

Health Effects of Odors

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Odor as a Warning System

- Odors are a primal warning system.
- Bad smelling meat is likely to make you sick if you eat it.
- Chemical odors from substances such as ammonia or chlorine can be warning of serious or even deadly health impacts, depending on the concentration.

Odors

- The human nose is quite sensitive and in many cases can detect odors in the low part per billion range.
- Often the human nose can detect odors at levels that are lower than chemical monitors can detect.
- Agencies may thus be unable to detect or identify odors by chemical monitoring.

Odor Alone Can Cause Health Symptoms

- Odors are associated with a variety of reported health symptoms when chemicals are present at levels far below those known to otherwise cause noncancer health effects.
- Reported odor-related symptoms from a number of studies include nervousness, headache, sleeplessness, fatigue, dizziness, nausea, loss of appetite, stomach ache, sinus congestion, eye irritation, nose irritation, runny nose, sore throat, cough, and asthma exacerbation.
- Odor and irritancy are mediated by different mechanisms but the thresholds can be similar for many chemicals, thus some symptoms reported for odors could be due to irritancy.

Odor Sensitivity Varies

- Women generally can detect odors at lower threshold than men.
- Pregnant women can be particularly sensitive.
- There is a general variability in odor threshold detection.
- There is variability in susceptibility to odor-induced health symptoms.

Studies of Health Impacts of Odors

- Mirabelli and Wing (2005) studied proximity to paper mills in South Carolina and wheezing symptoms among adolescents in North Carolina using a survey methodology.
- Paper mills air emissions include H_2S which is known to have a strong odor at levels where other toxicological effects are not known to occur.

Studies of Health Impacts of Odors

- There is a weak association between exposure to odors (as measured by distance from a plant) and incidence of wheezing 1.15 (95th C.I. 0.96, 1.34).
- The association is strongest with adolescents who smoke or live in households where there is smoking, suggesting that exposure to other pollutants might enhance response 1.21 (95th C.I. (0.99, 1.43))

Studies of Health Impacts of Odors

- Ames and Stratton, 1991 studied the association between smelling N-propyl mercaptan and various health symptoms.
- N-propyl mercaptan is a contaminant of an organophosphate pesticide (Mocap) with a strong onion odor.
- A survey method was used and odor exposure was measured by intensity, number of days of exposure, and proximity to the treated potato field.

Studies of Health Impacts of Odors

- The odds ratios for headache, vomiting, nausea, diarrhea, runny nose, sore throat, cough, trouble breathing, wheezing, burning/itching eyes, tiredness, skin rash, fever, hay fever attacks and asthma attacks, by perception of strong or unusual odors, range from 1.86 to 6.00 (asthma), all significant. This is after adjustment for age, sex and current cigarette smoking.

Studies of Health Impacts of Odors

- Neutra et al., (1991) published a paper summarizing some of the results of four studies conducted at hazardous waste sites in California by the California Department of Health Services.
- This paper summarized results of a symptom survey that compared residents living in proximity to the four hazardous waste sites to similar communities not near a site.

Studies of Health Impacts of Odors

- The residents around these sites were exposed to aromatic and chlorinated solvents in the low part per billion range, which is generally considered to be below the level at noncancer health effects would be expected.
- The data were collected using a survey.

Studies of Health Impacts of Odors

- Positive and significant odds ratios were observed for nervousness, headache, sleeplessness, fatigue, dizziness, nausea, loss of appetite, stomach ache, sinus congestion, eye irritation, runny nose, sore throat, cough, asthma, allergies, skin irritation, chest pains, earaches, and difficulty breathing at one or more sites.

Studies of Health Impacts of Odors

- One of the lower positive but statistically significant odds ratios was for tooth ache at two of sites where the question was asked.
- This question was included because it was thought that toothache was unlikely to be correlated to odor exposure as a measure of recall bias in the survey.

Studies of Health Impacts of Odors

- One of the questions asked in the survey was about environmental worry.
- Those whose environmental worry resulted from their symptoms were eliminated.
- There was a strong correlation between those who were worried about environmental chemicals and those who reported four or more symptoms.
- This was true for those exposed to odors as well as for the control communities.

Studies of Health Impacts of Odors

- Stress can clearly affect a variety of physiological parameters such as blood pressure and immune response so it not surprising that a component of the response to odors would involve a variable reaction to and perception of odors.
- This does mean that odor symptoms are “all in your head”.

Studies of Health Impacts of Odors

- Multiple scientific studies support the idea that a number of different symptoms are reported to be triggered by odor alone.
- These symptoms are triggered at the low part per billion air concentrations below the level that where “classical” toxicological (poisoning) health effects would not be expected.

Studies of Health Impacts of Odors

- Odor can also be perceived when chemical concentrations are high enough to expect health effects or even death by “classical” toxicological mechanisms.
- However, the science of toxicology is continually evolving and a certain humility about the concentrations at which chemicals can directly damage the human body is warranted.

Risk Assessment and Odors

- Risk assessment is not much help with assessing the impacts of odors on public health.
- We have one health value, a chronic reference exposure level based on odor (H_2S), however most of our chronic RELs are below the odor threshold.

Risk Assessment and Odors

- The variability in odor thresholds in the population and lack of data make it difficult to apply risk assessment techniques to odors.
- The fact that a facility does not pose a public health risk under the criteria of the Hot Spots program does not mean that odors are not impacting public health.

Summary

- Odors can cause a variety of health symptoms at concentrations below where traditional toxicity would be expected.
- There is considerable variability in odor detection threshold and in the response to odors.
- Traditional risk assessment does not adequately address health impacts from odors.