



Physiological role of *Kledaka kapha* in the process of digestion: A critical Ayurvedic Review & correlation with GI Mucosa and Secretions

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ABSTRACT

The primary goals of *Ayurveda*, an ancient Indian medical system, are to treat illnesses and preserve the health of healthy individuals. According to *Ayurveda*, health is a state in which the soul, sense organs, and mind are all in a state of complete well-being and the body's physiological processes including *Dosha*, *Dhatu*, *mala* & *Agni* are all in a state of homeostasis. The *Tridosha* hypothesis is exclusive to *Ayurveda*. The regulating functioning elements of the body are referred to as *doshas* in Sanskrit. The three *doshas Vata*, *Pitta* & *Kapha* are thought to be in charge of maintaining the body's homeostasis; health is simply a condition in which these *tridoshas* are in balance. An individual's psycho-physiological makeup is also determined by these *doshas*. When *dosh* deviates from the condition of equilibrium, it can vitiate various bodily tissues and cause ailments. Heavy, dense, chilly, soft, unctuous, sweet, immovable, and slimy are characteristics of *Kapha doshas*. *Avalambaka*, *kledaka*, *Tarpaka*, *Bodhaka*, and *Sleshmaka* are the five subtypes of *kapha*. *Kledaka kapha* is located in the abdomen. This *kapha* breaks down the intricacy of the dish and softens it. *Kledaka kapha's* functions can be compared to those of contemporary medicine. The philosophical aspects of *kapha* have received very little attention. A correlation between the physiological activity of *kledaka kapha* and gastrointestinal physiology has been attempted in this article. In order to better grasp the notion and evaluate it with modern science, the fundamental resources for this study were gathered from the *Ayurvedic classics* with the commentaries that are currently available, as well as from contemporary science textbooks.

Keywords: *Kledaka kapha*, *Kapha Dosha*, GI Mucosa

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sReceived 11 November 2025, Accepted 09 December 2025

Please cite this article as: Tripathy R *et al.*, Physiological role of *Kledaka kapha* in the process of digestion: A critical Ayurvedic Review & correlation with GI Mucosa and Secretions. American Journal of Pharmacy & Health Research 2025.

INTRODUCTION

The foundation of all Ayurvedic notions is the *Tridosha* theory, which is the foundation of the ancient Indian holistic science known as *Ayurveda*. These three *doshas* operate at different organizational levels, including cellular, single-system, and organism levels. According to *Ayurveda*, a person is considered healthy if their humours and metabolic condition are in balance, their tissues' and excretory products' functional activities are in balance, and their soul, senses, and mind are in a state of total well-being. The foundation of Ayurvedic knowledge is functional understanding. The idea of *tridosha* is essentially theoretical, and a dosha cannot always be represented by a single material or construction. According to *Acharya Charaka*, *Kapha's* general location are the chest, head, neck, joints, stomach & fat, the most important site is the chest.[1]

उरः शिरो ग्रीवा पर्वाण्यामाशयो मेदश्च श्लेष्मणः। स्थानानि, तत्राप्यूरो विशेषेण श्लेष्मणः स्थानम् ॥
(Cha.Su.20/8)

Drugs and food items with opposing qualities can counteract the heavy, dense, chilly, soft, unctuous, sweet, immobile, and slimy qualities of *kapha dosha*. [2]

गुरु शीत मृदुस्निग्ध मधुरस्थिर पिच्छिलाः। श्लेष्मणः प्रशमं यान्ति विपरीतगुणैर्गुणाः ॥ (Cha.Su.1/61)

In a homeostatic state, *kapha's* normal physiological functions include increasing the body's unctuousness property, helping to bind structures together, providing firmness and stability in bodily structures, maintaining the body's bulk, sexual vigour, strength, and high-class mental faculties like intelligence and lack of greed.[3]

स्नेहो बन्धः स्थिरत्वं च गौरवं वृषता बलम् ।

क्षमा धृतिरलोभश्च कफकर्माविकारजम् ॥(Cha.Su. 18/51)

Avalambaka, Kledaka, Bodhaka, Tarpaka, and Sleshmaka are the five forms of *kapha dosha*. [4]

According to *Acharya Sushruta*, the five subgroups of *kapha* are found not only in the stomach but also in the chest, neck, tongue root, and joints.[1]

श्लेष्मणस्तु उरः शिर जिह्वामूलं कंठसंध्यः इति पूर्वोक्तं च । (Su.Su.21/7 उल्हण)

Because of its potency, the *kledaka kapha*, which is found in the *Amashaya* (stomach and small intestine), supplies the water principle to the remaining locations of *sleshma* as well as to the entire body.[4]

स तत्रस्थेव स्वशक्त्या शेषाणां श्लेष्मस्थानानां । शरीरस्य चोदककर्मणाऽनुग्रहं करोति ॥ (Su.Su.21/14)

Kledaka kapha can be used to symbolize the liquid components of the gastrointestinal system secretions that moisten, dissolve, and breakdown food. One entity cannot adequately reflect it.

The science that demonstrates its concept based on functional understanding is *Ayurveda*. There is no indication in any ancient literature of a particular relationship between *kledaka kapha* and current physiology. In order to easily comprehend the profundity of the Ayurvedic Principle, there is a greater need for Ayurvedic science in today's culture. As a result, an attempt has been made to determine and establish the physiological role of *kledaka kapha* from a contemporary physiological standpoint.

MATERIALS AND METHOD

Review of literature and analysis of Ayurvedic classics, such as *Charaka Samhita*, *Astanga Samgraha*, *Astanga Hridaya*, *Sushruta Samhita* and research publications pertaining to this subject & some modern concepts from the book AK Jain text book of medical physiology 6th Edition & Guyton & Hall text book of Medical Physiology South Asia 2nd Edition.

Kledaka Kapha:

The main *Asaya* of *Kledaka kapha* is *Amasaya* (stomach) as written in *Charak & Sushrut samhita*, *Astanga Hridaya & Samgraha*. Upper portion of the body is the region of *kledaka kapha* accepted by all the above *samhitas*. Except *Sushrut Samhita* it is mentioned in rest all above *samhitas* that the important seat of this *kapha* is *Ura Pradesh*. Other places of *kledaka kapha* in the body are *Siras* (head region), *Greeba* (neck region), *Parvani* accepted by *Acharya Charaka* while *Acharya Vagbhatta* has described *kantha*, *sira*, *kloma* & *parvani* as *kledaka kapha's sthana*. *Dhatu* involve in *kledaka kapha* are *Rasa dhatu* & *meda dhatu* as per *Astanga Hridaya & Samgraha*. *Charaka* has given only description of *meda dhatu* in relation to *kledaka kapha*.

Functions of Kledaka Kapha:

Different <i>samhitas</i>	Function of <i>Kledaka Kapha</i> [4,5]
<i>Charaka Samhita</i>	The liquidity causes the food to break down in the stomach, and the fatty components cause it to soften even more. अन्नमादानकर्मा तु प्राणः कोष्ठं प्रकर्षति । तद्भवैर्भिन्नसंघातं स्नेहेन मृदुतां गतम् ॥ (Cha.Chi.15/5)
<i>Sushrut samhita</i>	<i>Sleshma's</i> moistening properties cause the meal to become moist, break down, and become more readily digested. आमाशयचतुर्विधस्याहारस्याधारः स च तत्रोदकै-गुणैराहारः प्रक्लिन्नो भिन्नसङ्घातः सुखजरो भवति ।(Su.Su.21/12)
<i>Astanga Hridaya</i>	<i>Kledana</i> , or the softening of food by combining it with mucus. यस्त्वामाशय संस्थितः क्लेदकः सोऽन्नसङ्घात क्लेदनात् ।(AH.Su.12/16-17)
<i>Astanga Samgraha</i>	Moistening food particles [5]

More over the common function as described by all the ancient *Acharyas* is That the four food categories are *Ashita* (eatable), *Peeta* (drinkable), *Leedha* (lickable), and *Khadita* (chewable)

(*Chaturvidhasya-Aahara*). These four food categories become crumbly, damp, and readily digested because to the characteristics of water; *kledaka kapha*, etc., causes liquefaction.

Modern correlation of function of *kledaka kapha*:

The functions of *Kledaka kapha* can be correlated with GI secretions & Mucosa starting from the mouth i.e. saliva to Intestinal secretions.

Saliva's characteristics and secretions: [6]

When food is brought to the mouth, it is masticated by teeth and fully combined with saliva as soon as it contains all six flavours (*Rasa*). Saliva's main functions include lubrication, swallowing, taste perception, and speech facilitation. The parotid, submandibular, and sublingual glands are the main salivary glands; several tiny buccal glands are also present. Saliva secretion typically ranges from 800 to 1500 milliliters each day, with an average of 1000 milliliters. Two types of protein secretions are found in saliva: (1) a serous secretion that contains the starch-digesting enzyme ptyalin (an α -amylase), and (2) a mucus secretion that contains mucin for surface protection and lubrication. While the submandibular and sublingual glands emit both mucus and serous secretion, the parotid glands secrete nearly all serous discharge. Only mucus is secreted by the buccal glands. Saliva has a pH of 6.0–7.0, which is ideal for ptyalin's digesting activity. By creating a food bolus, it also aids in the deglutition of food ingested through the oral cavity. The food bolus travels via the oesophagus and into the stomach. [6]

Secretions from oesophagus:

These secretions are mostly used to lubricate swallowing and are fully mucous. The compound glands near the esophagogastric junction protect the oesophageal wall from digestion by acidic gastric juices that frequently reflux from the stomach back into the lower oesophagus. The mucus secreted in the oesophageal compound gland prevents mucosal excoriation by re-entering food. Even with this defence, the stomach end of the oesophagus might still develop a peptic ulcer. [7]

When the boluses reach the *Amashaya*, they go through the first stage of digestion called *Madhura Avastha paka*, which produces *kapha*, which is similar to foam or froth. The sweet, slimy, moist food that causes the stomach to create sweet, frothy *kapha*. The diet ought to be connected to *Pichhilatwa*, *Prakalitatwa*, and *Madhuryatwa*. Comparing this stage to current knowledge, it seems that saliva and gastric secretions are the first to break down the carbohydrates, protein & fat in the food. [4]

माधुर्यात् पिच्छिलत्वाच्च प्रक्लेदित्वात्तथैव च । आमाशये सम्भवति श्लेष्मा मधुरशीतलः ॥ स तत्रस्थेव स्वशक्त्या शेषाणां श्लेष्मस्थानानां । शरीरस्य चोदककर्मणाऽनुग्रहं करोति ॥ (Su.Su. 21/13-14)

Gastric & Intestinal Secretions:

- Oxyntic and pyloric tubular glands are the two types of mucus-secreting cells that line the whole surface of the stomach. Through the mucus neck cells, they release copious amounts of thin mucus. Large amounts of viscous mucus called surface mucus cells cover the stomach mucosa with a gel-like layer of mucus that is frequently thicker than 1 mm. This protects the stomach wall and helps to lubricate the movement of food. The surface mucous cells are directly stimulated to release more of this thick, viscous, alkaline mucus by even the slightest touch with food or any irritation of the mucosa.[7]
- The duodenum's wall contains a wide variety of compound mucous glands known as Brunner's glands. In response to gastrointestinal hormones, vagal activation, and tactile or irritating stimuli on the duodenal mucosa, these glands release copious amounts of alkaline mucus. Brunner's glands generate mucus that protects the duodenum wall from the stomach's highly acidic gastric juice. Furthermore, a significant amount of bicarbonate ions from the mucus are added to the bicarbonate ions from pancreatic output. An epithelium made up of two types of cells covers the surfaces of both the crypts and the villi: (1) a moderate number of goblet cells, which secrete mucus that lubricates and shields the intestinal surfaces, and (2) a large number of enterocytes, which secrete large amounts of water and electrolytes in the crypts and reabsorb the water and electrolytes along with digestion products over the surfaces of imminent villi. [8]
- Similar to the small intestine, the large intestine's mucosa has many Crypts of Lieberkuhn, but it lacks villi. There are hardly any enzymes in the epithelial cells. Rather, they are primarily composed of mucous cells that only release mucus. Mucus makes up the vast majority of secretions in the large intestine. Water, mucus, bicarbonate, salt, chloride, potassium, calcium, and other elements are found in the large intestine discharges.[9]

**Mucus's lubricating and protective qualities, as well as its importance in the digestive tract:
[10]**

Mucus is a viscous secretion that is mostly made up of water, electrolytes, and a mixture of glycoproteins, which are made up of massive polysaccharides attached to much smaller amounts of protein. Although mucus varies significantly throughout the gastrointestinal tract, it always possesses a number of crucial qualities that make it a great lubricant and shield for the entire gut.

Characteristics of Gastrointestinal tract mucous:

1. The adhesive properties of mucus allow it to spread as a thin film across surfaces and stick firmly to food or other particles.
2. It has enough in the body to coat the Gastro-intestinal wall and keep the majority of food particles from actually coming into contact with the mucosa.
3. The particles can move easily over the epithelium because mucus has no barrier to sliding.
- 4-Faeces are formed when faecal particles stick together due to mucus.
4. The gastrointestinal enzymes have a hard time breaking down mucus.
5. Mucus is very difficult for the digestive enzymes to break down.
6. Mucus can therefore facilitate food's easy passage through the digestive system and shield the epithelium from chemical or excoriate harm.

DISCUSSION:

The three regulatory systems of all living systems—the neurological, endocrine, and immunological systems, respectively—are made up of *Vata*, *Pitta*, and *Kapha*. The *kledaka kapha*, one of the five types of *kapha*, is found in *Amashaya* and is in charge of the *kledana* and *Udaka karma* of other *kaphas*. Digestion is primarily caused by three things. *Samana Vayu*, *Kledaka Kapha*, and *Pachaka Pitta*. *Samana vayu* activates *pachaka pitta*, which facilitates food digestion and the separation of waste products and nutrients. *Kledana* (liquification, hydration, and softening of the eaten food by mingling with mucus) is mostly caused by *kledaka kapha*. To effectively break down and go into the gastrointestinal tract, our food must be hydrated and softened during the digestion process. This mucus's primary feature is its alkalinity. As a result, the extremely acidic, proteolytic stomach discharge is not directly in contact with the normal underlying stomach wall. Dietary juice, or *Aahara rasa*, is created, especially when food is broken down. When *Rasagini* acts on this *Aahara rasa*, the *kapha* manifests as a *kitta*. This *kapha* nourishes *kapha* throughout the body by being absorbed from the gut wall into blood vessels and entering the plasma.

The physiological functions of water, sodium, potassium, chloride, calcium, and bicarbonate ions, as well as mucus secretion from mucus neck cells of the stomach, pyloric glands, and surface mucous cells of the entire surface of the stomach, can be compared to the functions of *kledaka kapha*, as described by *Acharyas*. Moreover, the small and large intestines secrete water, mucus, bicarbonate, sodium, chloride, potassium, and calcium.

CONCLUSION:

Although the *kapha dosha* is *Panchabhoutika* in nature, it fulfils functions like coldness, heaviness, softness, slowness, lubrication, and nutrition carrier because of the dominance of *Jala* and *Prithvi Mahabhoota*. *Kledana karma* is the primary purpose of *kledaka kapha*. As a result, *kledaka kapha* breaks, dissolves, and moistens food ingredients. The GIT secretes a variety of substances that accomplish this job. These substances include serous and mucous secretions from salivary glands, mucous secretions from the oesophageal compound gland, mucous secretions from the stomach's surface mucous cells and mucous neck cells, mucous and bicarbonate ions secreted from the small intestine's Brunner's gland, bicarbonate ions secreted from the pancreatic duct, alkaline mucus secreted by the duodenum's goblet cells that lubricate and protect the intestinal surfaces, water and electrolytes secreted by the small intestine's enterocytes, and mucus secreted by the large intestine's crypts of lieberkuhns can be compared with the function of *Kledaka kapha*. For the benefit of humanity, more research is required to thoroughly assess every other kind of *kapha dosha*.

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