Advances in Bioresearch
Adv. Biores., Vol 12 (4) July 2021: 274-278

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.12.4.274278

Advances in Bioresearch

REVIEW ARTICLE

A Critical Review on *Bodhakakapha* of *Ayurveda* And Its affiliates in Modern Perspective

Mula Ram Suthar, Rakesh Roushan*
Department of Kriya Sharir, CBPACS, NEW DELHI, INDIA
*Email: rakesh.roushan45@gov.in

ABSTRACT
Ayurveda is one of the ancient and fruitful science for human beingness. Science of Ayurveda is based on tridosha theory. The aim of Ayurveda science is to maintain the health of the healthy and cure disease of diseased. The theory of Tridosha is unique to Ayurveda. The term dosha means the regulatory functional factors of the body. It is three doshas- Vata, Pitta, and Kapha are said to be liable for maintenance of homeostasis in the body; and health is nothing but a state of equilibrium of these tridosha. These Dosha also decide the psycho-physiological constitution of an individual. Doṣha are able of vitiating the different bodily tissues, when deviating from the state of equilibrium and can lead to diseases. Kapha dosha are heavy, dense, cold, soft, unctuous, sweet, immobile and slimy in their property. There are five subtypes of kapha, namely avalambaka, kledaka, bodhaka, tarpaka, kledaka, bodhakaand Sleshaka. The bodhaka kapha is mainly located in the root of the tongue and throat, because of soumyaguna it helps in the perception of taste through tongue. 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 gaustatory cortex. Thus, combined effect of both Bodhaka kapha and Prana vayuhelps in the perception and transmission of taste signal into the central nervous system. Very few works have been accomplished on conceptual features of kapha. In this article an attempt has been made to correlate the physiological functions of Bodhaka Kaphawith modern medical science. For this study, the essential materials have been collected from the Ayurvedic classics with the available commentaries, as well as Text books of contemporary modern medical science have been referred for better understanding of the concept and its comparison with modern medical science.
KEYWORDS : *Ayurveda, Bodhaka Kapha, Rasa-bodhana,saliva,gustatory cerebral cortex*

Received 06.04.2021 Revised 22.06.2021 Accepted 23.07.2021

How to cite this article:
Mula Ram Suthar, Rakesh Roushan. A Critical Review on *Bodhakakapha* of *Ayurveda* And Its affiliates in Modern Perspective. Adv. Biores. Vol 12 [4] July 2021. 274-278

INTRODUCTION

Ayurveda, an ancient Indian holistic science, is based on the *Tridosha* theory which forms the base for all *Ayurvedic* concepts. These three *doshas* function at various levels of the structure such as cellular level, single-system level, and organism level. In *Ayurveda* health is a state where the *dosha*, *agni*, *dhatu*, *mala*, all the physiological process are in homeostatic state and soul, sense organ and mind are in a state of total wellbeing [1]. *Ayurveda* is a science based on functional understanding. The concept of *tridosha*is basically a theory and any single substance or structure cannot represent a *dosha* at all times. *Acharya Charaka* has quoted the general site of *kapha* is Chest, head, neck, joints, stomach and fatty tissue, with chest the most important of them. Properties of *kapha dosha* are heavy and dense, cold, soft, unctuous, sweet, immobile and slimy, and can be subsided by drugs and food articles possessing opposite properties [2]. The normal physiological functions of *kapha* in homeostatic condition, it increases unctuousness property in the body, helps in binding structures together, provides firmness/stability in bodily structures, maintenance of bulk of the body, maintenance of sexual vigour, the strength of body, and high class of mental faculties like intelligence.

The *Bodhakakapha* is located in the root of the tongue and throat, by its moistening effect on the oral cavity, helps in the perception of taste. The Perception and discrimination of taste of food takes place only

when the food is mixed with saliva. The taste buds are meant for the perception of taste. They are situated in the mucosa of tongue, epiglottis and pharynx, additional taste buds are located on the palate, and a few are found on the tonsillar pillars, on the epiglottis, and in the proximal esophagus.
Ayurveda is the science that evidences its concept based on functional understanding. There is no specific correlation of *Bodhaka kapha* with contemporary modern physiology is mentioned in any ancient literature. It seems to be a problem found among the student, particularly the first year of Bachelor of *Ayurvedic* Medicine and Surgery to understand the concept of *Bodhaka kapha*. Increased demand for *Ayurveda* science in the present society is required to understand the depth of the *Ayurvedic* Principle in an easy way. Hence an effort has been made to ascertain and establish the correlation between the physiological function of *Bodhakakapha* with concerning modern physiological perspective.

Site and Function of *BodhakaKapha* Explained in Different *Ayurvedic* texts:

	Charaka Samhita [3]	Sushruta Samhita [4]	Astanga Hridaya [5]	Astanga Samgraha [6]
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
Indriya	*Jihva*	*Jihva*	*Jihva*	*Jihva*
Karma (Function)	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.

FUNCTION OF *BODHAKAKAPHA*
Rasa-Bodhana Karma-As soon as the four types of food withsix tastes are consumed, after that food is taken to the mouth it is mastication process by teeth and thoroughly mixed with saliva. These four types of food become humid and crumbly and easily digestible due to the properties of water; liquefaction comes from *bodhaka* and *Kledaka kapha* etc.
The watery portion of saliva mixed with food particles which helps in lubrication, swallowing, while *Bodhaka kapha* present on the tongue is concerned with perception of taste. *Ayurveda* describes six types of primary taste sensation *Madhur, Amla, Lavan,katu, Tikta*, and *Kasaya.* In contemporary physiology, only five primary taste sensations are described- sour, salty, sweet, bitter and umani. When food mixed with salivary secretions the ions of the food particles are released and it binds with its specific receptors. These tastes are sensed through at least 13 chemicals receptors found in taste cells of tongue. Taste also depends on the physical and chemical properties of the food. Sour taste is proportional to the acidity of the substance and salty taste depends upon the sodium ion concentration, sweet and bitter taste depends heavily on the organic nature of the substances.
In *Ayurveda* there is a concept about *rasa* (primary taste) and *anurasa* (subsidiary taste). *Rasa* is that which is perceived at first in dry form of the substance. The *rasa* perceived afterwards and drug in wet form is known as *anurasa* (subsidiary taste). This is seen when *Embellica Officinalis*is eaten. After-taste (*anurasa*) also depends upon the nature of alkaloid it contains. These taste buds perceive the taste of all substance after dissolving in the saliva. Taste is chiefly a function of the taste buds in the mouth, but it is usually experience that one's sense of smell also contributes strongly to taste perception [6].
Taste bud and its function- The taste bud is composed of almost 50 modified epithelial cells, some of which are supporting cells known as sustentacular cells and others of which are taste cells. The taste cells are constantly being replaced by mitotic division of surrounding epithelial cells, so that some taste cells are young cells. Others are mature cells that lie toward the center of the bud; these shortly break up and dissolve. The outer tips of the taste cells are arranged about a minute taste pore. From the tip of apiece taste cell, several microvilli, or taste hairs, protrude outward into the taste pore to approach the cavity of the mouth. These microvilli provide the receptor surface for taste. Interwoven around the bodies of the taste cells is a branching terminal network of taste nerve fibers that are stimulated by the taste receptor cells. Some of these fibers invaginate into folds of the taste cell membranes. Many vesicles form below the cell membrane near the fibers. It is believed that these vesicles contain a neurotransmitter substance that is released through the cell membrane to excite the nerve fibre endings in response to taste stimulation.
The texture of food, as find by tactual sense of the mouth, and the presence of substances in the food that stimulate pain endings, such as pepper, greatly alter the taste experience. The importance of taste lies in

the fact that it allows a person to select food in accord with desire and often in accord with the body tissues metabolic need for specific substance.

Location of the Taste buds- The taste buds are originating on three types of papillae of the tongue, as follows;

(1) The circumvallate papillae, which form a V line on the surface of the posterior tongue.
(2) The fungiform papillae over the flat anterior surface of the tongue.
(3) The foliate papillae located in the folds along the lateral surfaces of the tongue. Additional taste buds are positioned on the palate, and a few are found on the tonsillar pillars, on the epiglottis, and even in the proximal esophagus. Adults have 3000 to 10,000 taste buds, and children have a few extra. Above the age of 45 years, many taste buds degenerate, causing the taste sensation to become progressively less critical in old age.

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 [8].

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*[i].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.

Transmission of Taste Signals into the Central Nervous System-

Acharaya Sarangdhara has described *Pitta*, *kapha*, all *dhatus* and all *mala* are inactive in nature like lame entities. It is because of the activities of *vata* that they get carried away just like the clouds being carried away by the wind.*Bodhaka kapha* is present in the tongue and throat initiates the process of taste perception by stimulating several kinds of receptors like sodium receptor, potassium receptor, chloride receptor, adenosine receptor, inosine receptor, sweet receptor, bitter receptor, glutamate receptor and hydrogen receptor. A person can perceive hundreds of different tastes. They are entirely thought to be combinations of the elementary taste sensations, just as all the colors we can see are combinations of the three primary colors.

The neuronal pathways for transmission of taste signals from the taste buds of tongue and pharyngeal region into the central nervous system. Taste sensations from the anterior two thirds of the tongue pass first into the lingual nerve, then through the chorda tympani into the facial nerve, and Taste sensations from the circumvallate papillae on the back of the tongue and from other posterior regions of the mouth and throat are transmitted through the glossopharyngeal nerve and Taste sensations from the base of the tongue and other parts of the pharyngeal region are transmitted through the vagus nerve and through tractus solitarius in the brainstem. These nuclei transmit second-order neurons to a small area of the ventral posteriormedial nucleus of the thalamus, located slightly medial to the thalamic terminations of the facial regions of the dorsal column–medial lemniscal system. From the thalamus, third-order neurons are transmitted to the lower tip of the postcentral gyrus in the parietal cerebral cortex, where it curls deep into the sylvian fissure, and into the adjacent gustatory cortex (anterior insular-frontal operculum area). This lies slightly lateral, ventral, and rostral to the area for tongue tactile signals in cerebral somatic area I. From this description of the taste pathways, it is apparent that they closely parallel the somato-sensory pathways from the tongue [7].

DISCUSSION

1. Essentially*Vata, Pitta, Kapha* constitute three regulatory systems i.e. nervous, endocrine and immune system respectively of entirely living systems.

2. These taste buds perceive the taste of all substance after dissolving in the saliva, perception of taste is mainly a function of the taste buds in the mouth. In the above context the seat of *Bodhakakapha* has been told as the tongue, root of the tongue and throat so, it can be taken as all types of taste buds. The taste buds are presents on anterior, posterior and lateral surface of the tongue, additional taste buds are located on the palate, and a few are found on the tonsillar pillars, on the epiglottis, and in the proximal esophagus.
3. *Ayurveda* describes six types of primary taste sensation *Madhur, Amla, Lavan, katu, Tikta*, and *Kasaya.* In contemporary physiology, only five primary taste sensations are described- sour, salty, sweet, bitter and umani. These tastes are sensed through at least 13 chemicals receptors found in taste cells of tongue.
4. Food materials are consumed; food substances are dissolve in saliva and ions of food substance are release and freely active. Themost stimulating ions elements are reacting with the taste villi to initiate the receptor potential is by binding of the taste chemical to a protein receptor molecule. The receptor proteins open special ion channels in the apical membranes of the taste cells, thereby actuating the receptors. Saliva not only acts as a solvent for chemical stimuli in food, but also transports their stimuli to the taste stimuli to the receptors.
5. These receptors are generating the action potential of taste signals; the transmission of taste signals from the taste buds of tongue and pharyngeal region through the chorda tympani into the facial nerve, glossopharyngeal nerve andvagus nerve and through tractus solitarius in the brainstem.The taste signals are finally reached gustatory cortex (anterior insular-frontal operculum area).
6. Taste Reflexes Integrated in the Brain Stem-From the tractus solitarius, several taste signals are transmitted within the brain stem itself immediately into the superior and inferior salivatory nuclei, and these areas transmit signals to the submandibular, sublingual, and parotid glands to help control the secretion of saliva during the ingestion and digestion of food. For instance, when a person smells or eats favorite food, salivation is greater than when food that is disliked is smelled or eaten.
7. Overall *PranaVata* can be compared to the CNS anatomically and physiologically as its main seat is *Murdha* and controls all the physiological functions by generating motor impulses after the integration of the sensory impulses from all over the body [8].
8. The ions channels, chemical taste, protein receptors, receptor potential for taste, taste nerve fibers, salivary secretion, gustatory cortex area (anterior insular-frontal operculum area)are executing the functions of *Bodhaka kapha*.
9. *Tarpaka Kapha* located in the brain and provides nourishment to all senses. The functions of *Tarpaka Kapha*can be compared to the functions of cerebrospinal fluid which is responsible for the nourishment of visual cortex, auditory cortex, olfactory area, gustatory cortex area centres of the brain which control and nourishing the sense organs (eye, ear, nose, tongue) which is responsible for the nourishment of receptors in respective sense organ.

CONCLUSION

The *kaphadosha* is *panchabhoutika* in nature and has dominancy of *jala* and *prithvimahabhoota*.*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 *Bodhakakapha* 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.

The functions of *Bodhakakapha* can be compared to the functions of salivary secretions in the oral cavity which causes moistening of food, different ions released from the food materials when moistened, ions channels, different chemicals present in food materials. The functions of *Prana vayu* can be compared with the protein receptors, receptor potential for taste, taste nerve fibers, the facial nerve, glossopharyngeal nerve and vagus nerve, gustatory cortex area (anterior insular-frontal operculum area). The combined effect of all these entities are responsible for the functions of taste perception. There is a need of further research to evaluate in detail all other type of kapha dosha for the betterment of mankind.

REFERANCES

1. Moharana P & Roushan R. (2019). A critical review of Vyana Vayu in modern Physiological Perspective. International journal of basic and applied research. 8(7):75-82.
2. Suthar, Mula & Roushan, Rakesh. (2020). A Critical Review of Kledaka Kapha of Ayurveda In the Modern Physiological Perspective. 10(7):1-3.DOI: https://www.doi.org./10.36106/ijar
3. Chakrapani (2016).Grahanidosha chikitsitam adhyaya. (Eds.Diwedi L.D.) Ayurveda deepika on Charaka Samhita. Chaukambha Krishnadas Academy, Varanasi, India.p.376-421
4. Shastri A.D. Eds. (2014), Vranaprashna adhyaya, Ayurveda Tatwa Sandipika Hindi Commentary, Susruta Samhita,Chaukhamba Sanskrit SansthanVaranasi (India).p.112-122
5. Tripathy B.N. Eds.(2009).DoshabhediyaAdhyaya, Astanga Hridaya.Chaukambha Sanskrit Pratisthan, Varanasi, India,p.170-184
6. Gupta A.D. Eds. (2016).Doshabhediya Adhyaya, Astanga Sangraha, Chaukambha Krishnadas Academy, Varanasi, India,p.159-166
7. *Toshniwal M.B. et.al.,*(2014).Experimental Study of Bodhaka Kapha with Special Reference to Taste Perception, *Int*. J. Ayu.Alt. Med.,2(3):43-47.
8. Hall. E, Guyton. C. (2018).Taste and Smell, Special Sense- Central Nervous System (Eds. Anura Kurpad) Guyton & Hall Textbook of medical physiology,ElsevierRelx India Pvt. Ltd, New Delhi, India, p.743-747

Advances in Bioresearch
Adv. Biores., Vol 12 (4) July 2021: 274-278

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.12.4.274278

Advances in Bioresearch

REVIEW ARTICLE

A Critical Review on *Bodhakakapha* of *Ayurveda* And Its affiliates in Modern Perspective

Mula Ram Suthar, Rakesh Roushan*
Department of Kriya Sharir, CBPACS, NEW DELHI, INDIA
*Email: rakesh.roushan45@gov.in

ABSTRACT
Ayurveda is one of the ancient and fruitful science for human beingness. Science of Ayurveda is based on tridosha theory. The aim of Ayurveda science is to maintain the health of the healthy and cure disease of diseased. The theory of Tridosha is unique to Ayurveda. The term dosha means the regulatory functional factors of the body. It is three doshas- Vata, Pitta, and Kapha are said to be liable for maintenance of homeostasis in the body; and health is nothing but a state of equilibrium of these tridosha. These Dosha also decide the psycho-physiological constitution of an individual. Doṣha are able of vitiating the different bodily tissues, when deviating from the state of equilibrium and can lead to diseases. Kapha dosha are heavy, dense, cold, soft, unctuous, sweet, immobile and slimy in their property. There are five subtypes of kapha, namely avalambaka, kledaka, bodhaka, tarpaka, kledaka, bodhakaand Sleshaka. The bodhaka kapha is mainly located in the root of the tongue and throat, because of soumyaguna it helps in the perception of taste through tongue. 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 gaustatory cortex. Thus, combined effect of both Bodhaka kapha and Prana vayuhelps in the perception and transmission of taste signal into the central nervous system. Very few works have been accomplished on conceptual features of kapha. In this article an attempt has been made to correlate the physiological functions of Bodhaka Kaphawith modern medical science. For this study, the essential materials have been collected from the Ayurvedic classics with the available commentaries, as well as Text books of contemporary modern medical science have been referred for better understanding of the concept and its comparison with modern medical science.
KEYWORDS : *Ayurveda, Bodhaka Kapha, Rasa-bodhana,saliva,gustatory cerebral cortex*

Received 06.04.2021 Revised 22.06.2021 Accepted 23.07.2021

How to cite this article:
Mula Ram Suthar, Rakesh Roushan. A Critical Review on *Bodhakakapha* of *Ayurveda* And Its affiliates in Modern Perspective. Adv. Biores. Vol 12 [4] July 2021. 274-278

INTRODUCTION

Ayurveda, an ancient Indian holistic science, is based on the *Tridosha* theory which forms the base for all *Ayurvedic* concepts. These three *doshas* function at various levels of the structure such as cellular level, single-system level, and organism level. In *Ayurveda* health is a state where the *dosha*, *agni*, *dhatu*, *mala*, all the physiological process are in homeostatic state and soul, sense organ and mind are in a state of total wellbeing [1]. *Ayurveda* is a science based on functional understanding. The concept of *tridosha*is basically a theory and any single substance or structure cannot represent a *dosha* at all times. *Acharya Charaka* has quoted the general site of *kapha* is Chest, head, neck, joints, stomach and fatty tissue, with chest the most important of them. Properties of *kapha dosha* are heavy and dense, cold, soft, unctuous, sweet, immobile and slimy, and can be subsided by drugs and food articles possessing opposite properties [2]. The normal physiological functions of *kapha* in homeostatic condition, it increases unctuousness property in the body, helps in binding structures together, provides firmness/stability in bodily structures, maintenance of bulk of the body, maintenance of sexual vigour, the strength of body, and high class of mental faculties like intelligence.

The *Bodhakakapha* is located in the root of the tongue and throat, by its moistening effect on the oral cavity, helps in the perception of taste. The Perception and discrimination of taste of food takes place only

when the food is mixed with saliva. The taste buds are meant for the perception of taste. They are situated in the mucosa of tongue, epiglottis and pharynx, additional taste buds are located on the palate, and a few are found on the tonsillar pillars, on the epiglottis, and in the proximal esophagus.
Ayurveda is the science that evidences its concept based on functional understanding. There is no specific correlation of *Bodhaka kapha* with contemporary modern physiology is mentioned in any ancient literature. It seems to be a problem found among the student, particularly the first year of Bachelor of *Ayurvedic* Medicine and Surgery to understand the concept of *Bodhaka kapha*. Increased demand for *Ayurveda* science in the present society is required to understand the depth of the *Ayurvedic* Principle in an easy way. Hence an effort has been made to ascertain and establish the correlation between the physiological function of *Bodhakakapha* with concerning modern physiological perspective.

Site and Function of *BodhakaKapha* Explained in Different *Ayurvedic* texts:

	Charaka Samhita [3]	Sushruta Samhita [4]	Astanga Hridaya [5]	Astanga Samgraha [6]
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
Indriya	*Jihva*	*Jihva*	*Jihva*	*Jihva*
Karma (Function)	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.

FUNCTION OF *BODHAKAKAPHA*
Rasa-Bodhana Karma-As soon as the four types of food withsix tastes are consumed, after that food is taken to the mouth it is mastication process by teeth and thoroughly mixed with saliva. These four types of food become humid and crumbly and easily digestible due to the properties of water; liquefaction comes from *bodhaka* and *Kledaka kapha* etc.
The watery portion of saliva mixed with food particles which helps in lubrication, swallowing, while *Bodhaka kapha* present on the tongue is concerned with perception of taste. *Ayurveda* describes six types of primary taste sensation *Madhur, Amla, Lavan,katu, Tikta*, and *Kasaya.* In contemporary physiology, only five primary taste sensations are described- sour, salty, sweet, bitter and umani. When food mixed with salivary secretions the ions of the food particles are released and it binds with its specific receptors. These tastes are sensed through at least 13 chemicals receptors found in taste cells of tongue. Taste also depends on the physical and chemical properties of the food. Sour taste is proportional to the acidity of the substance and salty taste depends upon the sodium ion concentration, sweet and bitter taste depends heavily on the organic nature of the substances.
In *Ayurveda* there is a concept about *rasa* (primary taste) and *anurasa* (subsidiary taste). *Rasa* is that which is perceived at first in dry form of the substance. The *rasa* perceived afterwards and drug in wet form is known as *anurasa* (subsidiary taste). This is seen when *Embellica Officinalis*is eaten. After-taste (*anurasa*) also depends upon the nature of alkaloid it contains. These taste buds perceive the taste of all substance after dissolving in the saliva. Taste is chiefly a function of the taste buds in the mouth, but it is usually experience that one's sense of smell also contributes strongly to taste perception [6].
Taste bud and its function- The taste bud is composed of almost 50 modified epithelial cells, some of which are supporting cells known as sustentacular cells and others of which are taste cells. The taste cells are constantly being replaced by mitotic division of surrounding epithelial cells, so that some taste cells are young cells. Others are mature cells that lie toward the center of the bud; these shortly break up and dissolve. The outer tips of the taste cells are arranged about a minute taste pore. From the tip of apiece taste cell, several microvilli, or taste hairs, protrude outward into the taste pore to approach the cavity of the mouth. These microvilli provide the receptor surface for taste. Interwoven around the bodies of the taste cells is a branching terminal network of taste nerve fibers that are stimulated by the taste receptor cells. Some of these fibers invaginate into folds of the taste cell membranes. Many vesicles form below the cell membrane near the fibers. It is believed that these vesicles contain a neurotransmitter substance that is released through the cell membrane to excite the nerve fibre endings in response to taste stimulation.
The texture of food, as find by tactual sense of the mouth, and the presence of substances in the food that stimulate pain endings, such as pepper, greatly alter the taste experience. The importance of taste lies in

the fact that it allows a person to select food in accord with desire and often in accord with the body tissues metabolic need for specific substance.

Location of the Taste buds- The taste buds are originating on three types of papillae of the tongue, as follows;

(1) The circumvallate papillae, which form a V line on the surface of the posterior tongue.
(2) The fungiform papillae over the flat anterior surface of the tongue.
(3) The foliate papillae located in the folds along the lateral surfaces of the tongue. Additional taste buds are positioned on the palate, and a few are found on the tonsillar pillars, on the epiglottis, and even in the proximal esophagus. Adults have 3000 to 10,000 taste buds, and children have a few extra. Above the age of 45 years, many taste buds degenerate, causing the taste sensation to become progressively less critical in old age.

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 [8].

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*[i].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.

Transmission of Taste Signals into the Central Nervous System-

Acharaya Sarangdhara has described *Pitta*, *kapha*, all *dhatus* and all *mala* are inactive in nature like lame entities. It is because of the activities of *vata* that they get carried away just like the clouds being carried away by the wind.*Bodhaka kapha* is present in the tongue and throat initiates the process of taste perception by stimulating several kinds of receptors like sodium receptor, potassium receptor, chloride receptor, adenosine receptor, inosine receptor, sweet receptor, bitter receptor, glutamate receptor and hydrogen receptor. A person can perceive hundreds of different tastes. They are entirely thought to be combinations of the elementary taste sensations, just as all the colors we can see are combinations of the three primary colors.

The neuronal pathways for transmission of taste signals from the taste buds of tongue and pharyngeal region into the central nervous system. Taste sensations from the anterior two thirds of the tongue pass first into the lingual nerve, then through the chorda tympani into the facial nerve, and Taste sensations from the circumvallate papillae on the back of the tongue and from other posterior regions of the mouth and throat are transmitted through the glossopharyngeal nerve and Taste sensations from the base of the tongue and other parts of the pharyngeal region are transmitted through the vagus nerve and through tractus solitarius in the brainstem. These nuclei transmit second-order neurons to a small area of the ventral posteriormedial nucleus of the thalamus, located slightly medial to the thalamic terminations of the facial regions of the dorsal column–medial lemniscal system. From the thalamus, third-order neurons are transmitted to the lower tip of the postcentral gyrus in the parietal cerebral cortex, where it curls deep into the sylvian fissure, and into the adjacent gustatory cortex (anterior insular-frontal operculum area). This lies slightly lateral, ventral, and rostral to the area for tongue tactile signals in cerebral somatic area I. From this description of the taste pathways, it is apparent that they closely parallel the somato-sensory pathways from the tongue [7].

DISCUSSION

1. Essentially*Vata, Pitta, Kapha* constitute three regulatory systems i.e. nervous, endocrine and immune system respectively of entirely living systems.

2. These taste buds perceive the taste of all substance after dissolving in the saliva, perception of taste is mainly a function of the taste buds in the mouth. In the above context the seat of *Bodhakakapha* has been told as the tongue, root of the tongue and throat so, it can be taken as all types of taste buds. The taste buds are presents on anterior, posterior and lateral surface of the tongue, additional taste buds are located on the palate, and a few are found on the tonsillar pillars, on the epiglottis, and in the proximal esophagus.
3. *Ayurveda* describes six types of primary taste sensation *Madhur, Amla, Lavan, katu, Tikta*, and *Kasaya.* In contemporary physiology, only five primary taste sensations are described- sour, salty, sweet, bitter and umani. These tastes are sensed through at least 13 chemicals receptors found in taste cells of tongue.
4. Food materials are consumed; food substances are dissolve in saliva and ions of food substance are release and freely active. Themost stimulating ions elements are reacting with the taste villi to initiate the receptor potential is by binding of the taste chemical to a protein receptor molecule. The receptor proteins open special ion channels in the apical membranes of the taste cells, thereby actuating the receptors. Saliva not only acts as a solvent for chemical stimuli in food, but also transports their stimuli to the taste stimuli to the receptors.
5. These receptors are generating the action potential of taste signals; the transmission of taste signals from the taste buds of tongue and pharyngeal region through the chorda tympani into the facial nerve, glossopharyngeal nerve andvagus nerve and through tractus solitarius in the brainstem.The taste signals are finally reached gustatory cortex (anterior insular-frontal operculum area).
6. Taste Reflexes Integrated in the Brain Stem-From the tractus solitarius, several taste signals are transmitted within the brain stem itself immediately into the superior and inferior salivatory nuclei, and these areas transmit signals to the submandibular, sublingual, and parotid glands to help control the secretion of saliva during the ingestion and digestion of food. For instance, when a person smells or eats favorite food, salivation is greater than when food that is disliked is smelled or eaten.
7. Overall *PranaVata* can be compared to the CNS anatomically and physiologically as its main seat is *Murdha* and controls all the physiological functions by generating motor impulses after the integration of the sensory impulses from all over the body [8].
8. The ions channels, chemical taste, protein receptors, receptor potential for taste, taste nerve fibers, salivary secretion, gustatory cortex area (anterior insular-frontal operculum area)are executing the functions of *Bodhaka kapha*.
9. *Tarpaka Kapha* located in the brain and provides nourishment to all senses. The functions of *Tarpaka Kapha*can be compared to the functions of cerebrospinal fluid which is responsible for the nourishment of visual cortex, auditory cortex, olfactory area, gustatory cortex area centres of the brain which control and nourishing the sense organs (eye, ear, nose, tongue) which is responsible for the nourishment of receptors in respective sense organ.

CONCLUSION

The *kaphadosha* is *panchabhoutika* in nature and has dominancy of *jala* and *prithvimahabhoota*.*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 *Bodhakakapha* 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.

The functions of *Bodhakakapha* can be compared to the functions of salivary secretions in the oral cavity which causes moistening of food, different ions released from the food materials when moistened, ions channels, different chemicals present in food materials. The functions of *Prana vayu* can be compared with the protein receptors, receptor potential for taste, taste nerve fibers, the facial nerve, glossopharyngeal nerve and vagus nerve, gustatory cortex area (anterior insular-frontal operculum area). The combined effect of all these entities are responsible for the functions of taste perception. There is a need of further research to evaluate in detail all other type of kapha dosha for the betterment of mankind.

REFERANCES

1. Moharana P & Roushan R. (2019). A critical review of Vyana Vayu in modern Physiological Perspective. International journal of basic and applied research. 8(7):75-82.
2. Suthar, Mula & Roushan, Rakesh. (2020). A Critical Review of Kledaka Kapha of Ayurveda In the Modern Physiological Perspective. 10(7):1-3.DOI: https://www.doi.org./10.36106/ijar
3. Chakrapani (2016).Grahanidosha chikitsitam adhyaya. (Eds.Diwedi L.D.) Ayurveda deepika on Charaka Samhita. Chaukambha Krishnadas Academy, Varanasi, India.p.376-421
4. Shastri A.D. Eds. (2014), Vranaprashna adhyaya, Ayurveda Tatwa Sandipika Hindi Commentary, Susruta Samhita,Chaukhamba Sanskrit SansthanVaranasi (India).p.112-122
5. Tripathy B.N. Eds.(2009).DoshabhediyaAdhyaya, Astanga Hridaya.Chaukambha Sanskrit Pratisthan, Varanasi, India,p.170-184
6. Gupta A.D. Eds. (2016).Doshabhediya Adhyaya, Astanga Sangraha, Chaukambha Krishnadas Academy, Varanasi, India,p.159-166
7. *Toshniwal M.B. et.al.,*(2014).Experimental Study of Bodhaka Kapha with Special Reference to Taste Perception, *Int*. J. Ayu.Alt. Med.,2(3):43-47.
8. Hall. E, Guyton. C. (2018).Taste and Smell, Special Sense- Central Nervous System (Eds. Anura Kurpad) Guyton & Hall Textbook of medical physiology,ElsevierRelx India Pvt. Ltd, New Delhi, India, p.743-747