

OLFACTION (SENSE OF SMELL)

Important sense for many animals

Social communication, esp. of sex, emotion, health

Pheromones

Synchronization of reproductive cycles, births

“Copulin”, sexual identity

Bonding of mother and neonate

What is safe to eat

“**Food imprinting**”

Who is a good mating partner

“smells like mom” (rats)

The “**Bruce Effect**”

Close neurological ties to emotion and memory via **Limbic System** structures

Could there be changes in ability **to smell and mood? And memory?**

Sensory system:

Olfactory receptors (1000+ different receptor proteins so far identified,

Randomly scattered, each maximally sensitive to one chemical/odor

Located in nasal olfactory mucosa/olfactory epithelium

Cilia on receptors

10 million receptors in human; 50-100 million in rabbit; 1 billion in dog

Replaced every 30-60 days

Pathway:

Receptors --- axons pass through **Cribiform Plate/bone** --- synapse with **Mitral cells in Olfactory Bulb** --- Olfactory Tract --- medial temporal lobe (piriform cortex= **hippocampus, amygdala**) --- **medial dorsal nucleus of thalamus** and to **orbitofrontal cortex** (“anterior perforated substance”)

emotional responses to smells – medial temporal lobe structures

conscious appreciation of smell – thalamus + orbitofrontal cortex

Other Interesting Information:

Can be “smell blind”

Anosmia – complete loss of ability to smell

6% of head trauma patients

olfactory axons sheared off as brain slides across cribriform bone

May be unable to smell a **specific odor**, this may be inherited

Can get better at perceiving a given smell with repeated exposures,

A kind of “learning to smell” effect...why?

Seizures (which often start with abnormal firing in temporal lobe structures) are often preceded with a “warning” (“aura”) sensory “hallucination”, which is often a “bad smell”

Are age-related changes in ability to smell, gets worse as get older

Why? No replacement of receptor proteins?

For women, ability falls off esp. after menopause (HRT reverses)

UPSIT (University of Penn. Smell Identification Test)

Persons with **Major Depressive Disorder** also have poorer sense of smell; antidepressant drug therapy may improve

Smokers have impaired sense of smell; which is reversible if stops smoking

Prior to onset of memory problems in future **Alzheimer's** patients, They begin to lose their sense of smell (especially for the ability to identify smells or recall smells) although their sensitivity to a smell remains the same

Future role for “**room odorizers**”