STANDARD DEVIATIONS: Aroma Therapy?

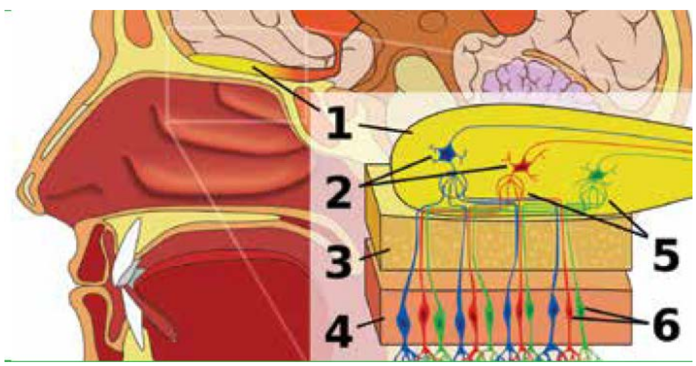
Aloha,

Do you have a special holiday aroma that keeps you in the holiday spirit? Black-eyed peas at New Years? Wassails on Christmas Eve? Does the heady flavor of gingerbread permeate your home? Maybe the smell of pine needles covering your living room floor is all you need. We bake an asparagus quiche on Christmas morning, and it's the smell of my urine later that gets to me.

The culprit in my Christmas cuisine is asparagusic acid, a substance unique to the plant. Its metabolism results in a mixture of sulfur-containing molecules (thiols) that our olfactory senses have little trouble detecting. There are, however, people who do not metabolize the acid and others whose olfactory receptors do not recognize the odor.

Volatile organics with high vapor pressures readily become gaseous, easily spread through the air, and are available for detection by even not-so-sensitive noses. Lots of bacteria (and yeast) make these compounds, too. Experienced Microbiologists are able to identify organisms just by opening an incubator. Is that a bad thing?

These odor molecules contact a tissue called the olfactory epithelium which contains olfactory receptor cells that lock onto these odor molecules. This generates electrical signals that are relayed to clusters of nerve cells called glomeruli. Then, specialized nerve cells called mitral cells send these signals to regions of the brain that will combine these signals so we can recognize the smell (or are intrigued by it).



1. Olfactory Bulb 2. Mitral Cells 3. Bone 4. Olfactory epithelium 5. Glomeruli 6. Olfactory receptor cells.

These molecules are much smaller than bacteria (let's say infinitesimal).It's the vapor pressure that allows them to escape the confines of your plates and get into the air. Normally, typically, <u>almost</u> always, and as a <u>general</u> rule smells do not contain bacteria. That does not mean smelling plates is advisable.

Aerosolization is the process by which a substance is converted into particles light enough to be carried by the air. This is a concern for many laboratory practices. Vortexing, centrifugation, agitation, even the gentle action of opening a plate can generate aerosols. The low infective dose of some organisms make this an especially concerning phenomenon. And viruses are a whole other kettle of fish. Their size makes them much more transmissible as aerosols.

Disruptive events that may cause aerosols are biosafety concerns, and we mitigate these risks with different strategies. Biosafety cabinet usage, respiratory protection, centrifuge cup covers, closed tubes and those little plastic backed specimen covers are good practices. If you are using gravity to assuage your concerns, consider the air handling, the temperature, the humidity, the material, and the cause as factors that may affect the organism settling.

We can't help but smell some bacterial growth. We can avoid aerosols and mitigate the practices that generate them.

Our noses are pretty good at letting us know what's going on. Here are some specific scents and the responsible organisms (are any familiar to you?):

Pseudomonas aeruginosa: Grapes, sweet, fruity. Some think of corn tortilla chips.

Staphylococcus lugdenensis: Earthy, hay-like, sweet.

Streptococcus anginosus: Butterscotch, caramel, sweet and cake-like.

Escherichia coli: Floral.

Haemophilus influenzae: Floral.

Candida/Yeast: Baking bread, beer.

Eikenella corrodens: Bleach.

Acinetobacter baumannii: Sweaty socks or a gym.

Proteus spp: Rancid, rotten chicken. Some say chocolate brownies.

Actinomycetes, Streptomyces, Nocardia spp: Earthy, musty dirt after rain.

Gram-negative anaerobes: Morning breath (cuz they are the reason!)

And, of course, there are smells that can be harmful. Sarin gas, hydrogen cyanide, phosgene, sulfur mustard, and chlorine are some of the compounds that can be lethal if inhaled.

There exists another source of odor with a microbiological association, *flatulence*. The resultant gases arise from complex oligosaccharides not broken down by mammals but readily digestible by gut flora and these tend to be volatile sulfurous compounds. Here's what you always wanted to know:

- Normal flatus volume range is around 476 to 1,491 ml per 24 hours.
- The number of flatus episodes per day is variable, the normal range is given as 8–20 per day.
- The volume of flatus associated with each flatulence event again varies (5–375 ml).
- The volume of the first flatulence upon waking in the morning is significantly larger than those during the day.
- Sound varies depending on the tightness of the sphincter muscle and velocity of the gas being propelled, as well as other factors, such as water and body fat.

For all you history buffs, I'd recommend Benjamin Franklin's letter to The Royal Academy of Brussels (1781), found here: http://teachingamericanhistory.org/library/document/to-the-royal-academy-of-farting/

Have a great week and be safe,

Bryan

References:

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