More about human taste

Gustatory sense refers to the perception of savors that are the sensations perceived by the tongue during tasting.

Usually, savors are classified in 5 categories

Salt, sour, bitter, sweet, umami (table 1)

Basic taste	Some compounds representing this taste
Sweet	Saccharin, aspartame, fructose, glucose, sucrose
Sour	Acetic acid, citric acid, chlorhydric acid
Salty	Sodium chloride, Potassium chloride, Calcium chloride
Bitter	Caffeine, quinine, magnesium sulfate, nicotine, morphin, strychnin
Umami	monosodium glutamate, L-arginine, L-glutamine

Table 1: basic taste and some typical molecules representative of each taste

What is actually the perception of taste

Frequently, we associate to taste an olfactory perception: **actually, when tasting 80% of the perception is composed of smell (by retro-nasal route)**. The mouth also contains thermal, mechanical and pain receptors; therefore the temperature and the texture of food influence the perception of their taste.

Physiology of taste

There is no regionalization of sensation perception on the tongue. The repartition of our taste receptors depends on our gene pool.
Taste sensation is perceived by taste receptors (taste buds) located mainly in the papillae on the upper side of the tongue.

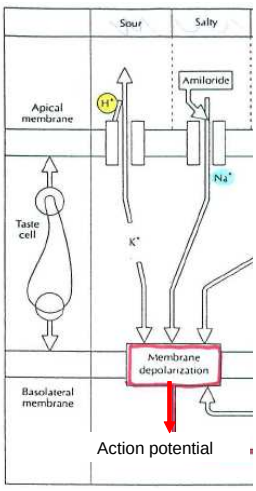
Three types of papillae

Calciform, fungiform, foliate.
Papillae bathe into saliva and shelter gustatory cells. These cells are renewed every 10 to 14 days. Due to the large number of gustatory cells, the sensory message can be kept constant.

Two ways of gustatory perception

- For salty taste, Na^{2+} ions directly go into the cells (figure 1), For sour taste, H^{+} ions are fixed on ionic canal thus liberating K^{+} ions (figure 1). Then, for both tastes, the membrane cell is depolarized and an action potential is generated
- For sweet, bitter and umami, taste perception is based on the key-lock principle: a taste bud can express several receptors and a molecule can activate various receptors (figure 2).

Figure 1 : salt and sour perception



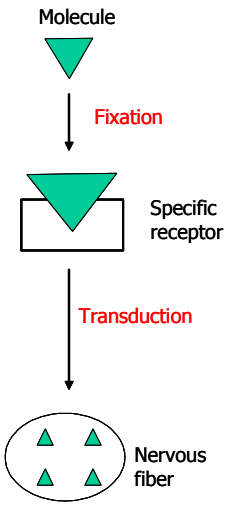


Figure 2 : sweet, bitter and umami perception

Treatment of taste information in the brain

The signal is transduced to the brain where the information is processed (figure 3).

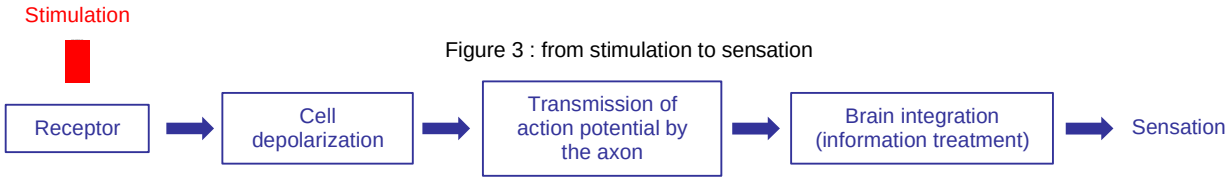


Figure 3 : from stimulation to sensation

In terms of qualitative coding, each stimulus entails the stimulation of some receptors therefore of a nervous fibers pool to form a memorized sensory image. The comparison of these sensory images allows to differentiate tastes.

As for quantitative coding, the modulation of electrical signal frequency optimizes the signal to noise ratio. Signal amplitude stays constant. After a stimulus, these is a period of inactivity before recovering noise.

The brain uses the outline extraction method to increase the message readability (removal of common information): for instance when we look at a picture, our brain analyzes the outline of the face and not each point of the face to recognize the person.