3 – Tier 1 – Hazard Assessment only.

Notes:

NA = not applicable

PBT = Persistent, Bioaccumulative and Toxic

B = bioaccumulative

P = persistent

T = toxic

9 REFERENCES, ABBREVIATIONS AND ACRONYMS

A. References

Department of the Environment, Water, Heritage and the Arts [DEWHA] (2009). Environmental risk assessment guidance manual for industrial chemicals, Department of the Environment, Water, Heritage and the Arts, Commonwealth of Australia.

ECHA. ECHA REACH database: http://echa.euroa.eu/information-on-chemicals/registered-substances.

European Chemicals Agency (ECHA). (2008). Guidance on Information Requirements and Chemical Safety Assessment, Chapter R11: PBT Assessment, European Chemicals Agency, Helsinki, Finland.

Ganong, W.F. (1995). Review of Medical Physiology, 17th Edition, Appleton & Lange, Norwalk, Connecticut, USA.

Klimisch, H.J., Andreae, M., and Tillmann, U. (1997). A systematic approach for evaluating the quality of experimental and toxicological and ecotoxicological data. Regul. Toxicol, Pharmacol. 25:1-5.

B. Abbreviations and Acronyms

°C	degrees Celsius
AICS	Australian Inventory of Chemical Substances
COC	constituent of concern
DEWHA	Department of the Environment, Water, Heritage and the Arts
EC	effective concentration
ECHA	European Chemicals Agency
EU	European Union
IUPAC	International Union of Pure and Applied Chemistry
kPa	kilopascal
LC	lethal concentration
mg/L	milligrams per litre
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent Bioaccumulative Toxic
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SGG	Synthetic Greenhouse Gases
ThOD	Theoretical oxygen demand