

## Occupational Uses

- In chemistry laboratories as a reagent
- In fertilizer manufacturing industries
- In lead accumulator manufacturing industries
- In pharmaceutical industries
- In metal industries for metal pickling (removing oxide coats)
- In sewerage treatment plants

## Occupational Exposure

- Estimated worldwide production of sulfuric acid is 160 million ton/year.
- Workers get exposed to sulfuric acid mists when:
  - Working with sulfuric acid as a process reagent
  - There are leakages from vents
  - Accidents occur that lead to creation of sulfuric acid mists
  - Accidents occur in the transportation process using vehicles

## Toxicological Data

- Skin irritation
- Eye irritation
- Irritation of the nasal cavity and the throat
- Damage to the lungs
- A carcinogen that can increase risk of development of the cancer of the larynx

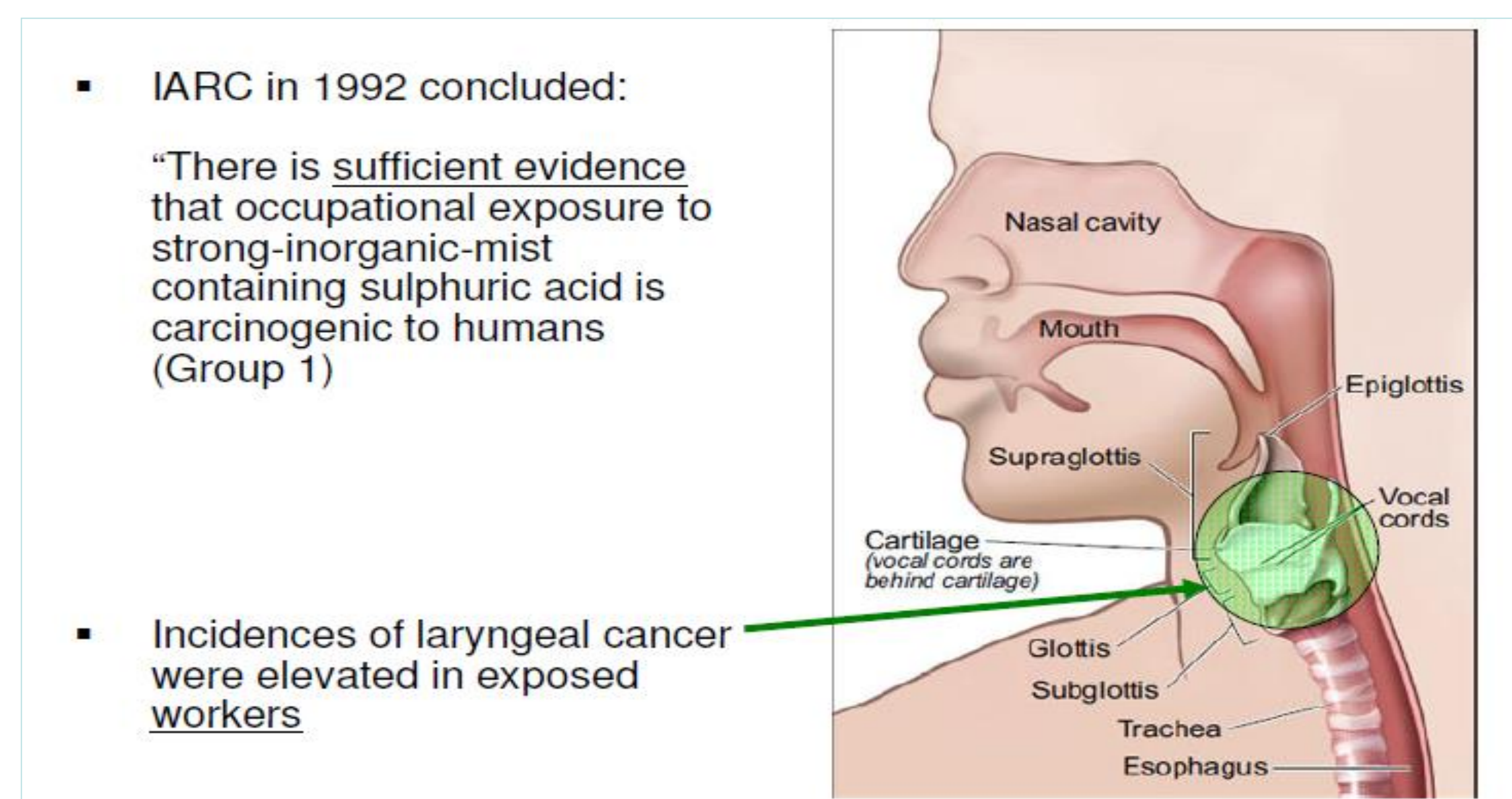


Figure 1. Body parts affected by  $H_2SO_4$  mist exposure  
(Source: <https://diamondenv.wordpress.com/2012/05/16/sampling-for-sulphuric-acid-mist/>)

## Epidemiological Studies

- In a US cohort study, Steenlan & Beaumont found a significant excess risk for cancer of the lung, considering a latency period of 20 years (IARC, 1992).
- People with high sulfuric acid exposure have an increased risk for pharyngeal, sinus, or laryngeal cancer (IARC, 1992).



Figure 2. Sulfuric Acid in the Workplace  
(Source: <https://diamondenv.wordpress.com/2012/05/16/sampling-for-sulphuric-acid-mist/>)

## Sampling Methods

- OSHA Method ID-165SG
  - A silica gel tube is attached to a calibrated personal sampling pump (OSHA.gov Methods, 2016).
  - Recommended sampling rate: 0.2 liters per minute
  - Recommended air volume: 96 liters
  - The sampling train is placed in the sampling area or worker's breathing zone.
  - After sample collection, the silica gel tube is removed from the tubing, sealed, labeled and transported to the laboratory for analysis.



Figure 3. Silica gel tube as sampling media  
(Source: [www.skinc.com/](http://www.skinc.com/))

## Analytical Methods

- Analytical methods seek to detect sulfate ion ( $SO_4^{2-}$ ).
- OSHA: Ion chromatography
- NIOSH: Ion chromatography with conductivity detection

## Occupational Exposure Limits (OELs)

- OSHA Permissible Exposure Limit (PEL)
  - 8-hr TWA - 1 mg/m<sup>3</sup>
- NIOSH Recommended Exposure Limit (REL)
  - 10-hr TWA - 1 mg/m<sup>3</sup>
- ACGIH Threshold Limit Value (TLV)
  - 8-hr TWA - 0.2 mg/m<sup>3</sup>

## Control Measures

- Engineering controls - Use of local exhaust ventilations, use of process enclosures, and use of separate corrosion-resistant exhaust vents
- Administrative controls – Training of workers on safe storage and handling of sulfuric acid, supervision, appropriate labeling, and use of warning signs in areas prone to sulfuric acid mist exposure.
- Personal protective equipment (PPE) - Use of impact and splash resistant goggles, face shield, and use of appropriate respirators depending on the concentration of sulfuric acid mist in a given workplace environment.

## References

- Csb.gov. (2014). *CSB Releases Analysis Showing February 2014 Release of Sulfuric Acid at Tesoro Refinery in Martinez, California, Resulted from Inadequately Tightened Fitting - General News - News | the U.S. Chemical Safety Board*. Csb.gov. Retrieved 6 April 2016, from <http://www.csb.gov/csb-releases-analysis-showing-february-2014-release-of-sulfuric-acid-at-tesoro-refinery-in-martinez-california-resulted-from-inadequately-tightened-fitting/>
- IARC. (1992). Occupational exposures to mists and vapors from strong inorganic acids and other industrial chemicals. *IARC Monogr Eval Carcinog Risks Hum*, 54: 1–310. PMID:1345371 from <https://monographs.iarc.fr/ENG/Monographs/vol100F/mono100F-33.pdf>
- Osha.gov. (2015). *Chemical Sampling Information | Sulfuric Acid*. Osha.gov. Retrieved 5 April 2016, from [https://www.osha.gov/dts/chemicalsampling/data/CH\\_268700.html](https://www.osha.gov/dts/chemicalsampling/data/CH_268700.html)
- Osha.gov Methods. (2016). *Sampling and Analytical Methods | Acid Mist In Workplace Atmospheres*. Osha.gov. Retrieved 6 April 2016, from <https://www.osha.gov/dts/sltc/methods/inorganic/id165sg/id165sg.html>