https://doi.org/10.46344/JBINO.2022.v11i03(b).08

TO STUDY THE ROLE OF AYURVEDA ON MICROBIAL LOAD FOR IMPROVING THE TASTE

Dr.Vidya Dinkar Shete[1] & Dr.Shubhangi Dagadu Kamble[2]

Associate Professor, Dept of Shalakyatantra, Vasant Dada Patil Ayu.Med.College .Sangli

Assistant Professor, Dept of Shalakyatantra , Vasant Dada Patil Ayurvedic Medical College & Institute of Yoga, Sangli.

ABSTRACT

The term Ayurveda comprises two words – *ayu* (life) and *veda* (knowledge), thus, deals with various aspects related to health and wellbeing in their diverse aspects, such as happy life, sustainable happiness, and longevity (3). According to Ayurveda, there are three fundamental states of a being such as the physical (including physiological), mental, and the spiritual.In the present article we are discussing the role of ayurveda in improving taste.

Keywords: Ayurveda, Microbes, Taste

Introduction

Ayurveda is one of the oldest healthcare systems that evolved in the Indian Subcontinent. From the large number of literatures spanning over three millennia on diverse aspects of managing health and wellbeing, both in Sanskrit and regional languages of the subcontinent, it can be deduced that it has had a dynamic and unbroken knowledge tradition (1). Contemporary Ayurveda has been formalized and institutionalized on aspects such as education, clinical approaches, pharmacopeia, and product manufacturing starting from late nineteenth century. In the post independence period in India, it has been recognized and legitimized as one of the formal healthcare systems of the country (2).

The term Ayurveda comprises two words – *ayu* (life) and *veda* (knowledge), thus, deals with various aspects related to health and wellbeing in their diverse aspects, such as happy life, sustainable happiness, and longevity (3). According to Ayurveda, there are three fundamental states of a being such as the physical (including physiological), mental, and the spiritual. Health is a balance of all these three states and their relationship with the outside world (4). This relationship between the microcosm and the macrocosm is yet another fundamental tenet of Ayurveda. The "being" constantly interacts with the outside world through its senses (senses of knowledge and senses of action) and the cognitive functions. At the same time, the outside world is constantly influencing the being. Both the outside world and the being are understood on the ontological basis of the *pancamahabhuta* or the five element theory. The categorization in terms of the five elements, including earth, water, fire, air, and space corresponds to each of the five senses, *viz*. smell, taste, vision, touch, and sound, respectively (3). This is a fundamental precept of all knowledge traditions in the subcontinent. But in Ayurveda for ease of understanding of physiological and pathological aspects, the five elements are further grouped into three called the *tridosa–vata* (a combination of space and air), *pitta* (fire), and *kapha* (water and earth) Body and mental types, metabolic processes, biological rhythm, seasonal variations, various other physiological and pathological processes, etc. are understood in terms of innumerable permutations and combinations of these elements and the *tridosa* in the body. According to Ayurveda, this forms the basis of understanding of materials (*Dravya guna sastra*), such as food or medicine, therapeutic approaches, and dietary or lifestyle changes, to stay healthy (5). Food classifications based on their organoleptic properties and their impact on psychological constitution of an individual is yet another interesting precept of Ayurveda (6).

Ayurveda classifies meat taste as sweet, although modern science classifies it as umami (the Japanese word "umai" means "meaty"); therefore within ayurvedic framework umami should be considered as a peculiar sweet submodality. Interestingly, several scientific findings support the ayurvedic perspective: (1) there are important structural similarities between sweet (T1R2/T1R3) and umami (T1R1/T1R3) taste receptors, both heterodimers, having

one subunit in common; umami mixtures (glutamate and ribonucleotide) as tasting sweet; taste cells coexpress the sweet taste and umami taste receptor subunits (all three T1R subunits)

Ayurveda classifies also fats (e.g., clarified butter or ghee, marrow fat, and the majority of oils) as having sweet taste; therefore within ayurvedic framework the newly proposed "fatty taste" should be considered as another peculiar sweet submodality. Several studies showed that tastants eliciting fat taste, like free fatty acids (FFA), may be detected by specific GPCR (e.g., GPCR120) and a rather unusual gustatory detector, CD36 (i.e., cluster of differentiation 36), a multifunctional versatile ancestral protein, widely distributed in the body (microvascular endothelium, macrophages, dendritic cells, microglia, retina, erythroid precursors, platelets, liver, adipose tissue, heart, skeletal muscles, breast, kidney, and gut). These two lipid sensors are coexpressed, probably in type II taste bud cells, and cooperate in fat detection. CD36 displays a greater binding affinity for long chain fatty acids (LCFA) than GPCR120, having the primary role in fat detection, and its expression is downregulated during a meal, in contrast with GPCR120 expression, which is not changed during the meal. The signaling cascade induced by LCFA in taste bud cells showed several similarities with the signal transduction cascade specific for sweet, bitter, and umami taste: GPCR involvement, activation of phospholipase C, calcium signaling, and transient cell depolarization are caused by the opening of the Na+-permeable channel called transient receptor potential melastatin-5 (TRPM5).

"Fatty taste" perception via CD36-GCCRs pathway is not the single perception modality. It seems that dual, complementary mechanisms are involved in the detection of dietary fats: (1) a high-sensitivity specifically tuned mechanism (CD36-GCCRs pathway), located in the gustatory epithelium, is involved in the detection of low concentrations of LCFA present in food items or released from triglycerides by a lingual lipase, (2) a low sensitivity, broadly tuned mechanism, represented by the trigeminal pathway, is located in the nongustatory epithelium, involved in the detection of high concentrations of various types of FFA .

Astringency is not recognized as a distinct taste, its perception being possible with nontaste oral tissues, and increased with repetitive sampling (a characteristic typical for trigeminal sensation, not for taste sensation). The most widely accepted definition is that astringency is a long lasting sensorial experience of drying, puckering, or roughness on the tongue and oral cavity, produced by certain food and beverages, most of them rich in tannins, like unripe fruits, nut skin, cocoa, green tea, grape seeds, and red wine. Other compounds able to produce astringent sensation are metal salts (e.g., aluminum ammonium sulfate, aluminum potassium sulfate), acids (e.g., tartaric acid), and dehydrating agents . Scientists explained most often astringency as a trigeminal orosensation: astringent compounds are detected by trigeminal sensors and activate a G protein-coupled signaling pathway that involves

recruitment of adenylate cyclase, followed by the activation of cyclic nucleotide-gated channels, and does not involve transient receptor potential (TRP) channels [12]. The astringent signal amplification takes place by Cl− efflux through Ca2+-activated Cl− channels in the trigeminal neurons . A possible synergism between a chemosensory and mechanosensory activation of trigeminal sensors was suggested, but this is still under debate and requires validation . The precipitation of salivary proteins by food tannins, especially proline-rich proteins, followed by stimulation of oral mechanosensors [178], as contributing mechanism to the astringency perception, is more or less accepted by the scientists today [12].

Salty and sour are recognized as "mineral taste," both being evoked by elemental ions (salty taste by Na+ concentrations from 10 mM to 500 mM, while sour taste by acidic pH and also weak organic acids, able to permeate the membrane) [3].

Ayurvedic theories and practices on health, food, and nutrition are quite different from those of biomedicine and modern nutrition. Systematic exploration can provide new insights to health and nutritional sciences to provide contemporary solutions in healthcare, for instance, how one can modulate the diet and lifestyle to suit one's *prakriti*, age, and season. *Rasayana* in particular is an area worth exploring for new ways of rejuvenation and anti-aging. Healthcare costs are a major concern to the government exchequers of both developing and developed countries. Knowledge as to how to manage health at an individual level can help bring down sky rocketing healthcare costs through providing wellness. The Ayurvedic principles and practices can potentially become relevant for designing an integrated health care strategy. Concepts in Ayurveda, such as the *rasa* of a material being an indicator of its action on the body, are new to biomedicine and the modern nutritional sciences and can provide practical ways to create balanced diets. Ayurveda, also, states that bitter taste is anti-infectious *(krimighna)*, many of the medicinal plants traditionally used for the treatment of infections having bitter taste (e.g., neem or *Azadirachta indica*, bhumyamalaki or *Phyllanthus niruri*, katuki or *Picrorhiza kurroa*, etc.) [109]. A statistical analysis in a database containing 460 Indian medicinal plants mentioned in Ayurvedic Materia Medica showed us a significant association between bitter taste (tikta rasa) and traditionally assigned anti-infectious activity (*krimighna)* ($p < 0, 05$, OR = 1,13–2,7). Apart from bitter taste, only pungency, among the six *rasa,* was also found to be statistically associated with anti-infectious activity *(krimighna)* (see Pungency). Every food item consisting of certain proportions of different nutrients (e.g., proteins, lipids, carbohydrates, vitamins, and minerals) undergoes biochemical changes during digestion and metabolism. Similarly, Ayurveda claims that every food item has a unique composition of five elements or *pancha mahabhutas* (earth: *prithivi*, water: *apas*, fire: *tejas*, air: *vayu*, and ether: *akasha*). The nutrient may retain or not its elemental composition throughout the digestion and metabolism. The postdigestive elemental configuration is evaluated in Ayurveda through the concept

of *vipaka* (postdigestive effect). Therefore *vipaka* is "the taste after the substance is digested". Here, the term "taste" should be understood within the Ayurveda framework (as combination of two elements, e.g., sweet, *prithivi* and *apas*), not as sensorial property of the nutrient. Similarly with taste receptors, which have taste roles and extrataste roles, nutrients have sensorial taste properties *(rasa)* and extrasensorial taste properties *(vipaka)*. Some of the nutrients are chemically modified by the time they reach the extraoral taste receptors in the intestine (in ayurvedic language they come to have a different composition of *pancha mahabhutas* from the original nutrient). The resultant digestion products have a "latent taste" attribute, which does not induce a sensorial experience, but display a specific affinity for a certain type of extraoral taste receptors. For instance, dietary sucrose (having a sweet taste, or sweet *rasa*), is converted by intestinal sucrase into glucose and fructose, which have also a sweet "latent taste" (sweet *vipaka*) and therefore affinity for the sweet extraoral taste receptors.

Although these extraoral taste receptors do not mediate any taste sensation, they are still called "taste receptors." Similarly, although the products of digestion do not mediate any taste sensation, they are still characterized in terms of *rasa* (taste), and the molecular basis for this *rasa* characteristic might be their potential affinity for the extraoral taste receptors.

All nutrients show mainly three types of *vipaka*, which depends on their *rasa* (tastes)Since *vipaka* is expressed in taste modalities (sweet, sour, and pungent) at both digestive and postdigestive levels (sweet *vipaka* helps in elimination of stool and urine as the physiological functions of extraoral taste receptors and TRP channels will be revealed and more taste assessment studies on medicinal plants and phytochemicals will be performed.

REFERENCES

1. Roper S. D. TRPs in Taste and Chemesthesis. Handbook of Experimental Pharmacology. 2014;223:827–871. [PMC free article] [PubMed] [Google Scholar]

2. Lindemann B. Taste reception. Physiological Reviews. 1996;76(3):718–766. [PubMed] [Google Scholar]

3. Liman E. R., Zhang Y. V., Montell C. Peripheral coding of taste. Neuron. 2014;81(5):984–1000. doi: 10.1016/j.neuron.2014.02.022. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

4. Huang Y. A., Maruyama Y., Stimac R., Roper S. D. Presynaptic (Type III) cells in mouse taste buds sense sour (acid) taste. Journal of Physiology. 2008;586(12):2903–2912. doi: 10.1113/jphysiol.2008.151233. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

5. Bigiani A. Mouse taste cells with glialike membrane properties. Journal of

Neurophysiology. 2001;85(4):1552–1560. [PubMed] [Google Scholar]

6. Lewandowski B. C., Sukumaran S. K., Margolskee R. F., Bachmanov A. A. Amiloride-insensitive salt taste is mediated by two populations of type III taste cells with distinct transduction mechanisms. Journal of Neuroscience. 2016;36(6):1942–1953. doi: 10.1523/JNEUROSCI.2947-15.2016. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

7. Chandrashekar J., Kuhn C., Oka Y., et al. The cells and peripheral representation of sodium taste in mice. Nature. 2010;464(7286):297–301. doi: 10.1038/nature08783. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

8. Yoshida R., Horio N., Murata Y., Yasumatsu K., Shigemura N., Ninomiya Y. NaCl responsive taste cells in the mouse fungiform taste buds. Neuroscience. 2009;159(2):795–803. doi: 10.1016/j.neuroscience.2008.12.052. [PubMed] [CrossRef] [Google Scholar]

9. Roper S. D. The cell biology of vertebrate taste receptors. Annual Review of Neuroscience. 1989;12(1):329–353. doi: 10.1146/annurev.ne.12.030189.001553. [PubMed] [CrossRef] [Google Scholar]

10. Sullivan J. M., Borecki A. A., Oleskevich S. Stem and progenitor cell compartments within adult mouse taste buds. European Journal of Neuroscience. 2010;31(9):1549–1560. doi: 10.1111/j.1460-9568.2010.07184.x. [PubMed] [CrossRef] [Google Scholar]

11. Zhao G. Q., Zhang Y., Hoon M. A., et al. The receptors for mammalian sweet and umami taste. Cell. 2003;115(3):255–266. doi: 10.1016/s0092-8674(03)00844-4. [PubMed] [CrossRef] [Google Scholar]

12. Schobel N., Radtke D., Kyereme J., et al. Astringency is a trigeminal sensation that involves the activation of G protein-coupled signaling by phenolic compounds. Chemical Senses. 2014;39(6):471–487. doi: 10.1093/chemse/bju014. [PubMed] [CrossRef] [Google Scholar]

13. Huang A. L., Chen X., Hoon M. A., et al. The cells and logic for mammalian sour taste detection. Nature. 2006;442(7105):934–938. doi: 10.1038/nature05084. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

14. Li F. Taste perception: from the tongue to the testis. Molecular Human Reproduction. 2013;19(6):349–360. doi: 10.1093/molehr/gat009. [PubMed] [CrossRef] [Google Scholar]

15. Henquin J.-C. Do pancreatic β cells "taste" nutrients to secrete insulin? Science Signaling. 2012;5(239):p. pe36. doi: 10.1126/scisignal.2003325. [PubMed] [CrossRef] [Google Scholar]

16. Ren X., Zhou L., Terwilliger R., Newton S. S., de Araujo I. E. Sweet taste signaling functions as a hypothalamic glucose

sensor. Frontiers in Integrative Neuroscience. 2009;3, article 12 doi: 10.3389/neuro.07.012.2009. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

17. Raybould H. E. Does your gut taste? Sensory transduction in the gastrointestinal tract. News in Physiological Sciences. 1998;13(6):275–280. [PubMed] [Google Scholar]

18. Dehkordi O., Rose J. E., Fatemi M., et al. Neuronal expression of bitter taste receptors and downstream signaling molecules in the rat brainstem. Brain Research. 2012;1475:1–10. doi: 10.1016/j.brainres.2012.07.038. [PubMed] [CrossRef] [Google Scholar]

19. Yamamoto K., Ishimaru Y. Oral and extra-oral taste perception. Seminars in Cell and Developmental Biology. 2013;24(3):240–246. doi: 10.1016/j.semcdb.2012.08.005. [PubMed] [CrossRef] [Google Scholar]

20. Foster S. R., Porrello E. R., Purdue B., et al. Expression, regulation and putative nutrient-sensing function of taste gpcrs in the heart. PLoS ONE. 2013;8(5) doi: 10.1371/journal.pone.0064579.e64579 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

21. Masubuchi Y., Nakagawa Y., Ma J., et al. A novel regulatory function of sweet taste-sensing receptor in adipogenic differentiation of 3T3-L1 cells. PLoS ONE. 2013;8(1) doi: 10.1371/journal.pone.0054500.e54500 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

22. Hass N., Schwarzenbacher K., Breer H. T1R3 is expressed in brush cells and ghrelin-producing cells of murine stomach. Cell and Tissue Research. 2010;339(3):493–504. doi: 10.1007/s00441-009-0907-6. [PubMed] [CrossRef] [Google Scholar]

23. Rozengurt N., Wu S. V., Chen M. C., Huang C., Sternini C., Rozengurt E. Colocalization of the a-subunit of gustducin with PYY and GLP-1 in L cells of human colon. The American Journal of Physiology—Gastrointestinal and Liver Physiology. 2006;291(5):G792–G802. doi: 10.1152/ajpgi.00074.2006. [PubMed] [CrossRef] [Google Scholar]