



Chemical Exposures and the Senses of Smell and Taste

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Over the years individuals in both public or private sector workplaces may come into contact with chemicals that are known or suspected to be toxic substances or hazardous materials. An individual's olfactory and taste senses may be a useful tool in evaluating some exposures.

What happens when odorant molecules or what we perceive to be “smells,” arrive at the nose? The smell sensing process begins when an intake of air sends odorant molecules on a journey up the nasal passages into the olfactory system. At the top of the nasal passage the odorant encounters a small region, the epithelium, densely covered with millions of olfactory receptor (OR) neurons. These neurons perform the sensing function; when a receptor neuron is stimulated by interaction with an odorant molecule it generates an electrical signal. The pattern of stimulated receptor neurons effectively forms a “signature” by which an odorant may be identified.¹

The electrical signals generated by the receptor neurons are processed in several stages. The signals travel first to the olfactory bulb, located in the pre-brain, then to the olfactory cortex, and finally to other regions of the brain. Processing at all of these stages contributes to an analysis of the odorant's signature based upon the particular set of receptor neurons that have been stimulated. This analysis, along with comparison with stored memories, results in final odor indications. If the signal is blocked or fine calcium particles react with the odorant (chemical) to neutralize its own toxicity in the olfactory system one may experience the loss of smell as well as taste from the formation of salt bridges as formed by arsenic, antimony and bismuth.

Research over the last twenty years has greatly expanded our insight into what happens at each of these stages of olfactory processing. The following information is a comparative list of toxic substances composed of chemicals and pesticides. The key principle to any critical factor in making various detoxification, treatment and recommended therapies are dependent upon $RISK = TOXICITY \times EXPOSURE$.

When a person is going through single or multiple exposures to a toxic substance, they will begin an internal detoxification process that applies many methods to relieve their body of its toxic burden and/or systemic organ toxicity. Even the simplest exposure may cause the release of a toxin that may manifest some significant symptom or sign that is characteristic of the poison as a chemical, pesticide or toxic metal. The first sign of exposure may be a chemical odor or

taste that is familiar to the person. The ability to smell may be acclimatized to the odor through olfactory fatigue due to the individual's exposure, which may give rise to other possible symptoms as stated in the examples below:

- Rotten egg odor: sulfur.
- Hypothermia: creosote.
- Hyperthermia (fever, pyrexia): nitrophenols, pentachlorophenol, borate, cadmium dust, thallium, metaldehyde, inorganic arsenicals and naphthalene.
- Chills: phosphine and arsine.
- Hot sensations: nitrophenols, chlordimeform and pentachlorophenol.
- Myalgia: paraquat and chlorophenoxy compounds.
- Thirst: pentachlorophenol, nitrophenol, inorganic arsenicals, phosphorous, phosphides, sodium fluoride, cholecalciferol aminopyridien, borate and endothall.
- Anorexia: organophosphates, n-methyl carbamates, nicotine, pentachlorophenol, hexachlorbenzyl, chlordimeform, cholecalciferol, halocarbon fumigants, nitrophenols, inorganic arsenicals and amino pyridine.
- Alcohol Intolerance: thiram and calcium cyanamide.
- Sweet taste in the mouth: chlordimeform.
- Metallic taste in the mouth: inorganic arsenicals and organic mercury.
- Salty, soapy taste in the mouth: sodium fluoride.

The nose "knows" its odors and can be a useful analytical tool to help evaluate symptoms from specific chemicals and pesticides may exist in the workplace, home or environment.

References:

¹ Zelkowitz, Marvin V. *Advances in Computers*, Volume 71: Nanotechnology. Elsevier/ Academic Press. New York, New York © 2007

² EPA 6th Edition: *Recognition and Management of Pesticide Poisonings* (EPA 735K13001). US Government Printing Office, Washington, DC

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