



Environmental Health Guide

Hydrogen Sulphide and Public Health



Delivering a Healthy WA

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This brochure provides health information and guidance in relation to possible public exposure to hydrogen sulphide in air.

What is hydrogen sulphide?

Hydrogen sulphide (H_2S) is a colourless gas with a characteristic odour of rotten eggs which being denser than air may pool in low areas in still conditions.

Where does hydrogen sulphide come from?

Hydrogen sulphide occurs naturally in some environments such as sulphur springs, swamps and salt marshes, and is often associated with the decomposition of organic material. Human activities and industries that may produce hydrogen sulphide include sewage treatment plants, tanneries, piggeries and manure handling operations.

In Western Australia some coastal communities have been exposed to hydrogen sulphide generated by the breakdown of seaweed that has accumulated on the shore line. Hydrogen sulphide has also been found to contaminate bore water and surface water bodies, usually at low levels, due to bacteria which convert sulfur materials into hydrogen sulphide. This may especially be the case where acid sulphate soils have been disturbed.

Exposure to hydrogen sulphide

People are normally exposed to hydrogen sulphide in air by breathing it in or by skin/eye contact. Any absorbed hydrogen sulphide does not accumulate in the body as it is rapidly metabolised in the liver and excreted in the urine.



Hydrogen sulphide usually breaks down in air in about three days and is dispersed by wind. Therefore exposure is only likely to continue if there is an ongoing source.

How can hydrogen sulphide affect health?

Hydrogen sulphide has a characteristic rotten egg smell which can be detected at very low levels, well below those that are known to cause health effects.

Smelling hydrogen sulphide does not mean that it will harm your health.

The smell can cause worry, anxiety and resentment. Repeated odour events may culminate in real symptoms such as headache, fatigue and nausea. Although these are not direct health effects they are undesirable.

Real human impacts from hydrogen sulphide are not likely until air levels reach at least 2ppm for 30 minutes. At this point sensitive groups such as some asthmatics may respond with some minor irritative changes in their bronchial capacity.

The lowest level for adverse health effects is at least 500 times the odour detection limit. At this level, irritation of the mucous membranes of the eye can occur.

The impacts and health effects of exposure to the levels of hydrogen sulphide that may be possible in the environment are shown in the Table 1.



Table 1. Exposure and Effect Levels for Hydrogen Sulphide in Air (Reference 1)

Level in air (ppm)	Impacts and health effects
0.008	Odour threshold (with some individual variability)
>0.008	Increasing possibility of annoyance and headache, nausea, fatigue
2	Bronchial restriction in some asthmatics
4	Increased eye complaints
5-10	Minor metabolic effects
20	Neurological effects including memory loss and dizziness

How are children affected?

It is not clear whether children are more sensitive than adults to hydrogen sulphide although they are likely to show the same types of effects. However, care should be taken since children are lower to the ground where hydrogen sulphide may be more concentrated and active children may breathe in more of the gas.

Are there exposure guidelines for hydrogen sulphide?

Levels in air

The Western Australian Department of Health (DOH) recommends hydrogen sulphide air quality guidelines developed by the World Health Organisation as shown in Table 2 (Reference 1). These are based on the dose exposure effects outlined above.

Table 2. DOH Recommended H₂S Exposure Limits for Public Protection

Limit (ppm)	Averaging timeframe
2	30 minutes
0.1	24 hours
0.014	90 days

Averaging timeframe is the time over which the measured level of hydrogen sulphide in air is averaged and relates to potential short or possibly longer term effects. The 2ppm limit value is associated with bronchial effects in some sensitive asthmatics and so should not be exceeded. The other limit values have safety margins built into them and so an exceedance does not necessarily mean a health consequence.

Levels in water

DOH recommends that bore water or any water that contains more than 0.05mg/L (References 2 and 3) of hydrogen sulphide, should be assessed for suitability for human use. This is based on protecting the aesthetic quality of the water (smell and taste) and is not related to health. Drinking or immersion in water above this level of contamination normally would be unpleasant.

At high concentrations of hydrogen sulphide in water, emissions of the gas may pose a respiratory risk to health under unfavourable conditions such as prolonged large scale irrigation close to residences. The risk threshold depends greatly on the circumstances but hydrogen sulphide levels of 1mg/L or higher would warrant care to be taken and a review of the circumstances of use.



Is hydrogen sulphide likely to affect me or my family?

Exposure of the public to hydrogen sulphide in Western Australia is nearly always just a nuisance or amenity issue. If people are made aware of this then anxiety and resentment are likely to be reduced, as are some of the odour-related indirect health effects such as headaches.

Direct health effects from exposure to environmental sources of hydrogen sulphide are only likely in very rare cases. These are likely to be confined to sensitive groups such as some asthmatics and the effects are likely to be minor and temporary.

How can I reduce exposure to hydrogen sulphide?

If the smell of hydrogen sulphide is strong or you are concerned about its impacts on your amenity or health, you can reduce your exposure by:

- Avoiding areas that are known sources of hydrogen sulphide
- Keeping windows closed when the odour outdoors is noticeable and opening doors and windows once the outdoor odour has subsided
- Not exercising outdoors when the smell is present, particularly if your breathing rate increases

If the hydrogen sulphide is being generated by human activities then appropriate management of those activities may help address the problem at source. For instance industrial emissions might be dealt with through process or engineering controls such as containment or filter ventilation.



When bore water is contaminated with hydrogen sulphide it is sometimes possible to treat the bore with an agent which removes iron from the water and therefore interferes with bacterial activity which happens to generate the gas. Water treatment companies can advise on suitable agents.

Use of hydrogen sulphide impacted water for irrigation purposes has the potential to release considerable amounts of gas, as mentioned above. Methods for reducing odour impacts include the following:

- Decreasing the quantity of water used
- Using drippers or delivery devices which are low to the ground and have large droplet size
- Watering when there is sufficient wind to disperse the odour
- Watering at night when there are fewer people around, if wind is sufficient
- Desynchronizing with other similar bore water use

For some of these measures consultation with the Department of Water may be necessary if there is a possible conflict with watering rosters.

If the hydrogen sulphide is the result of sea grass deposition and decay then usually it only acts as a nuisance. Deposition occurs on some beaches during winter in particular and often is removed naturally by subsequent storms. Prolonged accumulation can generate an odour problem for nearby residences or passersby especially if the deposit is being disturbed or when there are light onshore winds. This does not normally present a potential health risk except for very large amounts of sea grass and major disturbance such as periodically occurs at Port Geographe.



Port Geographe Sea Grass Accumulation 2009

Need further information?

Environmental Health Toxicologists in the Department of Health (DOH) on 9388 4999 can provide advice and interpret any water testing or air monitoring results. This brochure and information on other environmental contaminants are available at the following DOH websites, including on the Port Geographe sea grass issue:

<http://www.public.health.wa.gov.au/>

http://www.public.health.wa.gov.au/3/979/2/port_geographe.pm

Useful information on possible health effects of hydrogen sulphide is in the Public Health Statement for Hydrogen Sulfide – July 2006 from the United States of America Agency for Toxic Substances and Disease Registry which is available at:

<http://www.atsdr.cdc.gov/toxprofiles/phs114.html#bookmark06>

Scientific References

1. *Concise International Chemical Assessment Document 53 – Hydrogen Sulphide: Human Health Aspects*, International Programme on Chemical Safety and World Health Organisation, Geneva 2003.
2. *Australian Drinking Water Guidelines*, National Health and Medical Research Council and Natural Resource Management Ministerial Council, 2004.
3. *Contaminated Sites Reporting Guideline for Chemicals in Groundwater*, Western Australia Department of Health, 2006.





This document can be made available
in alternative formats such as computer disc,
audio tape or Braille, on request.

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