September 2009

Information sheet

Community and Health Services Department

York Region

Health Effects of Total Reduced Sulphur Compounds

Frequently Asked Questions

Q. What is total reduced sulphur (TRS)?

A. Total reduced sulphur (TRS) is a colourless gaseous mixture that produces offensive odours similar to rotten eggs or cabbage.

More specifically, TRS is a mixture of reduced sulphur compounds, primarily composed of hydrogen sulphide (H_2S), mercaptans (typically represented by methyl mercaptan), dimethyl sulphide (DMS), and dimethyl disulphide (DMDS). The most common TRS compound is hydrogen sulphide.

Q. What are common sources of TRS?

A. TRS compounds occur both naturally and from human-made processes.

Natural Sources	Industrial Sources	Human-made Sources	Household Sources
• Gases from volcanoes • Sulfur springs • Undersea vents • Swamps, stagnant bodies of water • Crude petroleum, natural gas • Decomposing organic matter	• Emissions from petroleum refineries, natural gas plants, petrochemical plants, coke oven plants, food processing plants and tanneries • Pulp and paper operations • Municipal sewers and sewage treatment plants • Agriculture manure-handling operations	• Bacteria found in your mouth and gastrointestinal tract produce TRS compounds during the digestion of food containing vegetable or animal proteins	• Drain cleaners • Some well water • Hot water heaters • Cigarette smoke • Automobile emissions • Sanitary drain pipes • Potted plants

Q. What is the background or ambient level of TRS in Ontario

A. Ambient concentrations of TRS in Ontario communities can vary significantly both due to local sources (agricultural, natural or industrial) and due to season (lower in cold weather).

The Ontario Ministry of the Environment measures ground level TRS concentrations in four communities in Ontario with known industrial sources of TRS. The 2007 data are provided in the table below but the public should keep in mind that these levels are generally higher than those found in most Ontario communities.

Table 1. Ambient TRS Concentrations in air (ppb = parts per billion)*

City	Mean (ppb)	1 hr Max (ppb)	24 hr Maxi(ppb)
Windsor	0.7	14	3
Sarnia	0.1	11	1
Hamilton	0.3	32	4
Sault Ste Marie	0.4	5	2

* 1 ppb is equal to 3 drops of water in an Olympic-size swimming pool.

For further information, please call:
York Region *Health Connection* 1-800-361-5653
or visit www.york.ca

Q. How can TRS affect my health?

A. Exposure to moderate concentrations of TRS compounds may cause eye, nose or throat irritation, headaches and nausea. It may also cause difficulty in breathing for some people with asthma.

In some cases, brief exposures to very high concentrations of TRS compounds (500,000 ppb) can cause a temporary loss of consciousness. Studies have shown that in most cases, the person regains consciousness without any other effects.

There have been no negative health effects reported in humans exposed to concentrations typically found in the environment.

Current research also indicates that TRS compounds have not been shown to cause cancer in humans. However, research is ongoing which will help the World Health Organization to properly categorize the ability of TRS to cause cancer.

Q. What is a safe level of exposure to TRS compounds?

A. In 2007, the Ontario Ministry of the Environment (MOE) established a 24-hour ambient air quality standard of 7 $\mu g/m^3$ (or 5 ppb) for TRS. The MOE sets air standards at a level that would not be expected to cause adverse effects based on continuous exposure. This new standard considers recent advancements in the understanding of the toxicology of TRS compounds.

The York Region Public Health Branch has confidence that ambient air quality concentrations of TRS below 5 ppb would present minimal risk of acute or long-term health effects in both the general and potentially sensitive populations (children).

Q. How can TRS compounds affect children?

A. Children (those under 18 years of age) are likely to be exposed to TRS compounds the same same way as adults. However, because TRS compounds are heavier than air and because children are shorter than adults, children are sometimes exposed to more TRS compounds than adults.

There is very little information on possible health problems in children who have been exposed to TRS compounds. Children exposed to TRS compounds appear to experience similar effects that adults experience. The results of studies in animals suggest that exposure to low concentrations of TRS compounds during pregnancy does not cause birth defects.

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Q. How might I be exposed to TRS compounds?

A. TRS compounds are part of the natural environment; the general population is exposed to TRS compounds routinely.

People who work or live nearby sources of TRS compounds may be exposed to higher levels of TRS than the general population.

Q. How can TRS compounds enter and leave my body?

A. TRS compounds enter your body primarily through the air you breathe. Much smaller amounts can also enter your body through the skin. TRS compounds are generally in the gaseous form, so exposure to them through ingestion is not likely.

When you breathe air containing TRS or when TRS compounds come into contact with your skin, they are absorbed into the blood stream and distributed throughout the body.

In the body, TRS is primarily converted to sulphate and like other sulphate compounds, it is rapidly excreted from the body through urination.

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Q. Is there a medical test to determine whether I have been exposed to TRS compounds?

A. TRS compounds can be measured in two ways. The first test measures levels of TRS compounds through exhaled air. Samples must be taken within two hours after exposure to be useful.

A more reliable test to determine levels of exposure to TRS compounds is by measuring increased sulphate levels in urine. This test must be done within 12 hours of exposure.

Both tests require special equipment, which is not routinely available in a doctor's office. Samples also need to be sent to a special laboratory for the testing.

While both of these tests will determine if you have been exposed to TRS compounds, they cannot determine exactly how much TRS compounds you have been exposed to or whether harmful effects will occur.

Q: What is the level of TRS in a trunk sewer?

A. The concentration of TRS in York Region's trunk sewer system will vary depending on a number of factors (for example, flows, time of day, season, etc.) but generally range from not detectable to approximately 7, 000 ppb.

Q. Where can I get more information?

A. The following links provide additional information on the health effects of TRS compounds including the most common TRS compound, hydrogen sulphide:

MOE Ontario Air Standard for Total Reduced Sulphur
http://www.ene.gov.on.ca/envision/env_reg/er/documents/2007/PA05E0030-f.pdf

ATSDR Public Health Statement on hydrogen sulphide
http://www.atsdr.cdc.gov/toxprofiles/phs114.html

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