Chemicals Responsible for Basic Tastes/ Taste Classification

Sweet Taste

- Sweetness is although a property of sugars and related compounds, this stimulus is imparted by a very large number of molecules.
- Some inorganic compounds (salts) are also found to be sweet such as beryllium chloride and lead acetate but are toxic.
- They are of widely different chemical natures which are non-ionic for example; sugars, amino acids, peptides, proteins, olefinic alcohols, nitro anilines, saccharin, chloroform and many other organic compounds.
- A great diversity of chemical compounds, such as aldehydes and ketones are sweet.

Sweet Taste

The amino acids which are mildly sweet are alanine and glycine whereas serine is the sweetest.

Many substances which are synthetically produced organic compounds are also known to be sweet.

They are widely used as artificial sweeteners in the production of dietetic foods, confectionary items and soft drinks e.g. aspartame, cyclamates, acesulfame K etc.

Sweet Taste

- Sucrose is the prototypical example of a sweet substance, although fructose is somewhat sweeter.
- Threshold value of sucrose is 0.342%, of glucose is 1.442% and that of saccharin is 0.00047%.
- It is observed that as the molecular weight of saccharides increases there is a decrease in sweetness which can best be explained by the decrease in solubility and increase in size of the molecule.

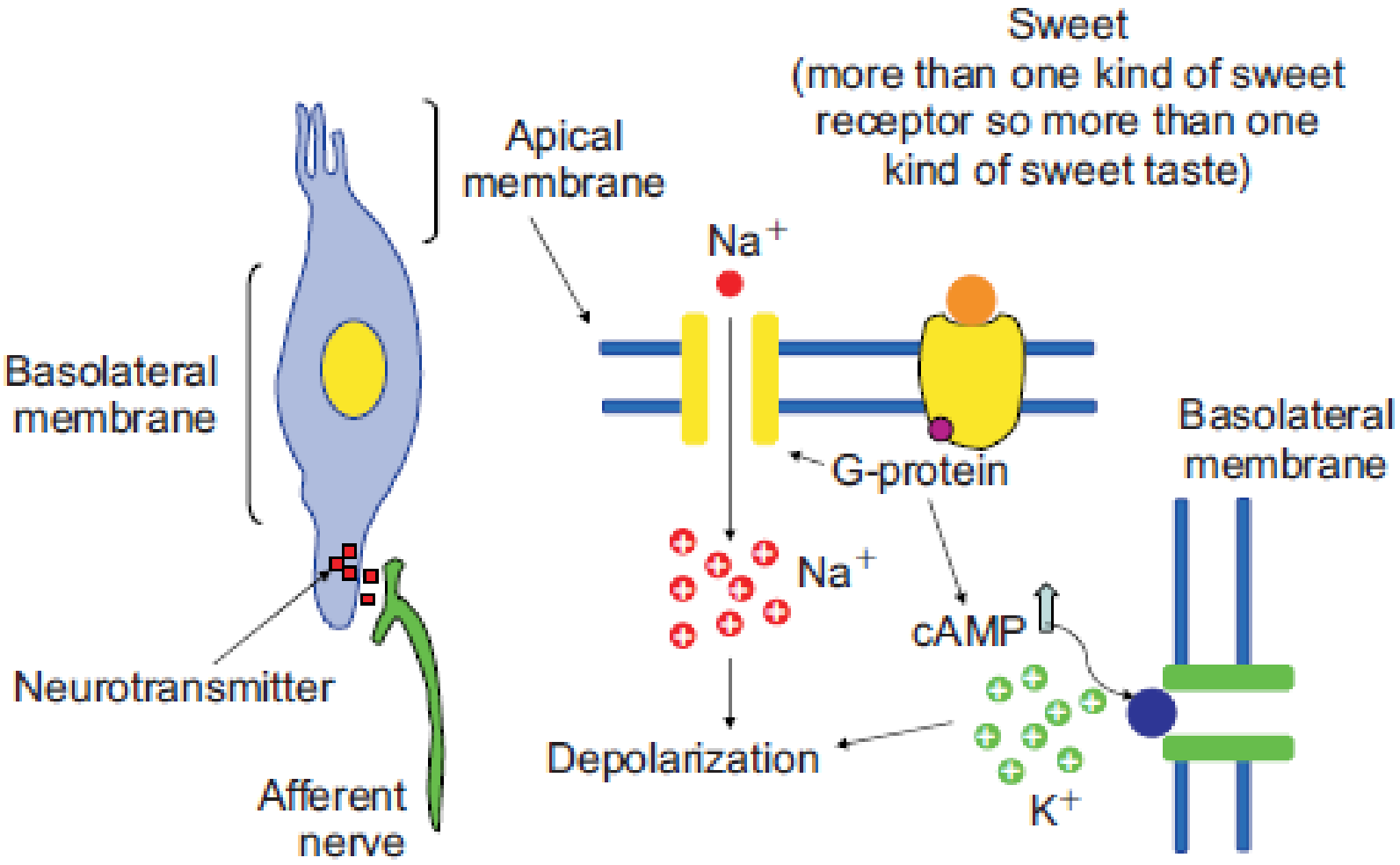


Fig. 6.7: Sweet taste perception.

Salty taste

Salty taste

- Classic salty taste is represented by sodium chloride, but the same response can be generated by certain ionic compounds such as lithium chloride, magnesium chloride, potassium chloride, ammonium chloride.
- Sodium and lithium are the only cations with a taste that is primarily salty.
- Potassium and calcium have some component of saltiness to their taste but they have other flavors, sometimes described as “metallic” or “bitter.”

TABLE 6.2: Examples of various salts with their different taste perceptions

Taste	Salts			
Salty	LiCl	LiBr	LiI	$NaNo_3$
	NaCl	NaBr	NaI	KNO_3
	KCl			
Salty & Bitter	KBr	NH_4I		
Bitter	CsCl	CsBr	KI	$MgSo_4$
Sweet	$Pb(CH_3COO)^*_2$		$Be(CH_3COO)^*_2$	

*Extremely toxic

Source: deMan 1999

Salty Taste

Saltiness is a property of some electrolytes as well as halides, chlorides, iodides, sulphates and nitrates which provide saltiness in decreasing order.

Chemically, it appears that cations cause salty taste whereas anions modify salty taste.

It is also claimed that the taste of salt (sodium chloride) by itself is unpleasant and the main purpose of the salt as a food component, is to act as a flavour enhancer.

It is the positive ions in salt i.e. sodium ions which triggers the perception of saltiness and the anions modify this salty taste.

Sodium chloride not only exhibits the salty taste but also enhances mouthfeel, sweetness, balance, and decreases off-notes.

Salty Taste

- Among the anions commonly found in foods, the chloride ion is the least inhibitory to the salty taste followed by citrate ions and the orthophosphate ions.
- Anions not only inhibits the salty taste but also contributes a taste of their own for e.g. in processed cheese in which citrate ions and orthophosphate ions are used as emulsifying agents, are deliberately used to suppress the saltiness of sodium ions.
- The threshold values of some of the salts are as follows: 0.175% for Sodium chloride, 0.106% for Lithium chloride, 0.247% for Sodium Bromide and 0.42% for Sodium Iodide.

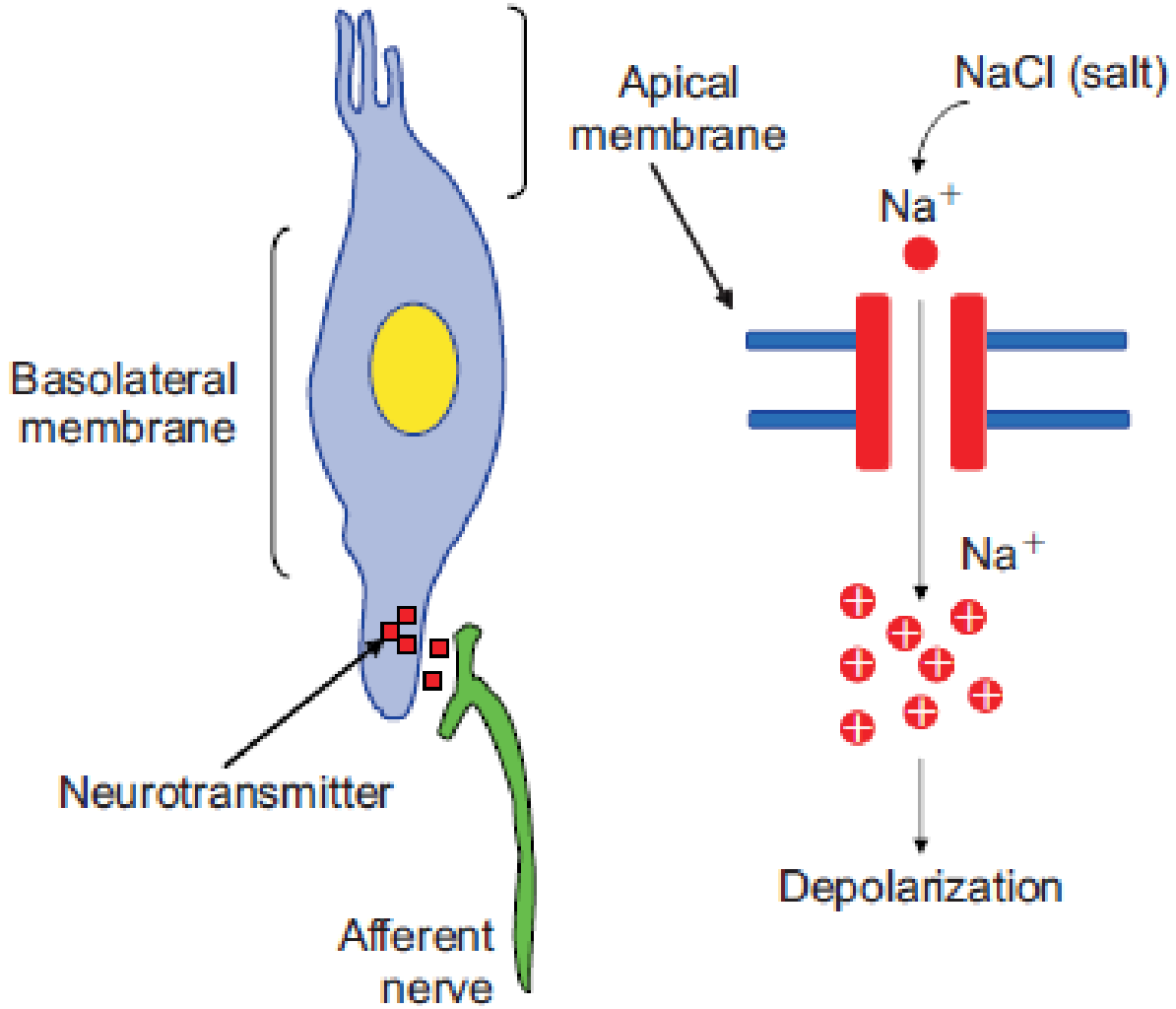


Fig. 6.8: Salty taste perception.

Sour Taste

Introduction

- Sour taste is elicited by a vast majority of organic aids such as acetic acid, tartaric acid, malic acid, citric acid and lactic acid.
- Phosphoric acid is the only inorganic acid used to impart tartness to a food.
- Not all acids are sour; amino acids are often sweet, and picric acid is very bitter.
- Citric acid which is abundantly found in citrus fruits is the most commonly used food additive to impart tartness as well as acidic taste to foods and beverages.
- Vinegar, another common food acid is 4% acetic acid solution.
- Wines and grapes get their tartness from tartaric acid.

Contd…

- When relative sourness of four organic acids and also their preference was determined, citric acid was judged the most sour, fumaric and tartaric about equal, and adipic least sour.
- The tastes of citric and tartaric acid are preferred over other acids when tested in aqueous solutions (Ough, 1963).
- Therefore, citrate monohydrate is taken as the standard for testing sour taste.

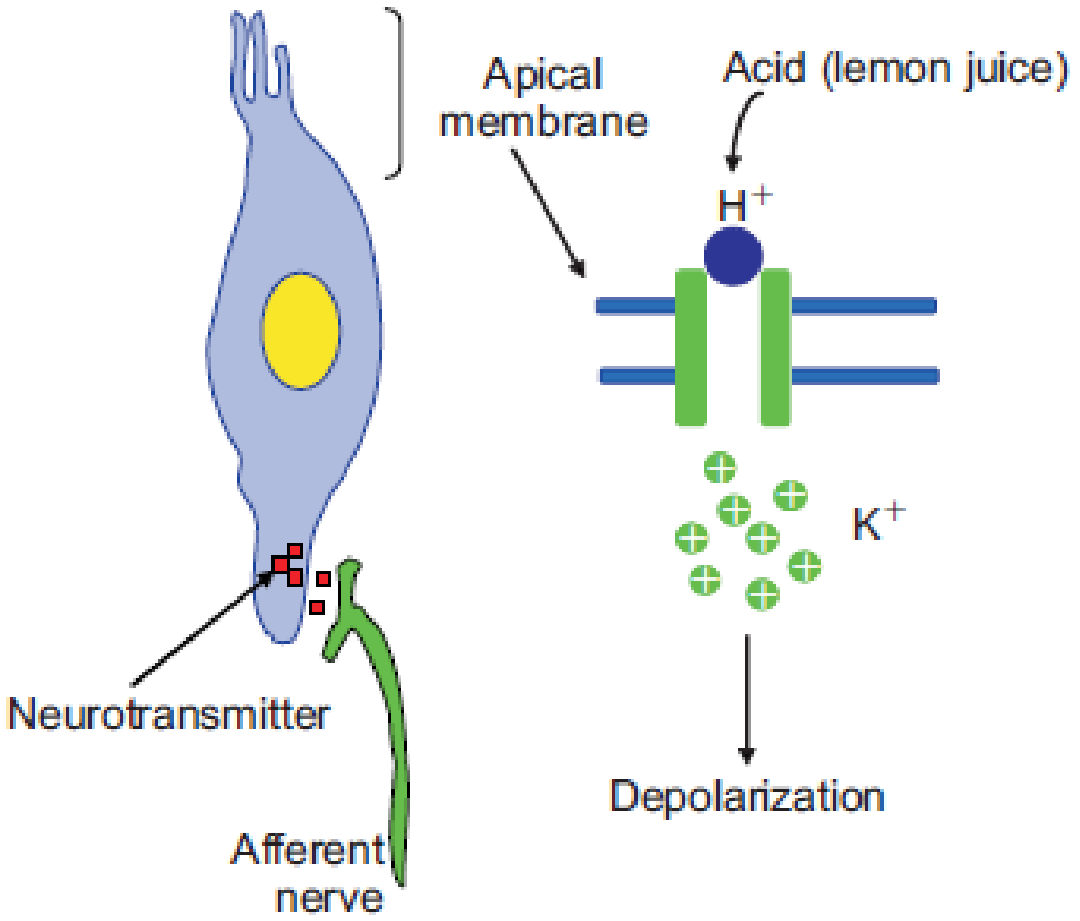


Fig. 6.9: Sour taste perception.

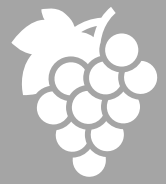
Bitter taste

Bitter taste

- Bitterness is an inherent property of many naturally occurring compounds such as glycosides which occur widely in nature as well as in grapefruit and citrus fruits.
- These glycosides when hydrolyzed yield a sugar moiety and a fraction known as aglycone, the reactive part of is a hydroxyl group .e.g. singirin, conferin, naringin, hesperidin.
- The glycosides which occur in citrus fruits especially in orange and grapefruit reduce their economic value.

Bitter taste

Three classes of organic compounds encountered in foods are particularly associated with bitterness i.e. the alkaloids, glycosides and peptides.



Alkaloids are nitrogenous bases that occur widely in nature, usually in the form of their salts with acetic or carboxylic acids e.g. caffeine, theobromine and quinine.

These are derivatives of purine.

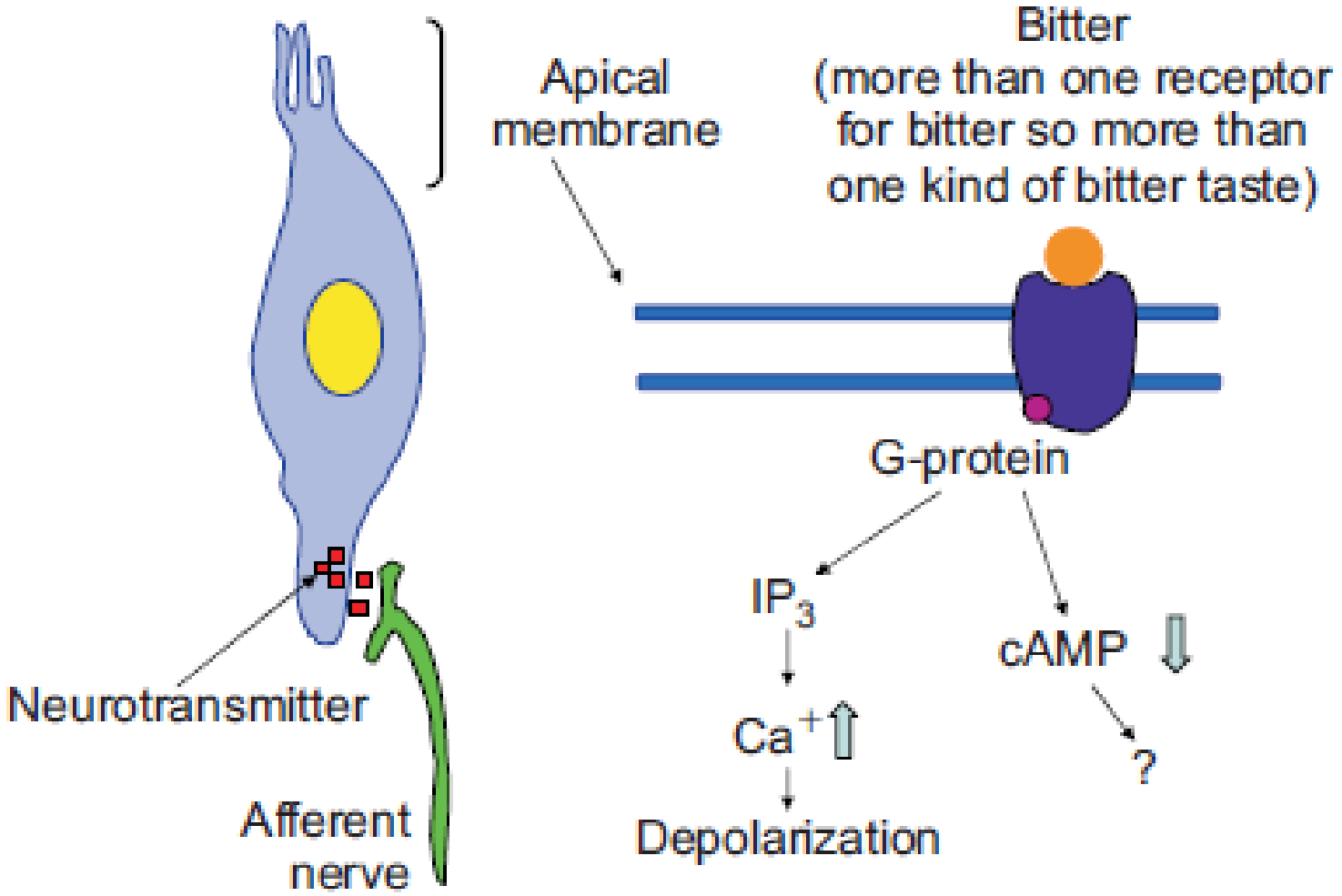


Fig. 6.10: Bitter taste perception.

Umami Taste

- This is now considered as the fifth basic taste.
- There is a basic taste response of amino acids especially glutamic acid and this taste is described as umami which is derived from the Japanese word meaning delicious or savoury.
- This characteristic taste is elucidated by glutamate such as MSG (mono sodium glutamate), di-sodium glutamate and di - sodium guanylate.
- These substances are purine based 5’ nucleotides. In some foods they enhance the perceived sweetness, saltiness or other flavor characteristics such as mouthfeel and thus improve overall palatability.
- These compounds occur in seaweed, black mushrooms wheat gluten, zein, peanut, soybean and yeast. Mono sodium glutamate imparts a ‘meaty’ or chicken like flavor. Glutamate taste is most effective in the pH range of 6-8 and decreases at lower pH values.
- The most commonly used substances in this category are monosodium L-glutamate (MSG), disodium 5-inosinate (IMP), and disodium 5-guanylate (GMP).


Thank you!