WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 1, 826-835. Research Article ISSN 2277–7105

ASSOCIATION BETWEEN *AGNI* AND THE PHYSIOLOGICAL ROLE OF PANCREATIC ENZYMES

Dr. Rajat Chhabra*[1], Prof. (Dr.) Srikanta Kumar Panda[2]

[1]MD Scholar, PG Department of Kriya Sharir, Ayurvedic and Unani Tibbia College, New Delhi.

[2]Professor, Department of Kriya Sharira, Ayurvedic and Unani Tibbia College, New Delhi.

Article Received on
05 Nov. 2024,

Revised on 26 Nov. 2024,
Accepted on 16 Dec. 2024

DOI: 10.20959/wjpr20251-35039

***Corresponding Author**
Dr. Rajat Chhabra
MD Scholar, PG
Department of Kriya Sharir,
Ayurvedic and Unani Tibbia
College, New Delhi.

ABSTRACT

Ayurveda the most ancient system of medicine which deals with the principles of life and health, has described an important principle, namely, *Trayopstambh* which includes *Aahara* (Diet), *Nidra* (Sleep) and *Brahmacharya* (Celibacy) as the three most important pillars of life which are responsible for the sustenance of life of human beings. The first and foremost importance has been given to *aahara* or the diet of an individual, the reason being that *aahara* is responsible for the maintenance of the physical stature of an individual as well as forms the structural and functional basis of a human being. In the process of digestion of this *aahara*, *Ayurveda* has also explained the concept of *agni*, which can be considered as the Digestive fire and helps in biotransformation of the components of the food so that the nutrition can be very well utilised in the body and helps in nurturing the body. Given the significance Pancreatic enzymes play in the body's digestion, absorption, and assimilation of food, an essential component of *agni* might be thought of as the Pancreatic enzymes. As part of the biotransformation processes occurring in the human body, pancreatic enzymes convert heterogeneous compounds into homogenous substances, aid in biochemical reactions at the tissue level, thus aids in food digestion. As a result, an effort is undertaken to link the roles of the pancreatic enzymes with *agni*.

KEYWORDS: *Agni*, Pancreatic enzymes, *Trayopstambha, Jatharagni, Mahabhutas.*

INTRODUCTION

The literal meaning of the term *Agni* being fire, in the context of human body does not actually

means so. In the science of Ayurveda, the fundamental principle of *agni* can be considered as the biological fire which resides in the human body in the form of *pitta. Agni* is a unique concept related to *pachana*, or digestion and metabolism. *Agni* is an entity that causes various bodily alterations.[1] *Acharya Charaka*, in his commentary has described the human body or the living being as a result of food and nutrition.[2] Also, *agni* has been identified as one among the centres of *prana* which can be considered as vital force.[3] For the formation, maintenance and optimum functioning of different physiological functions by the *dosha*, *dhatus* and *malas* in the human body, there is requirement of food and nutrition.[4] The foods ingested by the human body do not resemble with the tissues of the human body systems. Therefore, it becomes necessary for the body to convert the food substances in such a way that the transformed substances are readily absorbed by the system and utilised optimally so that it reaches the smallest units of the human body and maintains the normal physiological functioning. It is this *agni* which results into this transformation at each step which leads to the conversion of the food substances and ultimately is responsible for the absorption of these substances by the human system. Therefore, it can be understood that without the involvement of *agni*, this transformation cannot take place and hence proper nutrition cannot reach at the cellular level which maintains a healthy state in the body.[5]

The *Agni* is considered crucial element not only at the physiological but also at pathological levels. Due to various disturbances in the functioning of *agni*, as a result of the vitiation of different *doshas*, different diseases develop and also, total loss of *agni* might result in the death of that individual. Because of all these reasons, *agni* is considered as the root cause of stability of the human body.[6] *Acharya sushruta* has described the balance of *agni* along with the balance of *dohsa, dhatu*, and *mala* as important measure for the assessment of health.[7] The *parama sukshma guna*[8] of *agni* has been considered responsible for carrying out all the bio-transformations inside the human body so as to maintain normal physiological state of the individual.

MATERIALS AND METHODS

To gain a better understanding of the significance of pancreatic enzymes and *Agni* in the human body, Ayurvedic texts such as *Charak Samhita, Sushruta Samhita*, and *Ashtanga Hridaya* were reviewed. Articles were selected from PubMed and Web of Science-indexed journals. This methodical compilation of data from classics, papers, and books emphasises the functional relationship between pancreatic enzymes and *agni*.

RESULTS AND DISCUSSION

Types of Agni

Agni can be broadly classified into 3 types, based on the level of action, namely;

a.) ***Jatharagni****:* The literal meaning of the word *jathara* is *udara* and because this *agni* resides in the abdomen of the human beings it is termed as *jatharagni*. This *jatharagni* is considered as the primary and most important among all the forms of *Agni*. This is because, *jatharagni* is the controller and is responsible for maintenance of five types of *bhutagnis* and seven types of *dhatwagnis*.[9] The site of this *Agni* is in the *grahani* (duodenum).[10]

b.) ***Bhutagni:*** Once *jatharagni* acts on the food, the next *agni* to act on the food is *bhutagni*. There are five types of *bhutagni* namely; *Bhoumyagni, Aapyagni, Taijasagni, Vayva agni* and *Aakasheya agni*. It is a very well-known principle of Ayurveda that the human body as well as the food that we eat, is composed of five *mahabhutas* or the five basic elements i.e. *Prithvi, Agni, Jala, Vaayu* and *Aakash*.[11] This *bhutagni* acts on the digested food material by the *jatharagni*, and then convert the food material into *bhutdravyas* (fore eg, *parthivagni* acts on *parthivansha* of food) which are essential for the nourishment of the *dhaatus* of the body.[12] The specific type of ingredient present in the food is broken down by a specific *bhutagni* and because of that reason it can be said that these *bhutagnis* are specific in nature.

c.) ***Dhatwagni:*** The *Dhatwagni* comes into action once the action of *Bhutagni* is over. A total of seven *Dhatwagnis* corresponding to seven *dhatus* namely, *rasa dhatwagni, rakta dhatwagni, mansa dhatwagni, meda dhatwagni, asthi dhatwagni, majja dhatwagni, shukra dhatwagni*. Once the conversion into *sharirabhutas* of the *bhutansha* of foods is done, the *sharirabhutas* have to be transformed into *sharira dhatus* (body tissues) for which the *dhatwagni paka* is necessary. It is then, that the *dhatwagnis* work upon the specific nutrients which circulates as the *poshakansha* from the diet and leads to the production of *prasada bhaag* of *dhatus, updhatus* and *mala* of *dhatus* (by- products).[13,14] This transformation that takes place in the body in which the *dhatwagni vyapara* is involved mostly takes place in the liver. The formation of *sthaayi dhaatus* (body tissues) from the *asthaayi dhatu* (nutrients) takes place in the respective *dhatu* itself.[15]

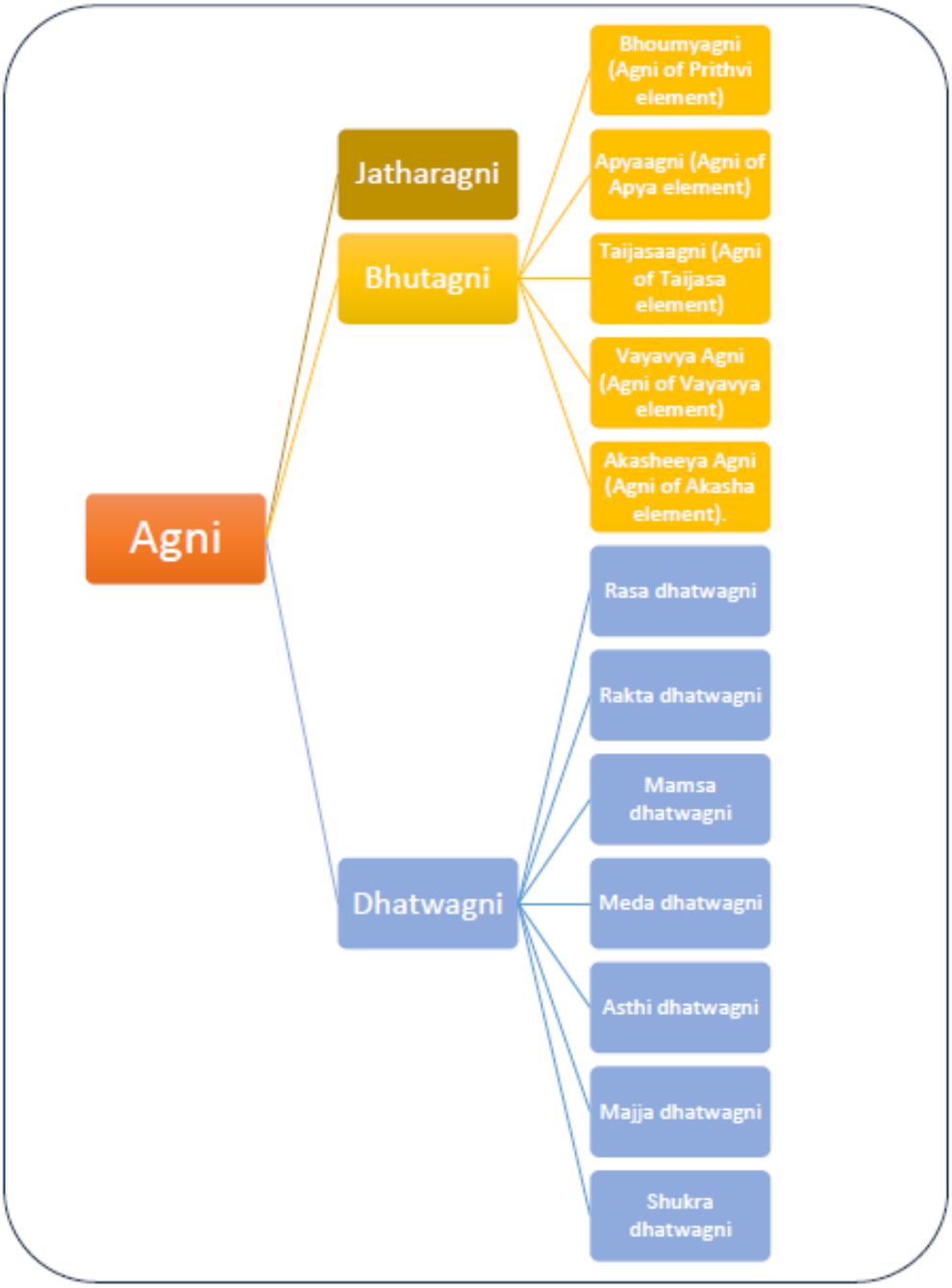

Fig. 1: Different types of *Agni.*

Different states of *Jatharagni*

Based on the dominance of doshas and the agnibala, jatharagni can be found in four different states[16]:

a.) ***Vishamagni:*** It is characterised by a robust hunger that is followed by a decrease in appetite. *Agni's* potency changes frequently. Such individuals have a dominance of *vata dosha.*

b.) ***Tikshagni:*** *Pitta* stimulates the *agni*, which aids in the rapid digestion of huge amounts of

food. In essence, it is the state in which the *agni's* potency increases.

c.) ***Mandagni:*** *Agni* in this stage has reduced potency, decreased metabolism, and poor appetite. *Apakwa* is led by *Mandagni*, and then *Ama* and *Udarshoola* are produced. Such *agni* has a dominance of *Kapha dosha.*

d.) ***Samagni:*** Equilibrium of the *tridoshas* is the situation in which *jatharagni* operates normally, allowing for full meal digestion. The *samagni* state of *agni* aids in correct digestion and assimilation of food, which nourishes *dhatus* and preserves good health.

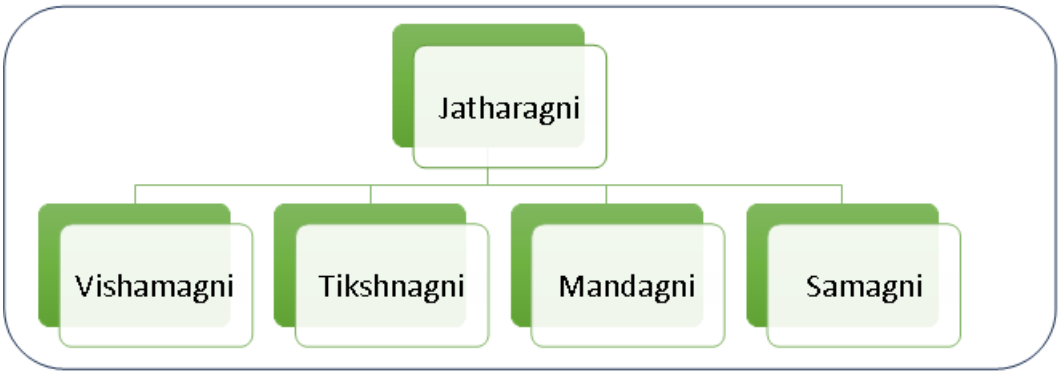

Fig.2. Status of *Jathargni* as per dominance of different *doshas.*

Role of Pancreatic Enzymes in Digestion

In the human body, the pancreas is one of the organs which has the highest capacity for the synthesis of proteins. Most of these enzymes are secreted into the intestinal canal. The major digestive enzymes secreted by the pancreas is as follows in table 1.[17,18]

Table 1: Digestive enzymes and proenzymes secreted and stored by the Pancreas.[19]

Proenzymes	Enzymes
Prophospholipase (I, II)	Lipase
Proelastase	α -amylase
Procarboxypeptidase A (1,2)	RNase
Procarboxypeptidase B (1,2)	DNase
Trypsinogens (1,2,3)	
Chymotrypsinogen (A, B)	
Mesotrypsin	

The enzymes which are stored in the pancreas, before they are secreted, in inactive form are the Proenzymes. The activation of these proenzymes takes place when they enter into the duodenum. On entering, these proenzymes are activated at the surface of the duodenal cavity, with the help of a brush border like glycoprotein peptidase and enterokinase which further activates trypsinogen. This activated form of trypsinogen, i.e. trypsin further catalyzes the

activation of inactive proenzymes. On the other hand, major digestive enzymes such as lipases and α-amylase, resides in the pancreas in an active form.

Functions of the Major Pancreatic Enzymes

a.) Amylase: Both the salivary glands and the Pancreas secrete the enzyme *Amylase*. The process of digestion is initiated in the mouth itself with the involvement of salivary amylase and it contributes upto 50% of the digestion of starch and glucose. On the other hand, the remaining digestion of starch and glucose is carried out by pancreatic amylase. However, both the salivary amylase and the pancreatic amylase have a common function to do, i.e. to hydrolyze 1,4-glycoside linkages present at the junction of carbon 1 and oxygen.[20] The presence of the brush-border enzymes then completes the process of hydrolysis of products obtained by amylase digestion to glucose. Glucose, which is the final product of carbohydrates digestion, is then transported across the membrane of intestinal epithelial cell by the process of sodium ion-coupled transport.[21]

b.) Lipases: Pancreas is majorly responsible for the secretion of this enzyme. Lingual lipases and gastric lipases are responsible for the digestion of fat, though not significantly. The significant lipases secreted by the pancreas are the triglyceride lipase and prophospholipases. Pancreatic lipase is responsible for hydrolysing a triglyceride molecule and breaks it into two fatty acid molecules which are released from carbons 1 and 3. Also, a monoglyceride with a fatty acid esterified to glycerol at carbon 2 is also released.[22]

c.) Proteases: These enzymes are secreted by the pancreas and are usually classified into 2 groups - the endopeptidases and the exopeptidases. All these enzymes are stored and secreted as inactive proforms, from the pancreas. These proforms gets activated by Trypsin in the duodenum. Endopeptidases like Trypsin, chymotrypsin and elastase, join with specific peptide bonds which are adjacent to specific amino acids inside a protein. Exopeptidases such as carboxypeptidases are useful in cleaving peptide bonds at the carboxyl terminal of proteins.[23]

Association between *agni* and the pancreatic enzymes

It can be observed that the concept of *agni* holds an important place in the digestion and metabolism of the food that is ingested. *Agni* is responsible for the conversion of food into the useful nutrients that are utilised by the body. However, of the thirteen types of *agni*, mentioned in the Ayurveda scriptures, *Jatharagni* holds the most important place because it is responsible for the optimum functioning of the *bhutagnis* and the *dhatwagnis*. The *jatharagni* can be further

associated with the enzymes secreted by the pancreas, because there are a lot of similarities between the description of *jatharagni* and the pancreatic enzymes.

a.) Acharya Charaka has described the site of *jatharagni* as the *grahani* which can be considered as the duodenum in modern terms. Similarly, the site of secretion of the pancreatic enzymes is the duodenum as per description available from the modern texts.[10]

b.) It can also be noted that without the digestion by pancreatic enzymes, the food cannot move forward in the gastrointestinal tract and rest of the enzymes from the liver, gall bladder and small intestine cannot act upon the food material and cannot be utilised by the body, which signifies the importance of pancreatic enzymes in the digestion of food. On the other hand, the primary importance of *Jatharagni* can be understood by the fact that, *bhutagni* and *dhatwagni* cannot act upon the food unless *jatharagni* has broken down the food into simpler form.[9]

c.) The main function of *jatharagni* is to convert *aahara* into *aahara rasa* which can then be utilised by the human body for nourishment. This jatharagni is responsible for both the digestion and metabolism. The pancreatic enzymes on the other hand perform the similar function of breaking down complex molecules of carbohydrates, proteins and fats into simpler substances such as glucose, amino acids and fatty acids which are utilised by the body tissues for nourishment.[18]

Therefore, it can be said that the functions of the *Jatharagni* and the pancreatic enzymes are in congruence with each other and that pancreatic enzymes, to some extent, are an entity of *agni* as per description available from the Ayurvedic texts.

DISCUSSION

According to classical writings, *agni* is a vital component in human bodies digestion and metabolism. The term *Agni*, as used in classical texts, refers to the bio-transformation processes that occurs in the human body and is responsible for the efficient functioning of the body's structural and functional units. Agni converts an individual's food into energy using the *Dhatu uttapapti* principle. According to the classics, *agni* is an essential component of an individual, providing life, complexion, vigour, health, lustre, and nourishment. In modern physiology, *Jatharagni's* activity can be associated with digestion in the stomach and intestine caused by pancreatic enzymes. *Jatharagni* has no direct effect on *pitta* or *agni*, but rather enhances the organs that contain the other types of *pitta*. As long as *jatharagni* is normal, the

body can keep adequate enzyme levels. Human beings consume nutrients that are *Vijateeya* (unrelated to the body), thus those foods must be changed into a form that can be absorbed by tissues.

CONCLUSION

A number of diseases affect the individuals if the *agni* gets contaminated or vitiated. A disturbed *agni* is the major cause for occurrence of almost all the disorders of the gastrointestinal tract and to some extent a cause for psychosomatic diseases. It is a well-known fact that abnormal *doshas* disrupt the regular operation of the body's tissues, which are essential for defence, immunity, and maintenance of health. It is this *agni* on which the increase or decrease of these *doshas* is dependent upon. If the *agni* is functioning optimally, a state of equilibrium is maintained among the three *doshas* and support the human body, both physically and mentally. On the other hand, if there are slight disturbances in the status of *agni*, surely there will be disturbances in the *doshas* too and will lead to disease condition. Hence, in order to understand the normal physiology of the body and the pathology of different diseases, it is important to understand the concept of *agni*. The proper understanding of the fundamental principles can only lead to better treatment by an Ayurveda physician.

REFERENCES

1. Concept of Ama in Ayurveda. 1st ed. varanasi: Chaukhamba Sanskrit Series Office, 2005; 4.
2. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Sutrasthana; chapter 28, verse 41 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 181.
3. Sharma P.V. editor. Susruta Samhita. English Translation. Sarira Sthana. Vol II. Chapter 4: 11, 12. Varanasi: Chaukambha Visvabharati, 2014; 378.
4. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Sutrasthana; chapter 28, verse 4 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 175.
5. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Sutrasthana; chapter 12, verse 11 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 80.
6. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Chikitsasthana; chapter 15, verse 3-4, Chaukhamba

Surbharati Prakashan, Varanasi: Revised Edition, 2008; 512.

7. Vaidya Jadavji Trikamji Acharya; Susruta: Susruta Samhita: Nibandhasangraha commentary by Sri Dalhanacharya: Sutrasthana; chapter 15, verse 41 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 75 sushruta- 15 /41.
8. Vaidya Jadavji Trikamji Acharya; Susruta: Susruta Samhita: Nibandhasangraha commentary by Sri Dalhanacharya: Sutrasthana; chapter 35, verse 27 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition., 2008; 154.
9. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Chikitsasthana; chapter 15, verse 3-5 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 512.
10. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Chikitsasthana; chapter 15, verse 56 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 517.
11. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Chikitsasthana; chapter 26, verse 10 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 512.
12. Vaidya Jadavji Trikamji Acharya; Susruta: Susruta Samhita: Nibandhasangraha commentary by Sri Dalhanacharya: Sutrasthana; chapter 46, verse 526 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition., 2008; 253.
13. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: *Ayurvedadipika* commentary by Cakrapanidatta: Sharirsthana; chapter 6, verse 4 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 329.
14. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Chikitsasthana; chapter 6, verse 39 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 447.
15. Vaidya Jadavji Trikamji Acharya; Agnivesha: Charaka Samhita: Ayurvedadipika commentary by Cakrapanidatta: Chikitsasthana; chapter 15, verse 17-19 Chaukhamba Surbharati Prakashan, Varanasi: Revised Edition, 2008; 514-515.
16. Charaka Samhita of Agnivesa, by Professor R.H. Singh Commentary Chaukhamba Orientalia Varanasi Reprint, Uttaradhyaya Chikitsasthana 15.13 Grahini, Chikitsitamadhyaya, 2014; 513.
17. Scheele, G., Bartelt, D., and Bieger, W., Characterization of human exocrine pancreatic proteins by two-dimensional isoelectric focusing/sodium dodecyl sulfate gel electrophoresis. Gastroenterology, 1981; 80(3): 461–73.

18. Whitcomb, D.C., and Lowe, M.E., Human pancreatic digestive enzymes. Dig Dis Sci., 2007; 52(1): 1–17. 10.1007/s10620-006-9589-z.
19. Beck, I.T., The role of pancreatic enzymes in digestion. Am J Clin Nutr., 1973; 26(3): 311–25.
20. Wright, E.M., Martin, M.G., and Turk, E., Intestinal absorption in health and disease—sugars. Best Pract Res Clin Gastroenterol, 2003; 17(6): 943–56. 10.1016/S1521-6918(03)00107-0.
21. Kimmich, G.A., Membrane potentials and the mechanism of intestinal Na(+)-dependent sugar transport. J Membr Biol., 1990; 114(1): 1–27.
22. Hofmann, A.F., and Borgstrom, B., Hydrolysis of long-chain monoglycerides in micellar solution by pancreatic lipase. Biochim Biophys Acta, 1963; 70: 317–31. 10.1016/0926-6542(63)90044-1.
23. Kilberg, M.S., Stevens, B.R., and Novak, D.A., Recent advances in mammalian amino acid transport. Annu Rev Nutr., 1993; 13: 137–65. 10.1146/annurev.nutr.13.1.137.