

Table -1: Acute Health Effects of Hydrogen Sulphide (H₂S)

Concentration in Air (ppm)	Description of Potential Health Effects
1	Noticeable odour. May be considered “offensive” by some individuals. Certain individuals may experience mild symptoms of general discomfort, nausea, headache, and irritability in direct response to odour. Possible aggravation of symptoms among asthmatics that may or may not be secondary to odour. Appearance of symptoms will depend on severity of asthmatic condition. Any effects would be transient. No symptoms related to direct toxicity expected among normal individuals.
10	Obvious offensive odour. Minimum concentration causing eye irritation after a single exposure lasting several hours according to some authorities. Irritation of eyes at this concentration has not been well established. Any irritation of the eyes is expected to be transient and fully reversible. Symptoms would be very mild (<i>i.e.</i> , possible itchiness, dryness, increased blink reflex, slight watering). No damage or permanent injury to the eyes. Could aggravate pre-existing eye conditions (<i>e.g.</i> , conjunctivitis). Odour-related symptoms could include headache, nausea and vomiting depending on the individual and the duration of exposure. Possible aggravation of symptoms among individuals with asthma, bronchitis or other forms of chronic respiratory disease.
20	Obvious offensive odour. Possible irritation of the eyes. Effects would be mild and fully reversible. Effects could include itchiness, dryness, tearing, slight redness. The likelihood of effects would increase with increasing duration of exposure. No damage or permanent injury to the eyes would be expected. Could aggravate pre-existing eye conditions (<i>e.g.</i> , conjunctivitis). Odour-related symptoms could include headache, nausea and/or vomiting depending on the individual and the duration of exposure. Possible aggravation of symptoms among individuals with asthma, bronchitis or other forms of chronic respiratory disease.
50	Strong and intense, but not intolerable odour. Possible irritation of the eyes and breathing passages. Eye irritation could present as itchiness, stinging, redness of eye, redness of eyelids, tearing, increased blink reflex and increased tendency to “rub” eyes. Severity of symptoms will vary with duration of exposure. Possible aggravation of pre-existing eye conditions. Possible eye injury after several days of exposure. Respiratory irritation could present as “tingling” or stinging sensation in throat and nasal passages, sore throat, increased tendency to “clear” throat, and cough. Likely aggravation of symptoms among asthmatics and individuals with pre-existing respiratory disease. Symptoms expected to be transient and reversible. No permanent injury expected unless exposure is prolonged. Strong possibility of odour-related symptoms, including headache, nausea, vomiting and/or diarrhea among odour-sensitive individuals.
100	Strong objectionable odour initially, becoming less intense due to olfactory “fatigue” with continued exposure. Increasing possibility of irritation of eyes and breathing passages within one hour of exposure. Symptoms of eye irritation could present as soreness, stinging or burning sensation of eyes, tearing, redness of eyes, redness and swelling of eyelids, possible blurred vision. Symptoms of respiratory irritation could include sore throat, cough, soreness or stinging of breathing passages, and possible wheezing. Definite aggravation of symptoms among individuals with asthma, bronchitis or other forms of chronic respiratory disease. Odour could induce headache, nausea, retching and vomiting.
250	Odour may or may not be distinguishable due to olfactory paralysis. Irritation of eyes and respiratory tract within several minutes of exposure, becoming severe with longer exposure. Eye irritation very likely to present as conjunctivitis with possible corneal involvement (<i>i.e.</i> , definite redness of eyes and swelling of eyelids, and soreness of eyes). Immediate and excessive watering and tearing of eyes, with possible blurred vision. Very real possibility of permanent eye injury if exposure is prolonged. Respiratory irritation would present as sore throat, cough, difficulty breathing, soreness of chest, and/or possible wheezing. Symptoms might be protracted. Definite aggravation of asthma. Some possibility of “systemic” symptoms, including headache, nausea and vertigo depending on duration of exposure.
500	Odour is not distinguishable due to olfactory paralysis. Severe irritation, and possibly injury, to the eyes and breathing passages within 30 minutes of exposure. Post-exposure ‘chemical pneumonia’ may appear due to damage to the lungs and the breathing passages if exposure is prolonged.

Concentration in Air (ppm)	Description of Potential Health Effects
	“Systemic” effects with central nervous system involvement may occur within one hour of exposure. Symptoms could include headache, anxiety, dizziness, loss of coordination and slurred speech, progressing to loss of consciousness and/or sudden collapse or ‘knockdown’. Effects could become life-threatening if exposure persists.
750	Odour is not distinguishable due to immediate olfactory paralysis. Signs of nervous system involvement will dominate the clinical picture, and could include anxiety, confusion, headache, slurred speech, dizziness, stumbling, loss of coordination, and other signs of motor dysfunction ... which could progress to abrupt “knock-down” and loss of consciousness and possibly death, if exposure continues for more than a few minutes. Definite possibility of chemical pneumonia among survivors post-exposure from damage to the lungs and the breathing passages.
1,000	Immediate “knock-down” and loss of consciousness. Death within moments to minutes. Immediate resuscitation and medical attention needed if victim is to survive.

Sources: This table is based on a number of sources, including: ATSDR (2004); Alberta Health and Wellness (2002); Guidotti (1994); Illinois Institute for Environmental Quality (IIEQ) (1974); National Research Council of Canada (NRCC) (1981); National Institute of Occupational Safety and Health (NIOSH) (1977); Milby (1962); Milby and Baselt (1999); U.S. Public Health Service (1964); and WHO (1981).

Table-2: Acute Health Effects of Sulphur Dioxide

Concentration of SO ₂ (ppm)	Acute health effects
0.1	Transient bronchoconstriction ¹ in sensitive exercising asthmatics individuals that ceases when exposure ceases. ²
0.3 – 1	Possibly detected by taste or smell
0.75	Transient lung function changes in healthy, moderately exercising, non-asthmatic individuals
1 – 2	Lung function changes in healthy non-asthmatics. Symptoms in asthmatics would likely increase in severity. There may be a shift to clinical symptoms from changes detectable only via spirometry.
3.0	Easily detected odour
6 – 12	May cause nasal and throat irritation
10	Upper respiratory irritation , some nosebleeds
20	Definitely irritating to the eyes ; chronic respiratory symptoms develop; respiratory protection is necessary
50 – 100	Maximum tolerable exposures for 30-60 minutes
greater than 100	Immediate danger to life (NIOSH recommendation)

¹ At low levels, bronchoconstriction was generally observed as changes in airway conductance detectable by spirometry rather than as clinical symptoms.

² It should be noted that clinical studies on humans are generally designed to elicit a response and consequently subject study volunteers to challenging conditions such as exercising, mouth breathing, cold, dry air, etc. Real-life responses in asthmatics should be viewed as being individual-specific dependent on severity of asthma, whether the individuals are medicated or not, how cold and/or dry the air is, mouth breathing (vs. nose-breathing, which can act as an effective scrubber mechanism), and exercise.

Source: Adapted from ATSDR 1998 from Ellenhorn 1988 and WHO 1979, AHW 2006