Savvy Smells

Materials:

beta-mercaptoethanol
5A-ANDROST-16-EN-3-ONE
smells from sensing kit□images of good looking food
images of bad looking food

Introduce by asking visitors about how we sense the world. and talk about senses. Smell is one of our chemical senses (the other being taste). Odors and tastes transmit messages to the brain areas where we have memories about the taste but also to brain areas where we remember people, places or events associated with smell and taste.

Fun fact: humans can detect ~10,000 odorants
We have 50million cells to detect odorants

Activity 1:

Our brain's main goal is for us to survive.
what does smelling help us do?
(alerts us to fires, spoiled food, poisonous fumes, leaking gas)

We need to eat so how do we know what to eat? If it is near us, we see it or if its far away and cooking, we smell it. So we are relying on our senses to tell us if we should eat.

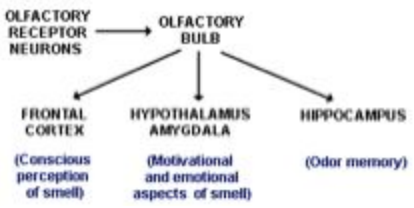
(show them images of good food and rotten food and ask them if they'd eat it)

Activity 2:

Lets pretend its dark out and we're in a cave and we can't see the food really well. How do we know if we should eat it, what do we all do? we sniff, we smell.

-have them smell the all the smells and Rate it: strong, pleasant, neutral would they eat it?
-have them smell the b-mercaptoethanol, would they eat it? why? how do they know?

Talk about where smell messages go to the brain, show them on a brain:



Fun fact: About 2 million people in the United States have NO sense of smell. This disorder is called anosmia. A serious head injury can cause anosmia. Most likely this results in damage to the olfactory nerves as they enter the olfactory bulb. It is also possible that damage of the frontal lobes caused by a tumor or surgery can cause anosmia. Elderly people often have a reduced sense of smell.

Activity 3:

5A-ANDROST-16-EN-3-ONE also called androstenone
(steroid derived from testosterone) occurs in human sweat and its a pheromone

Scientists are studying the genetics of preference.
in 2007: Gene on chromosome 19. OR7D4 (Olfactory Receptor D4) Same substance does not smell the same to all people
-sweet vanilla or floral
-stale sweat or urine or dying animal
-odorless

RT/WM or WM/WM genotypes less sensitive
RT/RT sensitive

Androstenone (5α-androst-16-en-3-one) is a steroid found in both male and female sweat and urine. It is also found in boar's saliva, and in celery cytoplasm. Androstenone was the first mammalian pheromone to be identified. It is found in high concentrations in the saliva of male pigs, and, when sniffed by a female pig that is in heat, results in the female assuming the mating stance. Androstenone is the active ingredient in 'Boarmate', a commercial product made by DuPont sold to pig farmers to test sows for timing of artificial insemination.[1][2]

https://www.youtube.com/watch?v=azyUTWBL7Os

male pork express androstenone so this study looked at the preference of pork eaters and their ability to smell androstenone
http://healthland.time.com/2012/05/03/does-meat-gross-you-out-it-may-be-genetic/
70% of people have 2 functional copies of OR7D4 gene
1 or no copies of the gene

Do your own experiment to examine percentages of public smell preferences.

Activity 4:

Olfactory fatigue:
After awhile, we stop being able to smell the odor. try removing the odor and then putting it under their nose again. Try this when they have their eyes closed and ask them to tell you when they smell it again.

Adaptation, or fatigue, to constant stimulation is a general feature of sensory systems. For instance, the touch receptor cells in the skin adapt to the stimulation of our clothes. Adaptation involves mechanisms at the level of the receptor cell, including the inactivation of ion channels in the membrane that generate the electrical signal. Removal of the stimulus followed by restimulation activates the process all over again.

Studies have shown that the time for adapting to an odor is significantly different when people believe they are being exposed to a harmless aroma, compared to when they think they are smelling a hazardous substance, even when the odor is exactly the same.

Background:

The smells of a rose, perfume, freshly baked bread and cookies...these smells are all made possible because of your nose and brain. The sense of smell, called olfaction, involves the detection and perception of chemicals floating in the air. Chemical molecules enter the nose and dissolve in mucous within a membrane called the olfactory epithelium. In humans, the olfactory epithelium is located about 7 cm up and into the nose from the nostrils.
Hair cells are the receptors in the olfactory epithelium that respond to particular chemicals. These cells have small hairs called cilia on one side and an axon on the other side. In humans, there are about 40 million olfactory receptors; in the German Shepherd dog, there are about 2 billion olfactory receptors.

No one knows what actually causes olfactory receptors to react - it could be a chemical molecule's shape or size or electrical charge. The electrical activity produced in these hair cells is transmitted to the olfactory bulb. The information is then passed on to mitral cells in the olfactory bulb.

The olfactory tract transmits the signals to the brain to areas such as the olfactory cortex, hippocampus, amygdala, and hypothalamus. Many of these brain areas are part of the limbic system. The limbic system is involved with emotional behavior and memory. That's why when you smell something, it often brings back memories associated with the object.

As you probably know, when you have a cold and your nose is stuffed up, you cannot smell very well. This is because the molecules that carry smell cannot reach the olfactory receptors.Hair cells are the receptors in the olfactory epithelium that respond to particular chemicals. These cells have small hairs called cilia on one side and an axon on the other side. In humans, there are about 40 million olfactory receptors; in the German Shepherd dog, there are about 2 billion olfactory receptors.
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