

INTERPRET

Samples
Report compiled by Dr Ger
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Substance Conc.	Beach se								B1N	B2N	B3N	B4N	B5N	B6N	B7N	B8N	B9N	
	B1S1	B2S	B3S	B4S	B5S	B6S	B7S	B8S										
Arsenic ele mg/kg		2.3	3.8	4.2	2.8	3.5	3	4.6	*	*		2	2.3	1.7	3	1.9	2.2	3.2
Arsenic as mg/kg		11.7	18.6	20.6	13.7	17.1	14.7	22.5	*	*		9.8	11.7	8.33	14.7	9.31	10.78	15.68

Conc.	Sea water								B1N	B2N	B3N	B4N	B5N	B6N	B7N	B8N	B9N	
	B1S1	B2S	B3S	B4S	B5S	B6S	B7S	B8S										
Arsenic ele ug/l		3.6	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	*	*	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Arsenic ele mg/l		0.0036	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	*	*	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic as ug/l		17.64	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	*	*	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25
Arsenic as mg/l		0.0177	<0.0123	<0.0123	<0.0123	<0.0123	<0.0123	<0.0123	*	*	<0.0123	<0.0123	<0.0123	<0.0123	<0.0123	<0.0123	<0.0123	<0.0123

* **Sites inaccessible at the time of sampling**

Interpretation of analytical results for acute human exposure based on acute oral intake of beach sand (sediments) or sea water

Acute oral toxicity of pure elemental arsenic for human beings LD50(hu)3 mg/kg but ranges from 2 to 10 mg/kg

Acute oral toxicity of pure MSMA for human beings LD50(ma)3 mg/kg (used as the norm for humans)

Acute exposure to MSMA by oral intake of beach sediments and sea water

Ingestion of sub-lethal to lethal dosages of MSMA by oral ingestion of beach sand

A person of 60 kg body mass (weight) requires at least $900 \times 60 = 54,000$ mg of MSMA to reach the LD50 value of MSMA for acute oral intake

Beach sediments contain a maximum of (calculated) 22.5 mg/kg MSMA

which means a person will have to ingest $54,000/22.5 = 2400$ kg of beach sand or 2.4 tonnes to ingest the LD50 quantity of MSMA

This is impossible scenario

Ingestion of sub-lethal to lethal dosages of MSMA by oral ingestion of sea water

A person of 60 kg body mass (weight) requires at least $900 \times 60 = 54,000$ mg of MSMA to reach the LD50 value of MSMA for acute oral intake

Sea water contains a (calculated) maximum of 0.0177 mg/l MSMA

which means a person will have to ingest $54,000/0.0177 > 3$ million litres of sea water to ingest the LD50 quantity of MSMA

This is impossible.

Chronic exposure by oral intake of beach sediments and sea water that is contaminated by MSMA

Allowed Daily Intake (ADI) or RfD (standard reference dose) of MSMA for human beings is 0.01 mg/kg body mass per day

A person of 60 kg body mass can thus safely ingest 0.6 mg MSMA per day without the risk of observable health effects, while the No Observed Effect Level (NOEL) for mice over a 2 year exposure period was determined to be 3.2 mg/kg body mass which means even if ingesting 320 times the human ADI, the mice showed no signs of chronic toxicity symptoms. This can be attributed to the very high water solubility of MSMA in water (1.4 kg/l).

A person of 60 kg body mass must therefore ingest 26.6 gram beach sand per day to or drink 3.4 litres sea water per day reach the ADI value

Acute dermal exposure to MSMA by contact with beach sediments and sea water

Reported acute dermal toxicity of MSMA for white rabbits: acute dermal LD50 (24 hrs) = 2,000 to 4,000 mg/kg body mass (assume worst case of 2,000 mg/kg)

A person of 60 kg requires $60 \times 2,000 = 120,000$ mg dermal exposure over a 24 hr period to reach the acute dermal LD50 of MSMA

120,000 mg equals $120,000/22.5 = 5,333$ kg contaminated beach sand

120,000 mg equals $120,000/0.0177 > 6,7$ million litres of contaminated sea water

Chronic dermal exposure to MSMA by contact with beach sediment and sea water

Reported chronic dermal toxicity of MSMA for white rabbits: chronic dermal LD50 (24 days) = 102 mg/kg body mass

A person of 60 kg requires over a 24 day period to be exposed to $60 \times 102 = 6,102$ mg MSMA per day to reach the chronic dermal LD50 fo MSMA

6,102 mg equals $6,102/22.5 = 271.2$ kg beach sand direct exposure per day

6,102 mg equals $6,102/0.0177 = 344,745$ litres of sea water direct exposure per day

MSMA versus elemental arsenic

Elemental arsenic is acutely highly toxic to human beings with a median LD50 of 13 mg/kg compared the MSMA acute oral LD50 of 900 mg/kg

Elemental arsenic is also chronically much more toxic than MSMA with severe adverse health effects recorded at a median oral intake of 0.5 mg/kg body mass per day

There is currently no evidence that the MSMA has been reduced to elemental arsenic and we can therefore only work on the toxicity data of MSMA