


**Get Involved
Reduce Environmental Odors
in Your Community**

Agency for Toxic Substances and Disease Registry (ATSDR)

READ THE NOTES TO FOLLOWING ALONG WITH THE SLIDES. You may need to change your view under the "View" tab to Normal version.

Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations



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Odors can make people aware of potentially dangerous chemicals at concentrations below harmful levels ...however...



People can sometimes smell chemicals in the air before they are at harmful levels. Community members feel that their quality of life and sense of wellbeing are diminished because of the odors.

ATSDR continues to receive concerns from community members requesting an evaluation of environmental odors coming from an industry near their community. The community concerns tend to be of common health symptoms such as

- headaches
- nasal congestion
- dizziness and
- watery eyes

How Much Environmental Odors Is Too Much?

This question must be answered *before* performance standards or any good environmental odor control program can be developed and enforced

Learning Objectives

1. Discuss potential odor sources
2. Recognize the most frequent symptoms related to odor exposure
3. Learn how to use the odor diary
4. Monitor odors in your neighborhood
5. Learn about odor controls
6. Communicate what you have learned to environmental regulators and industry and request action

Sense of Smell

- ✓ We breathe 10,000 to 20,000 liters of air/day mostly through our noses
- ✓ Environmental odors can alert people even when the chemicals producing them are below harmful levels

You can smell many chemicals (the odor threshold) before they are at harmful levels as is the case of **Hydrogen Sulfide**.

Hydrogen Sulfide (H₂S)

Odor threshold → 0.5 – 30 parts per billion (ppb)

Irritation threshold → 10 – 20 parts per million (ppm) -a thousand times more.

Olfactory Fatigue (where you can no longer use your sense of smell) → **100 ppm**

Loss of Consciousness (LOC): 750 – 1,000 ppm **Knockdown! Or Collapse [Sullivan and Krieger 2001] paralysis of the respiratory center [Dalton 1999] and death! (likely a consequence of *direct* toxic action of H₂S in the brain) [Sullivan and Krieger 2001].

Nerves of the Nasal Cavity

Olfactory Nerve

Provides for the sense of smell

- floral
- fruity
- earthy
- fishy
- fecal
- urinous

Trigeminal Nerve

Provides for the sense of irritation

- pungency
- burning
- stinging

The olfactory and the trigeminal nerves inform us of the chemical quality of the air we breathe

Olfactory Nerve → provides for the sense of smell

Trigeminal Nerve → provides for the sense of irritation

Potential Sources of Environmental Odors

- ✓ **Animals:** *Confined animal feeding operations (CAFO'S), manure*
- ✓ **Human activities:** *compost, sewage, garden garbage, household cleaning agents*
- ✓ **Industry:** *oil refineries, landfills, paper mills, waste water treatment plants, dry cleaners*
- ✓ **Nature:** *fires, moist soil, stagnant ponds*
- ✓ **Vehicles:** *diesel exhaust*

Potential Sources of Environmental Odors (cont...)

Odors emitted from any of the previously mentioned sources elicit far more community concerns than odorless air pollutants such as nitrogen dioxide

Schiffman and Williams 2005

Some individuals attribute health symptoms to odor exposures, even when no symptoms would be expected because the odor level of the substance in air is so small. Bulsing et al. 2009.

Environmental Odors Effects

- ✓ Annoyance/nuisance: private or public
- ✓ Decreased quality of life
- ✓ Diminished sense of wellbeing
- ✓ Perceived dangers



Annoyance or Nuisance can be private or public:

Private nuisance: Activity, situation, or conduct of another person that annoys you or inconveniences you or your family. It is also an activity, situation, or conduct that interferes with the enjoyment, health, or safety of your land, home or building.

Public nuisance: Activity, situation, or conduct of another person that interferes or affects the comfort, health, or safety of the public.

Decreased quality of life: When the enjoyment of all that life has to offer is reduced.

Diminished sense of wellbeing: When the feeling that life is going well is decreased or lost.

Perceived dangers: To become aware of something through the senses. You may “have the sense” that *something is wrong...* for some people odors may be an environmental cue similar to the sound of a machine or the sight of smoke.

Environmental Odors Symptoms

- ✓ The sensitivity and response to odor varies from person to person
- ✓ The same odor at the same exposure level can have different effects in different people

Some people when “worried” about an environmental odor feel sicker and tend to report those symptoms.

This gave rise to an explanatory model where:

1- Odors may act as a marker for toxicologically significant exposure

2- Odors may bring on symptoms in their own right

3- Odors serve as a cue for stress-related symptoms among individuals who perceive the odor source as posing a health risk.

Shusterman 1991.

Environmental Odors Symptoms (cont...)

May vary by

- Age
- Genetics
- Gender (sex)
- Medical conditions
- Lifestyle
- Social habits
- Medical history of depression



Individual responses may vary. (Dalton, 1999; Shusterman, 2001)

Age → Both the very young and the very old are at increased risk for odor exposure

Genetics → Inherited dislike for an odor

Gender → women are more sensitive to the health effects from odors

Medical Conditions → Individuals with other medical conditions: Asthma, Chronic Obstructive Pulmonary Disease (COPD), Chronic sinusitis; headaches, migraines, seizures; tachycardia

Life Style → Outdoor exercise with increased risk of exposure

Social Habits → Tobacco use/Environmental Tobacco Smoke (ETS), Alcohol abuse

Medical History → People suffering from mental depression.

Environmental Odors Symptoms (cont...)

- ✓ **Headaches, nausea**
- ✓ **Eye, nose, and throat irritation**
- ✓ **Nasal congestion**
- ✓ **Hoarseness, sore throat, cough**
- ✓ **Chest tightness, shortness of breath**
- ✓ **Heart palpitations**
- ✓ **Drowsiness**
- ✓ **Mental depression**

Headache and nausea are the most common symptoms.

Environmental Odors Symptoms (cont...)

- ✓ Some symptoms can be measured:
 - A patient complains about something, and the examiner will hear what it is (e.g., wheezing) or see it (e.g., redness and/or tearing of the eyes)

- ✓ Some symptoms cannot be measured:
 - A patient complains about something he/she is feeling (e.g., nausea, headache...), but the examiner cannot see it

Identifying these differences can prompt the primary health care provider to do a more careful investigation and include other factors (e.g., emotional responses) that may be responsible for the symptoms.

Sensitive Populations

- ✓ **Children**
- ✓ **Pregnant women**
- ✓ **The elderly**
- ✓ **People with:**
 - **Asthma**
 - **Chronic Obstructive Pulmonary Disease (COPD)/
Emphysema**
 - **Mental depression**

Assessing a Community's Response to Environmental Odors



1. To record the odor data on the presence of odor persons affected to be present in the meeting of the team.
 2. When recording odors in the field, indicate the date, time, weather, wind speed, and other data in a report in the notebook column.

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Assessing the community's response to odors is helpful for making recommendations and developing health messages.

An odor diary is one way to assess responses to odors and can be implemented by the community or by environmental or health agencies.

Odor Diary

Log the following information once:

- ✓ Age and
- ✓ Gender (sex)
- ✓ Medical history such as asthma, COPD, mental depression ...)

An odor diary is a tool for community members to assess responses to odors.

An odor diary – completed by community members – can help them recognize things like odor types and times of the day when odors are worse.

It includes questions on age, sex, and certain medical conditions, and it can help identify risk factors.

Odors Diary (cont...)

Log the following information daily:

- ✓ Where you were when you smelled the environmental odor
- ✓ Duration of exposure

Be sure to include the number of hours each day that you were at the location where you smelled the odors (or the duration of the exposure).

Diaries are easy to fill out. Use them for no more than 2 weeks but fill them out daily during those 2 weeks, even when there is no odor.

Odors Diary (cont...)

Log the following:

- ✓ **Description of the odor**
- ✓ **Season of the year and time of the day or night**
- ✓ **Outdoor activities (gardening, exercise, school sports, etc.)**
- ✓ **Outdoor conditions (calm, windy, raining, etc.)**

Odors Diary (cont...)

To help determine best sampling parameters and times,

- ✓ Use the odor diary any time there is an environmental odor AND
- ✓ Before sampling of chemical levels in air AND
- ✓ During sampling of chemicals levels in air,
 - Compare concentrations with odors responses
 - Determine conditions or activities that may make odor responses worse

Before environmental sampling:

If you start using an odor diary before sampling the air, the results may provide information on the **type of odor** and **when it is most prevalent**. People can use this information to determine what chemicals to include in a sampling plan and the best times to sample.

During Environmental Sampling:

Collecting odor information **during sampling** can assist with comparing the recorded concentrations with the odor responses or symptoms it produces. The conditions and activities may provide information on what makes the odor symptoms worse.

Odors Controls

Legislative or physical controls

- Preventing odors from being created
- Capturing and destroying odors before they are released to the environment (reduce emissions by using technology)
- Dispersing or concealing odors to avoid a nuisance when transporting away from the odor source
- Restricting times of day
- Zoning restrictions
- Prevent dissemination of the odor (e.g., planting trees around the facility)

Operational time of day restrictions – Closing or reducing the odor-producing operations the time(s) of day/week when the odors are worse (as seen in the odor diaries).

Zoning restrictions – Determine where (locations) odors are worse and prevent future odor-producing additions (e.g., upgrades, new construction, new industry, etc.) through zoning restrictions

Reduce emissions- Reduce emission through use of odor control technologies.

Prevent odors from disseminating by planting trees

Sheffield and Bottcher 2000

Community Actions

Personal actions to reduce exposure

- Closing windows
- Exercising indoors
- Leaving the area for a while



Communities can also help protect themselves by reviewing completed odors diary to determine personal actions people can take to cope with the odors and to develop suggestions for facilities and regulators.

Community Actions (cont...)

Work with the odor-producing facilities or regulators to implement odor controls

Community members and/or environmental and health agencies can discuss the findings of the odor diaries with the odor-generating facility and/or local legislators/regulators and suggest alternatives when odors are worse.

Tools for reducing odors are effective through local implementation of legislation or good-neighbor relationships.

Community Action (cont...)

Request environmental odor health education for area physicians

- **Grand Round presentations in area hospitals**
- **Fact sheets**
- **Flyers**
- **Odors information**

Knowledge about the problem is important

Grand Rounds are presentations of various topics given to health care providers in the hospitals where they work.

Sometimes these presentations are brought to them by organizations wanting to alert the area medical community that something may be affecting the health of their patients.

Summary

- ✓ **Historically, unpleasant odors were recognized as warning signs of potential risks to human health**
- ✓ **Today we now know that odors from environmental sources might cause health symptoms depending on individual and environmental factors**

Schiffman and Williams (2005).

Historically, “unpleasant odors” have been recognized as “warning” signs of potential risks to human health, not direct triggers of health effects.

Today, we recognize odors can diminish our sense of wellbeing and lead to symptoms such as headaches and nausea.

Summary (cont...)

- ✓ **Communities can help protect themselves by using odor diary to determine personal actions to reduce odors and to develop suggestions for facilities and regulators**
- ✓ **Community action can be effective for reducing environmental odors**

“Odors in public health practice are not only warning signs of potential health effects, but may in itself be the direct cause of some symptoms in humans.”

Schiffman and Williams 2005.

References

- Baldwin et al. 2004
- Buck and Axel 1991
- Bulsing et al. 2009
- Dalton 1999
- Dalton 2003
- Dalton 2003
- Knutson 2003
- Rosen Kranz 2003
- Schiffman and Williams 2005
- Shusterman 2001
- Van Thriel 2008
- Sullivan and Krieger 2001
- Sheffield and Bottcher 2000
- Wing et al. 2008



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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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