

TASTE MASKING TECHNOLOGIES: RECENT DEVELOPMENTS AND NOVEL APPROACHES

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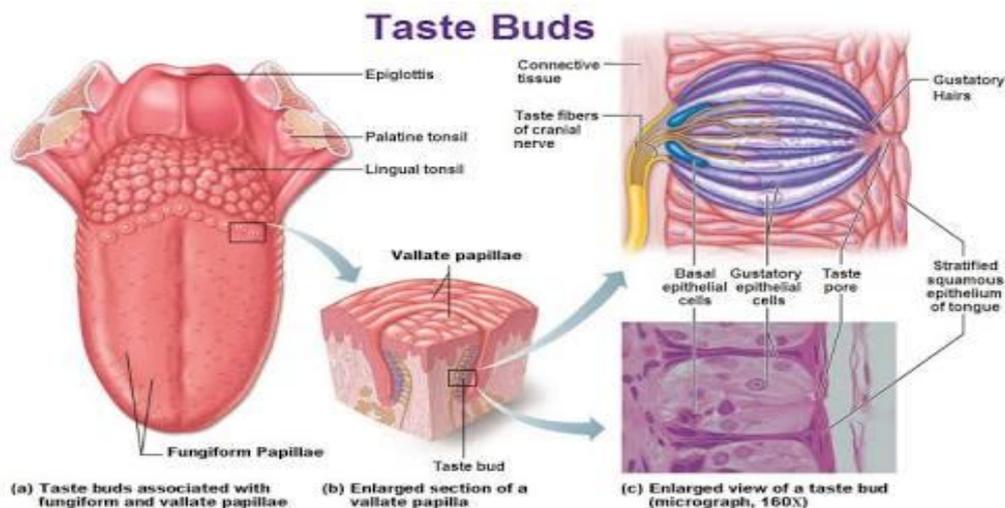
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INTRODUCTION

Taste, gustatory perception, or gustation is the sensation produced when a substance in the mouth reacts chemically with taste receptor cells located on taste buds in the oral cavity, mostly on the tongue. Taste, along with smell (olfaction) and trigeminal nerve stimulation (registering texture, pain, and temperature), determines flavors of food or other substances. Humans have taste receptors on taste buds (gustatory calyculi) and other areas including the upper surface of the tongue and the epiglottis. The gustatory cortex is responsible for the perception of taste. The tongue is covered with thousands of small bumps called papillae, which are visible to the naked eye. Within each papilla are hundreds of taste buds. The exception to this is the filiform papillae that do not contain taste buds. There are between 2000 and 5000 taste buds that are located on the back and front of the tongue. Others are located on the roof, sides and back of the mouth, and in the throat. Each taste bud contains 50 to 100 taste receptor cells. The sensation of taste includes five established basic tastes: sweetness, sourness, saltiness, bitterness, and savoriness. Scientific experiments have proven that these five tastes exist and are distinct from one another. Taste buds are able to distinguish between different tastes through detecting interaction with different molecules or ions. Sweet, savory, and bitter tastes are triggered by the binding of molecules to G protein-coupled receptors on the cell membranes of taste buds. Saltiness and sourness are perceived when alkali metal or hydrogen ions enter taste buds, respectively.



The Taste sensations are

- Sweet- usually indicates energy rich nutrients e.g. certain sugar, certain carbohydrates and alcohols
- Umami – the taste of amino acid (e.g. meat broth or aged cheese).
- Salty – allows modulating diet for electrolyte balance, such as chloride, sulphate, bromides
- Sour – typically the taste of acids and acid salts, it is due to the hydrogen ion concentration upon which the acidity depends
- Bitter – Caused by some organic compounds, such as alkaloids (strychnine and quinine), certain glucosides and bile salts.

TASTE MASKING

Taste masking techniques is defined as a perceived reduction of an undesirable and bitter taste that would otherwise exist. The ideal solution to taste masking of bitter substances is the discovery of an universal inhibitor of all bitter tasting substances that does not affect the other taste modalities such as sweetness. Oral administration of bitter or unpleasant tasting drugs is often the biggest barrier for patients group such as pediatric, geriatrics, and bed ridden. A survey of American association of pediatrician reports unpleasant taste as the biggest barrier in the treatment of pediatric population. The efficiency of taste masking is often a key determinant for the success of specialized dosage form like orally disintegrating tablets and films and chewable tablets. Proven methods for bitterness reduction and inhibition have resulted in improved palatability of oral pharmaceutical.

Taste masking techniques include mainly two aspects.

1. Selection of suitable taste masking agents such as polymers, sweeteners, flavors, amino acids.
2. Selection of suitable taste masking methods.

TECHNIQUES EMPLOYED FOR TASTE MASKING

The methods commonly employed for achieving effective taste masking include various physical and chemical methods that prevent the drug substance from interacting with the taste buds.

- ❖ **Taste abatement by flavoring:**- Pharmaceutical flavors are available as liquid (essential oils, fluid extracts, tinctures, distillates, etc). Solids (crystalline vanillin, freeze dried cinnamon powders, and dried lemon in fluid extract and pasted (soft extracts, resins and so called concentrated, which are brittle on outside and soft on the inside) to reduce the bitterness of drug. This approach has been used to produce taste masking medication floss of Aspirin.
- ❖ **Taste abatement by lipophilic vehicles:**- Lipids: oils, surfactants and polyalcohol effectively increase viscosity in mouth and coat taste buds. Acetaminophen, Gabapentin, Metronidazole are various drugs with disagreeable or bitter taste have been effectively taste masked by using this approach.
- ❖ **Lecithin like substance:**- The Kao Corporation in Japan, together with the faculty of pharmacy at Hokkaido University, has found that a homogenated suspension of phosphatidic acid and β -lactoglobulin from soybean and milk, respectively, completely suppresses bitter stimulants such as quinine, L-leucine and isoleucine, caffeine and papaverine hydrochloride.
- ❖ **Taste Abatement by Carbohydrates:**- Several drugs can be taste masked with starch or cellulose, containing a carboxy methyl group, examples include carboxy methyl cellulose (CMC), sodium CMC, cross-linked, sodium CMC, sodium CMC starch. Sparfloxacin is optically taste masked by preparing film-coated granules. Ibuprofen may also be formulated and coated with a solution of hydroxyethyl cellulose and hydroxypropyl methyl cellulose in water to obtain coated granules, which can be compressed into chewable tablets.
- ❖ **Taste Abatement by Protein, Gelatin and Prolamines:**- For mint-flavored pharmaceutical gums, incorporating a prolamine / cellulose ingredient can reduce the bitterness of

the flavor. A high – PH aqueous zinc solution, used to coated hydroxypropyl cellulose, is particularly effective in combating the bitterness of spearmint flavor macrolide anti biotics have been coated with a mixture of prolamine and plasticizers such as vegetable oil and waxes.

- ❖ **Solid Dispersion system**:-Solid Dispersion have been defined as dispersion of one or more active ingredients in an inert carrier or matrix at solid state prepared by melting (fusion) solvent or melting solvent method. also using them as absorbents various carriers may increase the stability of certain drugs.
- ❖ **Taste Abatement by Rheological Modification**:- Increasing the viscosity with rheological modifiers such as gums or carbohydrates can lower the diffusion of bitter substance from the saliva to taste buds. The present approaches are pseudoephedrine Hcl, Destromethorphan and ibuprofen.
- ❖ **Microencapsulation**:-Microencapsulation as a process has been defined by Bokan as a means of applying relatively thin coating to small particles of solid droplets of lipid and dispersion. This process can be used for masking of bitter tasting drugs microencapsulating drug parting with various coating agents like povidone, HPMC, ethyl cellulose.

❖ Prodrugs

A Prodrug is a chemically modified inner drug precursor, which upon biotransformation liberates the pharmacologically active drugs.

| Sr No. | Parent Drug | Prodrug with improved taste |
|--------|-----------------|-----------------------------|
| 1 | Chloramphenicol | Palmitate ester |
| 2 | Clindamycin | Palmitate ester |
| 3 | Triamcinolone | Diacetate ester |

❖ Polymers used for taste masking by coating

The polymers used for the purpose of taste masking are selected on basis that they should permit the rapid release of drug in the saliva, but allows its in the gastric cavity or the duodenal region where the drug is expected to be absorbed.

| <i>Drugs</i> | <i>Techniques</i> | <i>Polymer</i> |
|--|-------------------|--|
| Ranitidine (anti ulcer) | ENSA | PEG, Ethyl Cellulose |
| d-indobfin (inhibitor of platelet aggregation) | FBD | Eudragit E-100, RL/RS Ethyl Cellulose |
| Pseudo ephedrine (anti histamine) | ESE | Eudragit E |

- ❖ **Taste abatement by ion exchange resins:** Most of the bitter drugs have amine as a functional group, which is the cause of their obnoxious taste. Polystyrene matrix cation exchange resins (Indion CRP-244, Indion CRP-254) have been used to mask the bitter taste of chlorpheniramine maleate, ephedrin HCl, diphenhydramine HCl. Radebaugh and Galen were able to successfully mask the bitter taste of ranitidine and buflomedil by using Amberlite IPR-69. Ion exchange has successfully masked the taste of the following drugs like azithromycin by using various grades of Indion ion exchange resins.
- ❖ **Inclusion complex formation with cyclodextrin:** Bitter taste of ibuprofen and Gymnimasylvestre has been effectively masked by cyclodextrin.

EVALUATION OF TASTE MASKING

The different methods used for quantitative evaluation of taste masked products are as follows.

- panel tasting
- spectrophotometric taste sensor
- E-tongue
- Multichannel taste sensor
- Affective Testing
- Measurement of frug taste nerve responses

CONCLUSION

Diverse novel techniques mentioned herein can assist conquer the bitter and obnoxious flavour of API (Active pharmaceutical Ingredients) as well as in large part improve the product choice and patient compliance. It will also beautify the great of the treatment furnished to suffers. Also, numerous techniques will be combined to increase palatable and price powerful system.

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