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A REVIEW ARTICLE ON THE PHYSIOLOGICAL STUDY OF BODHAKA KAPHA W.S.R. SALIVA

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ABSTRACT

Ayurveda depicts the *Doshas* as three crucial standards working in external nature yet additionally entering our human instinct and in this way controlling every single physiological cycle. *Dosha*, *Dathu*, *Mala* together structures the premise of the body. The idea of *Tridosha* is a special idea of *Ayurveda*. *Vata*, *pitta*, and *Kapha* make the body. Everyone is significant with their own claim to fame. Lack of nonappearance of anyone *Dosha* can't fill the need of life as *Kapha*, *Pitta* and *Vata* are answerable for *Srushti* (Creation), *Sthiti* (Maintenance), and *Laya* (Destruction) of every one of the animals. *Kapha* is the *Dosha* that is liable for the making of the animals and it is the substance supporting the whole universe. The equilibrium of these elements addresses the sound state and awkwardness will cause different infections. In business, as usual, *Dosha* will carry out their own roles and individual *Dosha* will have their own particular site. *Kapha Dosha* is one of the useful units of the body. *Kapha* is practically partitioned into five kinds for example *Avalambaka*, *Kledaka*, *Bodhaka*, *Tarpaka*, *Sleshaka Kapha*, and so forth. *Bodhaka* is situated at the foundation of the tongue and throat; it helps in the view of taste as a result of the gustatory receptor being watery in nature. As per current science, the taste is a synthetic sensation. Spit by its dissolvable activity breaks up the strong food substances, so the disintegrated substances can invigorate the taste buds. The invigorated taste buds perceive the taste. Taste is impeded when the mouth is dry since substances must be tasted when in the arrangement. Taste is a synthetic sensation. By its dissolvable activity, spit disintegrates the strong food substances, so the broken-up substances can invigorate the taste buds. The invigorated taste buds perceive the taste.

KEYWORDS:-*Bodhaka, Kapha,* saliva, taste perception, Mucin.

INTRODUCTION

Sarira is a living body. The various constituents of the body are gathered into three standard classes, specifically *Dosha*, *Dhatu*, and *Mala*. *Ayurveda* considers no substance other than these three protected components of the living body.[3] *Vata-Pitta-Kapha Doshas, Rasa-Rakta-Mamsa-Meda-Asthi-Majja-Sukra Dhatus, and Purisha-Mutra-Sweda Malas* are like underlying foundations of a living body.[2] As roots are crucial for trees among different organs like stems, branches and so on this *Dosha-Dhatu-Mala* are fundamental for the human body. *Ayurveda* portrays the *Doshas* as three central standards working in external nature yet additionally entering our human instinct and in this manner managing all physiological processes. These three *Doshas* are comprised of five components: *Vata* contains air and space, *Pitta* involves fire and water, and *Kapha* water and earth. The Balance of these substances addresses the sound state and irregularity will cause different diseases. *Kapha Dosha* is one of the utilitarian units of the body. There are five kinds of *Kapha* to be specific *Bodhaka*, *Sleshaka*, *Tarpaka*, *Avalambaka*, *Kledaka*.*[5]*

The *Visesha Sthana* of *Bodhaka Kapha* is supposed to be *Jihwa*. The fundamental capability of *Bodhaka Kapha* is supposed to be *Rasabodhana* i.e perception of taste. *Bodhaka kapha* is one among the *Kapha* types, for the most part, liable for *Bodhana karma* of Rasa (Taste Perception) alongside parting of ingested food. *Ayurveda* has referenced six unique sorts of taste that are called Rasa. These *Rasas* are *Madhura*, *Amla*, *Lavan*, *Katu*, *Tikta* and *Kashaya*. *Bodhak Kapha* is situated at the foundation of the tongue and pharynx. It is answerable for the impression of taste as a result of the gustatory receptor being watery in nature.[1]

Kapha is the strong element of the body. This *Dosha* helps in the upkeep of underlying and practical respectability of the body. This is shaped by the prevalence of *Ap* and *Prithvi Mahabhuta*. The word *Kapha* is gotten from the Root words Ka (Water) + *Pha* (Flourishes). So it is the humor that is thrived or is created out of Water. It is having numerous equivalent words as per its characteristics and capabilities like *Sleshma*, *Bala*, *Balasa*, *Balasaka*, *Ojas*, and *Soma* in its predictability and *Mala* and *Papma* in its abnormally. *Bodhana* alludes to illuminating or instructing. So the *Kapha* liable for data of Rasa is called *Bodhaka Kapha*.*[4]*

Sthana* (Site) *and* Karma (function) of *bodhaka kapha

Bodhaka Kapha area is *Jihva moola* (the foundation of the tongue) and *Kanta* (the oropharynx). Taste depends on *Ap Mahabhuta, Kapha* which is likewise the result of *Ap Bhuta* situated in the throat can see the taste. *Rasanendreya* situated at tip of tongue is liable for detecting various preferences.[8]

Rasa is a property of *Jala Mahabhuta, Rasanendriya* is an organ that develops from *Jala* Mahabhuta. Accordingly, the tongue can detect the trait of Rasa on account of their comparative beginnings. Despite the fact that the capability of enthusiasm for taste is done by *Rasanendriya, Bodhaka Kapha* is fundamental for the appearance of Rasa on the tongue. So *Bodhaka Kapha* supports the impression of taste with the assistance of its *Jaleeya* attributes.[1,3]

	***Charaka samhita*[7]**	***Sushruta samhita*[1]**	***Astanga Hridaya*[5]**	***Astanga Samgraha*[9]**
Asaya	Situated on the tongue	Situated on the root of the tongue and throat	Situated on the tongue	Situated on the tongue
Region	Inside the oral cavity	Inside the oral cavity	Inside the oral cavity	Inside the oral cavity
Composition	Sowmya Guna	Sowmya Guna	Sowmya Guna	Sowmya Guna
Indriya	*Jihva*	*Jihva*	*Jihva*	*Jihva*
Karma	It helps in the perception of all types of taste.	Its moistening effect on the oral cavity and because of *soumyaguna* it helps in the perception of all types of taste through tongue.	It helps in the perception of all types of taste.	It helps in the proper perception of all types of taste.

***Rasa bodhana* - Perception of taste**

Dosha, Dhatu, Mala together structures the premise of the body. The equilibrium of these substances addresses the solid state and irregularity will cause different infections. There are five sorts of *Kapha* to be specific *Bodhaka, Sleshaka, Tarpaka, Avalambaka, Kledaka*. A subtype of *Kapha* which illuminates uncovers stirs, stimulates, or signifies the preferences present in various kinds of substances is called *Bodhaka Kapha*. The Boss capability of *Bodhaka Kapha* is *RasaBodhana* for example impression of taste.[2]

Taste is a compound sensation. Taste buds contain tactile receptors (chemoreceptor's) that are found in the papillae of the tongue and general sense of taste, pharynx, and epiglottis. They comprise of little tangible sensitive spots of the glossopharyngeal, facial, and vagus nerves. The tactile receptors are animated by synthetics that enter the pores disintegrated in spit. Taste is debilitated when the mouth is dry since substances must be tasted when in the arrangement. Nerve driving forces are created and led along the glossopharyngeal, facial, and vagus nerves prior to synapsing in the medulla and thalamus. Their objective is the taste region in the parietal curve of the cerebral cortex where taste is perceived. So, here spit is going about as a teacher for a view of taste. With this capability, we can connect *Bodhaka Kapha* with spit.[14]

***Bodhaka kapha* – Digestion**

At the point when food is taken into the mouth, it is saturated and disintegrated by spit. The mucin of the spit greases up the bolus and works with the gulping. Spit has three stomach-related compounds specifically, salivary amylase, maltase, and lingual lipase. It helps indigestion.[14] Thus, *Kapha* which is available in the oral hole or spit which does the *Kledana* (relaxing of the food) can correspond with *Bodhaka Kapha*.

Bodhaka kapha – Vyadhikshamatva

Because of the steady emission of spit, the mouth and teeth are flushed and kept free of food flotsam and jetsam shed epithelial cells and unfamiliar particles. Along these lines, spit forestalls bacterial development by eliminating materials, which might act as culture media for the microorganism's development. The protein lysozyme of spit kills a few microscopic organisms like staphylococcus, streptococcus, and bruella. The proline-rich proteins and lactoferrin present in spit have antimicrobial property. This is related to the *Vyadhikshamatva* property of *Bodhaka Kapha*. By this element, we can relate the *Bodhaka Kapha* with spit.[1]

Saliva

It is a watery opalescent, bland discharge, emitted by the three sets of salivary organs viz the parotid, sub-maxillary (additionally called sub-mandibular), and sublingual. Of absolute salivary emission, 70% is emitted by sub-mandibular, 25% is discharged by parotid, and 5% by sublingual organs. The parotid organ discharge is extremely wealthy in salivary amylase, a starch parting compound, but relatively poor in mucin, while the emission of sublingual and sub-maxillary, especially the sublingual organ is wealthy in mucin yet poor in the enzyme.[15]

Structure and Duct system of salivary glands

Salivary organs are shaped by acini or alveoli. Every acinus is shaped by a little gathering of cells that encompass a focal globular pit. The focal hole of every acinus is consistent with the lumen of the pipe. The fine conduit depleting every acinus is called an intercalated pipe. Many intercalated pipes join to frame intralobular conduit. Barely any intralobular conduits join to frame interlobular channels, which join to shape the primary pipe of the gland.[14]

Total amount

1200-1500 ml in 24 hours. A large proportion of this 24-hour volume is secreted at mealtime, when secretory rate is highest.[15]

Composition

- Water – 99.5%
- Solid – 0.5
- Organic substances
  - Enzymes - Amylase (Ptyalin), Maltase, Lingual lipase, Lysozyme, Phosphatase, Carbonic anhydrase, Kallikrein.
  - Other organic substances – Mucin, Albumin, Pro- line-rich protein, Lactoferrin, IgA, Blood group antigens, Free amino acids, Non-protein nitrogenous substances- urea, uric acid, creatinine, xanthine, hypoxanthine.
- Inorganic substances- Sodium, Calcium, Potassium, Bicarbonate, Bromide, Chloride, Fluoride, Phosphate.
- Gases – Oxygen, Carbon dioxide, Nitrogen etc.[16]

Function of saliva

1. Protects the lining of oral cavity by keeping it moistand diluting the irritant if any.
2. Helps in sensation of taste by dissolving and keeping the constituents in solution.
3. Lubricates the food, makes the food as bolus form and thus facilitates the act of mastication and swallowing.
4. It makes the taste bud to respond to sweet, salt, acidand bitter substance.
5. Keeps the mouth and teeth clean and free of food debris. In addition bacterial action of lysozyme in saliva guards the teeth etc. against infection.
6. Mucin present in the saliva protects the mouth by lubricating the mucous membrane of the mouth.
7. Proline rich protein, lactoferrin present in saliva possesses antimicrobial property[15].

Taste buds

Taste is a chemical sense. Taste buds are sense organs for taste or gustatory sensation. The stimulated taste buds recognize the taste.[15]

Situation of taste buds

Most of the taste buds are present on the papillae of tongue. Taste buds are also situated in the mucosa of epiglottis, palate, pharynx andthe proximal part of esophagus.[16]

Types of papillae

- Circumvallate papillae
- Fungiform papillae
- Filiform papillae[14]

Types of cells in taste buds

The cells (taste cells) within the taste buds are of 2 types: gustatory receptor cells and supporting or sustentacular cells. The taste cells are formed from the epithelial cells surrounding the taste bud and migrate towards the center as they mature and finally degenerate in about 10 days. It is presumed that all the cells in the taste bud are sensory but in different stages of development. However, only gustatory receptor cells make synaptic connection to sensory nerve fibers. Each gustatory receptor cells ends in 'micro-villi' at the top near the pore.[14]

Role of ions in taste perception

The mechanism by which most stimulating substances respond with the taste villi to initiate the receptor potential is by binding of the taste chemical to a protein receptor molecule that lies on the outer surface of the taste receptor cell nearby to or protruding through a villus membrane. This, in turn, opens ion channels, which agrees positively charged sodium ions or hydrogen ions to enter and depolarize the normal negativity of the cell. Then the taste chemical itself is gradually laved away from the taste villus by the saliva, which removes the stimulus. The type of receptor protein in each taste villus decides the type of taste that will be perceived. The rate of discharge of the nerve fibers from taste buds increases to a highest in a small fraction of a second but then adapts within the next few seconds back to a lower, steadily level as long as the taste stimulus remains. Thus, a strong instant signal is transmitted by the taste nerve, and a weaker continuous signal is transmitted as long as the taste bud is exposed to the taste stimulus.[15]

Threshold for taste

Threshold for taste depends on the physical and chemical composition of the food material. The taste perception of aqueous solution of a drug is quick as compared to the powdered form of the same drug in case of all *rasas i.e. Madhura, Amla, Lavana, Katu, Tikta and Kashaya Rasa*. The threshold for stimulation of the sour taste by hydrochloric acid averages 0.0009 N; for stimulation of the salty taste via sodium chloride, 0.01 M; for the sweet taste via sucrose, 0.01 M; and for the bitter taste by quinine, 0.000008 M. Note particularly how much more sensitive is the bitter taste sense than all the others, which would be expected, because this sensation provides an important protective function in the living being against many dangerous toxins in food.[16]

Pathway for taste

- **Receptors**

Receptors for taste sensation are the gustatory receptor cells of taste buds. Each taste bud is innervated by about 50 sensory nerve fibers and each nerve fiber supplies at least five taste budsthrough its terminals.

- **First order neuron**

First order neurons of taste pathway are in the nuclei of three different cranial nerves, situated in the medulla oblongata. Dendrites of the neurons are distributed to the taste buds. After arising from taste buds, the fibers reach the cranial nerve nuclei by running along the following nerves:-

1. Chorda tympani fibers of facial nerves, which runfrom anterior two third of tongue.
2. Glossopharyngeal nerve fibers, which run from posterior one third of the tongue.
3. Vagal fibers, which run from taste buds in other regions.

Axons from first order neurons in the nuclei of these nerves run together in medulla oblongata and terminatein the nucleus of tractus solitaries.

- **Second order neuron**

Second order neurons are in the nucleus of tractus solitaries. Axons of second order neurons run through medial lemniscus and terminate in postero-ventral nucleus of thalamus.

- **Third order neuron**

Third order neurons are in the postero-ventral nucleus of thalamus. Axons from third order neurons project into parietal lobe of the cerebral cortex.

- **Taste center**

Center for taste sensation is in opercular insular cortex, i.e. in the lower part of post- central gyrus, which receives cutaneous sensations from face. Thus, the taste fibers do not have an independent cortical projection.[14]

Taste transduction

Taste transducer is the process by which taste receptor converts chemical energy into action potentials in the taste nerves fibers. Receptors of taste sensation are chemoreceptors, which are stimulated by substances dissolved in mouth by saliva. The dissolved substances act on micro-villi of taste receptors exposed in the taste pore. It causes the development of receptor potential in the receptor cells. This in turn, is responsible for the generation of action potential in the sensory neurons.[15]

DISCUSSION

The balance of these entities represents the healthy state and imbalance will cause various diseases. In normalcy, *Dosha* will be performing their own functions and individual *Dosha* will be having their own specific site. By mentioning the various *Sthana* of the each *Dosha* the different function performed by individual *Dosha* in different sites has been emphasized. The sub-types of *Dosha,* its location and function have also been mentioned. Regarding the *Sthana* of various *Dosha* authors have different opinion. Later authors have added some more *Sthana* of *Dosha*. For example, ears among the location of *Vata*; umbilicus, eyes and skin among the location of *Pitta*; *Kloma*, nose, tongue among the location of *Kapha.*[6] There are five types of *Kapha* namely *Bodhaka, Sleshaka, Tarpaka, Avalambaka, Kledaka*. The *Visesha Sthana* of *Bodhaka Kapha* is said to be *Jihwa.* The main function of *Bodhaka Kapha* is said to be *Rasabodhana* i.e perception of taste. *Kapha* is also said as Bala & is responsible for *Vyadhikshamatva* i.e fighting against the pathogens.[12]

The *Kapha,* situated at the root of tongue and throat is known as *Bodhaka Kapha*. It has *Sowmya* properties. Taste is a chemical sensation. Saliva by its solvent action dissolves the solid food substances, so that the dissolved taste buds recognize the taste.[9]

Saliva is hypotonic to plasma. Taste is a chemical sensation. By its solvent action, saliva dissolves the solid food substances, so that the dissolved substances can stimulate the taste buds. The stimulated taste buds recognize the taste. This can be related to functions of *Bodhaka Kapha* i.e taste perception (*Rasabodhana*).

Due to the constant secretion of saliva, the mouth and teeth are rinsed and kept free off food debris; shed epithelial cells and foreign particles. In this way, saliva prevents bacterial growth by removing materials, which may serve as culture media for the bacterial growth. Enzyme lysozyme of saliva kills some bacteria such as *staphylococcus*, *streptococcus* and *brucella*. Proline rich proteins present in saliva posses antimicrobial property and neutralize the toxic substances such as tannins. Tannins are present in many food substances including fruits. This can be related to *Sthanika Vyadhikshamatva* property of *Bodhaka Kapha*.[11]

CONCLUSION

The *kapha dosha* is *pancha-bhoutika* in nature and has dominancy of *jala* and *prithvi mahabhoota*. Rasa is perceived by the tongue (*rasana*). The permutations and combinations of *mahabhutas* constitute to the diversity of taste. Hence technically speaking there is no matter in the universe which is of a single taste. The attributed taste of a foodstuff is because of inherent major taste. The *Bodhaka kapha* is located in the root of the tongue, tongue and throat, its moistening effect on the oral cavity. All types of the taste buds are located on whole surface of the tongue; additional taste buds are located on the palate, and a few are found on the tonsillar pillars, epiglottis, and even in the proximal esophagus. It is concerned with perception of taste. Perception of the taste of food is the primary function of *Bodhaka kapha*, the chief location of *prana vayu* is *murdha* (head) and another active site is *jihva* (tongue) also. *Prana vayu* carries taste sensation from tongue to the gustatory cortex. Thus, combined effect of both *Bodhaka kapha* and *Prana vayu* helps in the perception and transmission of taste signal into the central nervous system.

Bodhaka Kapha is located on tongue, aids in the appreciation of taste and splitting of food with the help of its moistening and lubricating nature. For the purpose of taste perception along with tongue (*Rasanendriya*), proper functioning of *Bodhaka Kapha* also very essential. In physiology of taste perception unless and until food substances are in solution form taste buds are not going to get stimulated, which is achieved by the Saliva in the mouth.

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