



UNIQUE JOURNAL OF AYURVEDIC AND HERBAL MEDICINES

Available online: www.ujconline.net

Research Article

A CONCEPTUAL STUDY ON DIGESTION AND ASSIMILATION OF FOOD AND ITS RECIPROCAL RELATIONSHIP IN ANCIENT AND MODERN SCIENCE

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Received 16-12-2014; Revised 14-01-2015; Accepted 12-02-2015

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ABSTRACT

The diagnostic and therapeutic concept of Ayurveda is entirely based on concept of Agni and its role in digestion and assimilation of food. For better understand to concept of Agni, we have needed to establish a relationship with enzymatic theory of medical science. Place and performance of three kinds of Agni has been described but not enough now a days. The breakdown of complex form of food into simplex monomers through an enzymatic process in gastrointestinal tract is called digestion. Similarly in Ayurveda, the conversion of panchbhautic ahar (complex food) into monomers of panchmahabhuta (simplest form of food) is take place by Jathragni and bhutagni in human gut respectively. The end products of food absorb and reach to each dhatus in a single time and taken by dhatus as per requirement through a peculiar type of principle is called law of selectivity.

Keywords: Agni, Dhatu, Vilakshangunayukta, Panchmahabhuta, Jatharagni, Bhutagni and Dhatwagni.

INTRODUCTION

In nature, sun is the entire source of energy for living being, unfortunately humans being unable to take solar energy. So, receive their food from plants, animals and their products. For make a usable source of energy, foodstuff passes throw a biochemical process in human gastrointestinal tract, is called digestion. For humans, digestion starts in the mouth, where enzymes that aid in digestion are released in saliva and help prepare food for further digestion by the stomach duodenum and intestines. There are several enzymes participate and break down complex dietary ingredients like carbohydrates, proteins and fats etc. into smaller particles are absorbed into the bloodstream; where they are immediately used as energy or to be stored as energy reserves. What is left is moved to the large intestine for the final stages of absorption and digestion, and unusable waste is expelled from the body as excrement.

In cosmos, the sun is a resource of heat (Agni); it means the sun is the dwelling place of heat or energy. Like that in Ayurveda, the agni has only a dwelling place in pitta and doing digestion, anabolism, catabolism and others biochemical reactions in the body¹. There are mainly three types of Agni and each biochemical reaction of body performs by these three agnis i.e. Jatharagni, Bhutagni and Dhatwagni. These agnis play a major role in maintaining consistency of

homeostasis so called every disease born due to disequilibrium of Agni.

AIM AND OBJECTIVES

Present conceptual review is done with following objectives:

1. To make available a scientific and conceptual comprehension about digestion, absorption transportation and fate of food.
2. To endeavor to establish all above facts of the article on modern science.
3. To uphold a liaison in ancient and modern view about facts of the article

MATERIALS AND METHODS

During the period of conceptual and scientific study of this article, the writers were going too concerned to several Ayurvedic texts, text book of modern medical science, different kinds of encyclopedia, journals, magazine and sites of internet etc.

Digestion of food: Food digestion comprises the disintegration of food into its smaller monomers into with help of Jathragni and Bhutagni in gastrointestinal tract throw a biochemical process.

Role of Jatharagni:

The digestion of food in amashaya & pachyamanashaya, corresponding to stomach & small intestine, involving the

splitting of complex food substance into their simpler components with the help of saharikarana (ushma, vayu, kleda, sneha, & kala)², which is well for absorption into the body & can be utilized & metabolized by sharira-dhatu, is done by pachakagni. Jatharagni is also performing a chief role in separation of sara (fruitful monomers of complex food) and kitta (residue fraction of food). The pitta is located (or secreted?), in area between amashaya & pakvashaya. Its constitution is pancha-bhautic and liquid (drava) in consistency but tejas-mahabhuta is predominant component over the rest. So that performs action like fire.

Avastha-paka:

This is a process & stage of food digestion, in which biochemical & physical transformation takes place, at three places & in three stages of gastro-intestinal tract. Where, because of specific type of digestion, there is three rasas i.e. madhur, amla & katu are arose respectively. On this basis, has been classified into three groups;

i) Madhura avastha-paka:

As soon as the food consisting of six rasas is taken, sweetness is manifested during the first stage of avastha-paka resulting in the production (secretion?) of thin & frothy kapha³. Since, mouth & amashaya is the seat of bodhaka & kledaka kapha respectively and these kapha is responsible for physio-chemical changes in taken shadarasa diet by sanghata (cleavage), kledana (hydration) & snehana of anna, thereafter they becomes soft, shithila (sluggish) & like a solution then further change into frothy state. In this avastha-paka, the digested food becomes sweet in taste. This chemical changes in food because of the presence of udaka guna (liquid merit) in kapha⁴.

ii) Amla avastha-paka:

According to Acharya Charaka, during the process of digestion, the food remains in vidagdha form (semi digested form) which results in sourness. While moving downwards from the amashya (stomach), this stimulate the production of achchha pitta⁵.

Acharya Sushruta⁶ has told that grahani is situated in between amashya & pakvashya, also called as pachyamanashya. Internally, it is covered with a special type of membrane is named as Pittadhara-kala. From different ashaya, like pancreas, liver & intestine etc. achchha-pitta is secreted & reaches into pachya-manashaya, where digestion of food occurs. Thereafter food converts into vidagdha form & retaining the properties of amla rasa. So, it called as amlavastha.

According to Charaka⁷, grahani is located in the umbilical region & it is the seat of agni. This agni, providing nourishment & support to grahani, helps in cooking the food

place over it, i.e. in amashaya or stomach. Till the food is digested, the grahani helps in retention in the upper part & after digestion, the annarasa is absorbed through the pittadharakala into vein (dhamni) & remaining apakva food is expelled into pakvashaya through the sides of grahani.

iii) Katu avastha-paka:

This is the third avasthapka⁸, in which food product reaches into pakvashaya, it gets further digested & dehydrated by the agni, and it takes a bolus form resulting in katu rasa. This stimulates the production of vayu Acharya Chakrapani⁹ has said, even though, agni by nature has its flames upwards, still it has its drying effect in relation to the object even placed below. On this principle, when the digested food stuff passing from pachya-manashaya to pakvashaya, then becomes shoshymanasya i.e. being dry up by absorption of water content. Thereafter, the waste products i.e. faeces, of food take a bolus form, because of drying effect of Agni.

B. Role of Bhutagni:

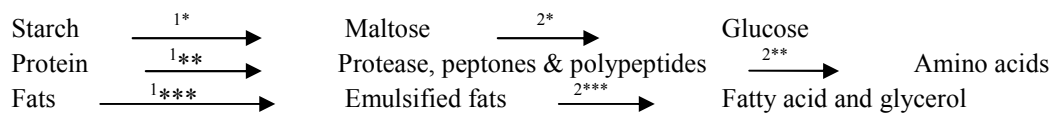
The digestion of food by jatharagni leads to the breakdown i.e. sanghatbheda of complex panchbhautic food into five distinct less complicated groups of dravya viz. parthiva, apya, agneya, vayavya, & nabhasa¹⁰. The part of agni (bhutagni) is present in dravya of belonging to each group & this agni, digest the dravya of that group. It means, there is a radical changes in the qualities of each group of substance i.e. vilakshanaguna, said by Chakrapani¹¹.

Thus, the food substances retain the vilakshanaguna are rendered fit for being absorption, assimilation into dhatu The end product of bhutagnipaka is known as poshkadravya¹² or poshakras and transformed into a homologous substances.

Reciprocal correlation about digestion w.s.r.to enzymes and agni:-

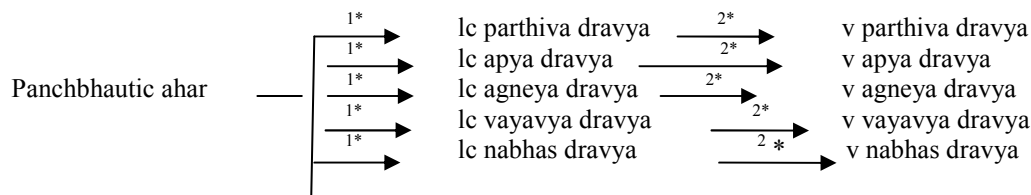
According to modern medical science, food is a chemical combination of mainly carbohydrate, protein, fats and other minor ingredient like minerals and vitamins etc. After digestion, these chemical polymers break into their respective monomers such as carbohydrate into glucose, protein into amino acids and fats into fatty acids and glycerol. Like that, there is no concept of chemical, like carbohydrate, protein and fats as food ingredients in ayurveda. But ancient medical text has own ideal and universal notion regarding to food (ahara) and explained that “every matters of universe is composed of five monomers” i.e. panchmahabhut. It means our foodstuffs is a different types of combinations of complicated polymers which are build up of their respective monomers (akash,vayu, agni, jala & parthiva mahabhut). Like medical science, after digestion of panchbhautik ahar converts into small monomers like akash etc.

Enzymatic transformation of food



1 *Ptyalin enzyme **Pepsin and Pepsinogen *** Bile salt

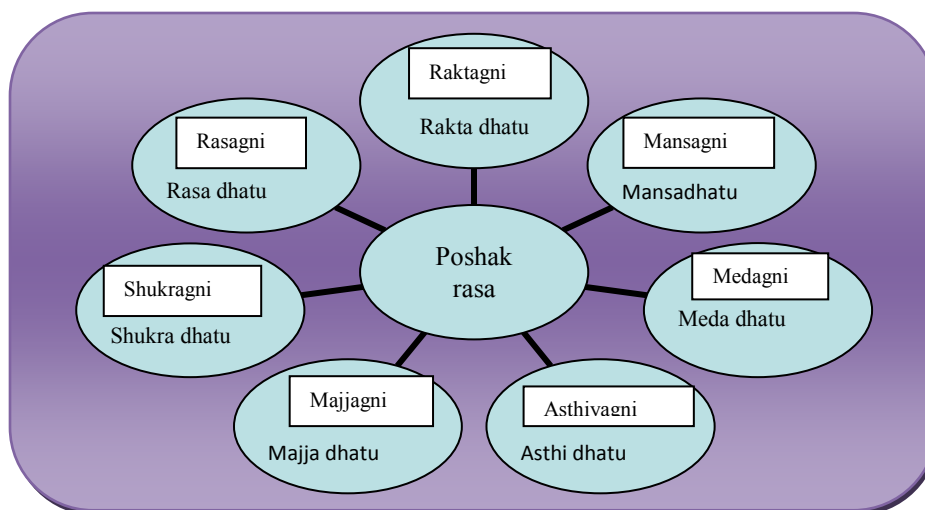
2 *Maltase **Trypsin & chymotrypsin & other proteolytic enzymes ***Pancreatic lipase



Note: lc- less complicated, v- vilakshangunyukta, 1* the site of action of jatharagni at enzymatic level where ptyline, pepsin and blie salts act. 2* the site of action of the bhutagni at enzymatic level where maltase, trypsin, chymotrypsin and pancreatic lipase act.

The process whereby the products of digestion are converted to the chemical substances of the body tissues, first passing through the lacteals and blood vessels; transformation of food into living tissues. There are two phase, i.e. anabolism and catabolism

Assimilation of food and bhutagni paka:



Diagrammatic presentation of dhatu poshana nyaya (Law of selectivity)

But in Ayurveda, assimilation processes performs by seven kinds of dhatwagni in their respective dhatus¹³.

After enzymatic action, digestive end product is formed and reaches into circulation thro lymphatic and blood circulatory system. Thereafter end products of complexes food, reach to the cells by either energy dependent or energy nondependent process. Like this, in ancient science, ahar rasa containing vilaksahngunayukta panchbhautic dravyas which are rendered fit for metabolism into dhatu, goes into circulation and reach to dhatus in a single time. Where, each dhatu of body takes that particular dravya from among five vilakshangunayukta dravyas which can nourish and develop to that particular dhatu. The received quantity of drvyas by dhatus, are directly proportional to the need and demand of the body. In which dhatu, there is rich quantity of those mahabhoutas, that dhatu receives to those mahabhouta rich dravya. For illustration; Rakta dhatu is rich with agni mahabhout, so this dhatu will take agni mahabhout pradhan drava and so on. Here, there is mix-up of two basic principle of ayurveda i.e. first is ek kal dhatu poshan nayay and second is khale kapot nyaya; for explanation of assimilation of food and hence this principle is collectively is called as Law of selectivity.

The equilibrium between anabolic & catabolic of dhatus is governed by dhatwagni. The commentator Chakrapani¹⁴ has explained that rasadidhatus constantly undergo destruction,

which is replaced by panchbhautika nutrients. He also states that the dhatus are made well by anabolic process & lost due to catabolic events i.e. sharira-dhatus which are destroyed by their own agnis and restored by four kinds of ahara.

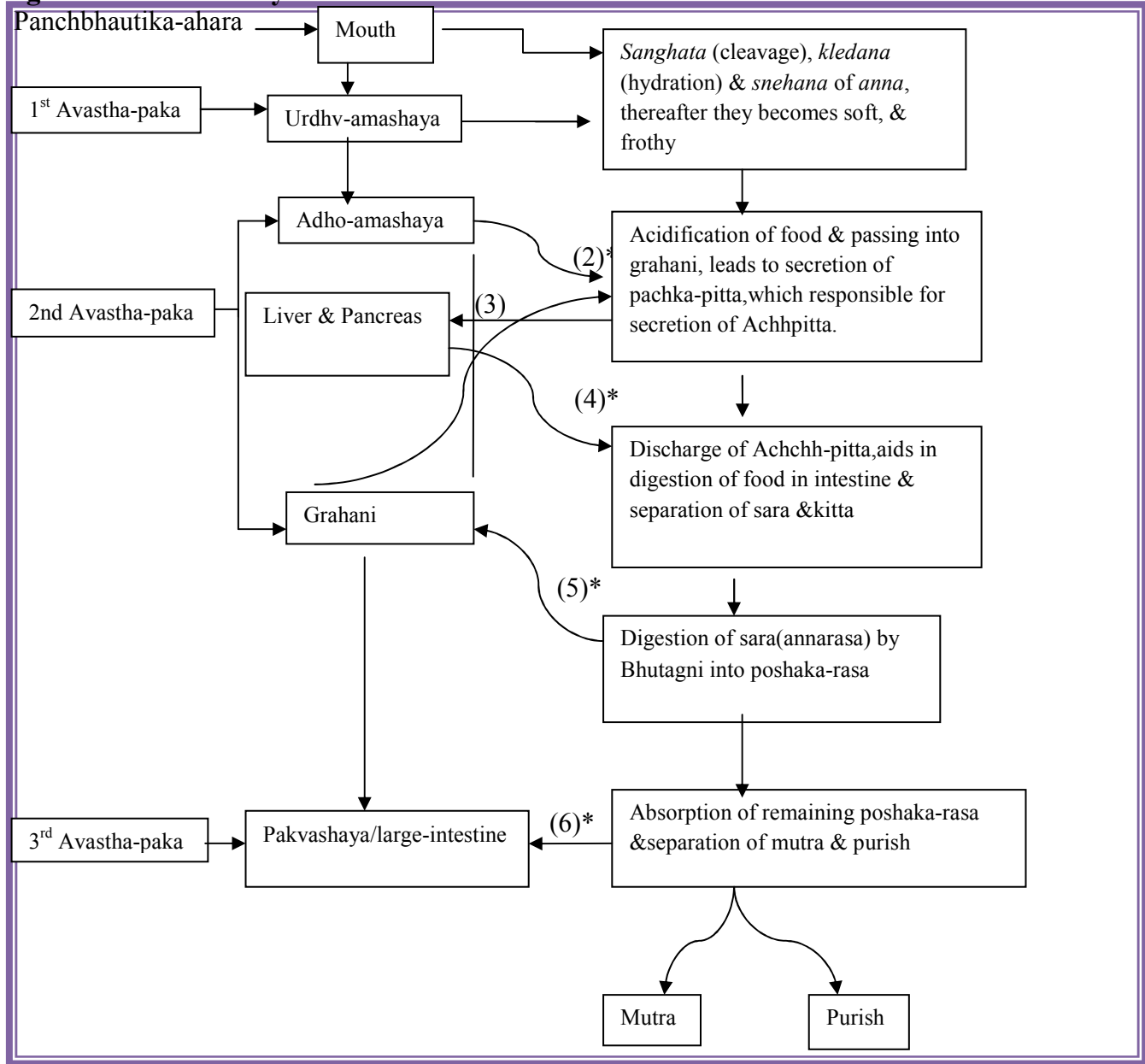
RESULTS AND DISCUSSION

1. Secretion of kledaka-kapha, may be correlated with mucous i.e. secreted in buccal cavity, oesophagus & stomach. Because, both having the same functions, like adherent qualities, low resistance for slippage, amphoteric & digestive properties¹⁵.
2. Secretion of pachaka-pitta into pachya-manashaya (including stomach & intestine up to illium). May be correlated with secretion of gastric & intestinal, viz. pepsinogen, HCl & mucous by oxyntic gland and mucous & gastrin by pyloric gland of stomach, and intestinal enzymes. Cholecystokinin & secretin are secreted from duodenum & jejunum when acidic food passing through them¹⁶.
3. Stimulation of liver & pancreas for secretion of achchh-pitta. The secretion of bile & pancreatic juice is triggered by cholecystokinin & secretin¹⁷.
4. Secretions of achchh-pitta. May be resembles with bile & pancreatic juice containing bicarbonate ion & enzymes. Because, secreted during the passing of acidic chyme into the duodenum & jejunum¹⁸.

5. Absorption of poshaka-rasa through pittadhara-kala. This may be correlated with the absorptive surface intestinal mucosa associated with villi & also known as valvulae conniventes¹⁹.
6. Absorption of remaining sara through purishdhara-kala (absorptive surface large intestine). Most of absorption in

the large intestine occurs in the proximal one half of the colon, give this portion the name absorbing colon, whereas the distal colon functions principally for storage and is therefore called the storage colon²⁰.

Digestion of food in Ayurveda:



(Diagrammatic representation of digestion of food according to Ayurveda)

CONCLUSION

The concept of digestion and assimilation of food, more or less similar to modern science in several aspects. Jathragni and bhutagni are much close to digesetive enzymes because of having less difference in functions and dhatwagni is acts at cellular level and play a principle role in assimilation so it may be correlated with the cellular enzymes.

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Source of support: Nil, Conflict of interest: None Declared