30.7A: Taste and Smell at Birth and in Old Age

The senses of taste and smell develop in the intrauterine environment and can deteriorate with age.

Learning Objectives

- Describe the status of taste and smell at birth and in old age

Key Points

- Newborns are born with odor and taste preferences acquired in the womb from the smell and taste of amniotic fluid, influenced by the mother’s diet.
- A significant change takes place in the regulation of olfaction just after birth so that odors related to the offspring are no longer aversive, allowing the female to positively respond to her babies.
- Anosmia is a lack of functioning olfaction: an inability to perceive odors.
- Ageusia is the loss of taste function, particularly the inability to detect sweetness, sourness, bitterness, saltiness, and umami (savory taste).

Key Terms

- **olfactory bulb**: The structure of the vertebrate forebrain involved in olfaction, the perception of odors.
- **anosmia**: The inability to perceive odors.
- **taste bud**: Sensory receptors located around the small structures on the upper surface of the tongue, soft palate, upper esophagus, and epiglottis.
EXAMPLES

Failure to detect odors (anosmia) is one reason that older individuals may not enjoy eating, since an inability to smell is related to an inability to taste (ageusia). Caretakers of such individuals must ensure they continue to eat healthy foods.

The senses of taste and smell first develop in neonates and can be diminished by the effects of aging.

Smell

At birth, infants can show expressions of disgust or pleasure when presented with pleasant (honey, milk) or unpleasant (rotten egg) odors and tastes. Newborns have inherent smell and taste preferences acquired in the womb from the smell and taste of amniotic fluid, which is influenced by the mother’s diet.

Intrauterine Olfactory Learning

Intrauterine olfactory learning is demonstrated by behavioral evidence that newborns respond positively to the smell of their own amniotic fluid. Infants recognize and react favorably to scents emitted from their own mother’s breasts, despite the fact that they also may be attracted to breast odors from unfamiliar nursing females in a different context. The unique scent of the mother (to the infant) is referred to as her olfactory signature. Infants are also able to recognize and respond with familiarity and preference to their mother’s underarm scent.

In newborn mammals, the nipple area of the mother is the sole nutritional source, so the maternal olfactory scent becomes associated with food intake. Newborns who do not gain access to the mother’s breasts would die shortly after birth, so this olfactory cue helps maintain and establish effective breast feeding. The mother’s olfactory signature is experienced with reinforcing stimuli such as food, warmth, and tactile stimulation, enhancing further learning of that cue.

As demonstrated by animals in the wild (apes, for example), offspring are held by the mother immediately after birth without cleaning and continually exposed to the familiar odor of the amniotic fluid (making the transition from the intrauterine to extrauterine environment less overwhelming).

Studies demonstrate that the changes to the olfactory bulb and main olfactory system following birth are extremely important and influential for maternal behavior. Pregnancy and childbirth result in a high state of plasticity of the olfactory system that may facilitate olfactory learning within the mother. A significant change takes place in the regulation of olfaction just after birth so that odors related with the offspring are no longer aversive, allowing the female to positively respond to her babies.
**Olfactory System:** Human olfactory system. 1: Olfactory bulb 2: Mitral cells 3: Bone 4: Nasal epithelium 5: Glomerulus (olfaction) 6: Olfactory receptor cells

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**Anosmia and Aging**

Older people experience a decline in the sense of smell. Anosmia, a lack of functioning olfaction (inability to perceive odors), may be temporary, but traumatic anosmia can be permanent. Anosmia is due to an inflammation of the nasal mucosa, blockage of nasal passages, or a destruction of one temporal lobe. A common cause of anosmia is old age.

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**Taste**

**Taste Receptors in Humans:** Structure of the taste bud, including afferent nerve, connective tissue, basal cell, taste receptor cell, lingual epithelium, oral cavity, and taste pore.

Taste buds contain the receptors for taste and are located around the small structures (papillae) on the upper surface of the tongue, soft palate, upper esophagus, and epiglottis. These papillae are involved in detecting the five known elements of taste perception: salty, sour, bitter, sweet, and umami. Via small openings in the tongue epithelium (taste
pores), parts of the food dissolved in saliva come into contact with taste receptors (taste buds). The taste receptor cells send information detected by clusters of various receptors and ion channels to the gustatory areas of the brain via the seventh, ninth, and tenth cranial nerves. On average, the human tongue has 2,000–8,000 taste buds.

The average life of a taste bud is 10 days. Ageusia is the loss of taste function, particularly the inability to detect sweetness, sourness, bitterness, saltiness, and umami. It is sometimes confused with anosmia, a loss of the sense of smell. Because the tongue can only indicate texture and differentiate between sweet, sour, bitter, salty, and umami, most of what is perceived as the sense of taste is actually derived from smell. True ageusia is relatively rare compared to hypogeusia (a partial loss of taste) and dysgeusia (a distortion or alteration of taste). Local damage and inflammation that interferes with the taste buds or local nervous system such as that stemming from radiation therapy, glossitis, tobacco use, and denture use also cause ageusia. Other known causes include loss of taste sensitivity from aging causing a difficulty detecting salty or bitter taste, anxiety disorder, cancer, renal failure and liver failure.