

The Health Effects of Environmental Odors

Agency for Toxic Substances
and Disease Registry
(ATSDR)



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AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

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Factors That May Influence Perceptions and Reactions to Odors

“Signal detection”

“Miasma theory”



Sense of Olfaction in Environmental Health

***Odors* can make people aware of potentially dangerous chemicals that may be at *below* harmful levels**



Threshold Limit Value (TLV)

What is TLV?

Examples of TLV's



Sequence of Sensory Effects

Detection

Recognition/ID

Annoyance

Intolerance

Perceived Irritation

Somatic Irritation

Toxicity (Acute/Chronic)



Sources of Environmental Odors

Industrial

Wood treatment plants

Paper mills

Landfills

Petroleum refineries

Solvent handling facilities

Waste-water treatment plants

Non-Industrial

Pesticide and fertilizers applications (e.g., ammonia)

Animals feeding (CAFO)

Diesel exhaust

Sewage



Environmental Odors Complaints

Odors emitted from any of the previously mentioned sources elicit far more community complaints than *odorless* air pollutants such as Nitrogen Dioxide

S. Schiffman”, Science of Odors as a Potential Health Issue. J. Env. Qual. 34:129-138(2005)



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Odorous Area Chemicals

Acetaldehyde

Acetone

Ammonia

Arsine



Other Effects of Environmental Odors

Perceived dangers

↓ Quality of life

↓ Sense of well-being



Mechanism of Action

3 Mechanisms:

At irritation
level

Below irritation
level

Co-pollutant



Health Effects

Sensitivity and response to odors *varies* from person to person

The same odor at the same exposure level can have *different effects* in different people



Health Effects

Subjective (not measurable)

Objective (measurable)



Health Effects

Mucous membranes

Upper & lower respiratory airways

Heart and blood vessels

Stomach and intestines

Brain

Psychological

General well-being



Individual Responses Vary

Age

Gender

Genetics

Medical history

Lifestyle (Outdoor exercise)

Social habits

-Tobacco use/ETS

-Alcohol abuse



Environmental Hazard Variables

Aggregate characteristics

Dose

Duration

Frequency

Environmental cue



Respiratory Effects of Environmental Odors

Environmental odors that are irritating to the lower respiratory tract can exacerbate asthma episodes



Conditions That Increase Sensitivity

Asthma

Chronic Obstructive Pulmonary Diseases (COPD)

Depression

Hypersensitivity



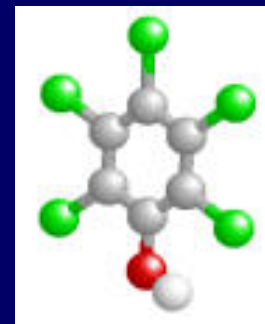
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How can we protect communities?

Preventing exposure

Removing the person from the source

Technology to mitigate airborne emissions



In Conclusion

Unpleasant odors have been recognized as “warning” signs of potential risks to human health, not immediate causes of health effects

We now know that odor sensations from environmental sources might indeed cause health symptoms that are dependent on many individual & environmental factors



Today the thought is that

In public health practice, *odors* are not only warning signs of potential health effects, but may in themselves be the *direct cause* of some symptoms in humans.

(Science of Odors as a Potential Health Issue. Susan S. Schiffman and C.M. Williams. Journal of Environmental Quality, 34: 129-138 (2005))



Thanks so much!

Any questions?



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References:

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- Sullivan Jr. JB., Krieger GR., Clinical Environmental Health & Toxic Exposures, Second Edition. Lippincott Williams & Wilkins.**



Links

1. **ATSDR:** <http://www.atsdr.cdc.gov/>
2. **ATSDR Tox Profiles:**
<http://www.atsdr.cdc.gov/toxpro2.html>
3. **ATSDR Case Studies:**
<http://www.atsdr.cdc.gov/HEC/CSEM/csem.html>
4. **Toxnet:** <http://www.toxnet.nlm.nih.gov/>
5. **Scorecard:** <http://www.scorecard.org/>
6. **EPA Integrated Risk Information System (IRIS)**
<http://www.epa.gov/iris/>
7. **CDC recommends:**
<http://www.phppo.cdc.gov/cdcRecommends/AdvSearchV.asp>

