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Concept of transformation and incorporation of nutriment in the body: A review

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Abstract
Background and Objectives: Human body consists of different types of organs in respect to structure and function. Continuous wear and tear occurs in these organs of the body while performing living processes and tasks. This wear and tear is inevitable. Wearing of tear is provided by nutriment. It is necessary to provide nutritive material in such form which can be utilised by the organs of the body.
Methodology: This study is based on doctrines of Greco-Arab Physicians like Galen, Avicenna, Razes, Averroes etc. regarding transformation as well as incorporation of nutriments inside the body. Literature related four digestions is surveyed from various classical books and journals, for better understanding and explanation of this concept. Collected material then analysed and systematized in a comprehensive way.
Observation and Conclusion: Inside the body replenishing entity i.e. nutriment gets transformed from complex to simpler form so it can assimilate into the organs of the body. This whole process of transformation of nutriment is divided into four steps called as *hudhum arbaa*. This process of transformation is gradual and brought about by *quwwate ghādhiya* (Nutritive faculty) as well as its subservient faculties.

Keywords: *Quwwate ghādhiya,* digestion, nutrition, unani medicine

1. Introduction
There are different types of organs in the body which vary in structure and function. e.g. There are hard and dry organs like bone, also there are soft and moist organs like muscle, brain etc. The functions executed by bones are different from that executed by the brain [1]. This difference in structure and function of organs is because of their composition. Although, every organ is composed of *arkān arba'a* (four elements; air, water, fire and earth) but their proportion vary from organ to organ. This means that the proportion of *arkān arba'a* found in bone will be different from that found in muscle. That is to say more amount of *ajzā' arḍiyya* (element earth) is present in composition of bone as compared to muscle that makes bones harder than the muscles. Since continuous *Tahallul* (dissolution/wear and tear) is occurring in every organ of the body therefore, during process of *Tahallul* substance getting dissolute from one organ differs from other because of difference in their composition. Hence substances getting dissolute from bone will be different from those of nerve or muscle [1]. For the same reason, replenishing substance i.e. nutriment should be identical to the substance getting dissolute during wear and tear of the organ [2]. Nutriments are not capable of providing nourishment directly until these complex nutriments get converted into simpler form that can be utilised by the organs. Therefore, inside the body, nutriment undergoes a series of transformation so that it can assimilate into the organs [3]. This transformation is done by *quwwat jādhiba* (Attractive faculty), *quwwat māsika* (Retentive faculty), *quwwat hāḍima/ mughayyira* (digestive or transformative faculty) and *quwwat dāfi'a* (expulsive faculty) [3, 4]. These faculties are subservient to *quwwat ghādhiya* (Nutritive faculty) [4, 5]. This faculty is responsible for providing nourishment to the body [6, 1]. Function of this faculty continues from formation of foetus till the death of individual [1].

2. *Huḍūm arba'a*
Huḍūm is pleural form of *Haḍm* which means *taghyyur* (transformation) and *tabaddul* (changes) that nutriment undergoes in the body [7]. In process of *haḍm* heat and moisture act as medium [3]. Unani physicians described the changes that nutriments are undergoing inside the body, collectively as *huḍūm* (digestions) and classified them into four stages, which is known as *huḍūm arba'a* (Four digestions) [4, 5]. These are:
1. *Haḍm mi'dī* (Gastric Digestion),
2. *Haḍm kabidī* (Hepatic Digestion),
3. *Haḍm urūqī* (Vascular Digestion),
4. *Haḍm uḍwī* (Organ Digestion).

2.1 *Haḍm me'dī*
Haḍm mi'dī means the changes that ingested nutriment undergoes while passing through the alimentary canal (from mouth to intestine). These changes are as follows:
Alteration in nutriment begins when it comes in contact with the lining of mouth. Digestion begins from mastication. Mastication causes breakdown of nutriment into smaller particles and mixes saliva with substances of nutriment thoroughly, consequently the nutriment is partially transformed in the mouth itself. Mainly saliva helps in this transformation [3, 4]. The fact that mastication does produce some digestive change is evident from the altered smell and taste of nutriment which has been masticated as stated by

Renowned physician Ibn Sina (980-1037 AD) [4]. Saliva also keeps the mouth moist and helps to lubricate the nutriment, making it easier for nutriment to pass easily through the oesophagus [6].

Attractive faculty attracts nutriment by means of vertical fibres into stomach so that further digestion of nutriment can occur. However, retentive faculty retains the attracted nutriment in stomach as long as digestive faculty completes its action over nutriment [1, 4, 5]. Digestive faculty acts on the nutriment in a way that it converts beneficial substances of nutriment into such entity which can be further acted upon by digestive or transformative faculty of liver, resulting in formation of blood that is capable of nourishing whole body [2].

The action of digestive faculty over nutriment starts when nutriment comes in contact with the substance of stomach while heat and secretions of stomach act as medium [3]. However, not only heat of stomach and intestine as well as of the organs in relations also help in the digestion like liver on the right and spleen on the left. Although, spleen is of *barid mizāj* (cold temperament) but being highly vascular, it too provides heat to stomach. In front of stomach there is omentum which, due to its fat, receives heat quickly and sends it to stomach. While above is the heart which warms the stomach through warming the diaphragm [2, 4, 5, 6]. Heat is necessary for digestion but nutriments are not cooked in the stomach and intestine like the nutriment is cooked in the oven or on the fire, because the actual heat present in the stomach is not even able to heat up the things. Therefore, neither the nutriment is boiled nor roasted in the stomach and intestine, but the process of digestion and transformation is of the type that the essence of an entity is transformed into another type [3].

Although, *ruṭūbat* (moisture or gastric juice) is also important for effective digestion because *ruṭūbat* when mixes with nutriments make them capable of accepting the action of digestive faculty [5, 3].

Erasistratus (304-250 BC) proposed mechanical explanation for digestion. He described the peristaltic movement of the muscular coat and said that nutriment is ground by muscular action of the stomach itself [9]. It is a fact that along with heat and moisture, peristalsis plays an important role in digestion.

In the stomach, digestive faculty mainly causes breakdown of the nutriment. Along with this, it mixes nutriment with *ruṭūbat* (digestive juices) resulting in liquefaction of the nutriment [6]. It is a fact that digestion of nutriment is the resultant of changes in nutriment by the enzymatic activities and movements in the stomach which helps in proper mixing of nutriment with the digestive juices. Also, breakdown of ingested nutriment provide larger surface area of nutriment to get expose for enzymatic action [10]. Hunyn bin Ishaq (809-873AD) has named the secretions of stomach as *humūḍat me'dī* (acid of stomach) [7]. Now it is well known fact that digestion of proteins take place with the help of hydrochloric acid in stomach [10]. As a result of digestion, nutriments convert into semi solid substance known as *kaylūs* (chyme) which is then passes into duodenum with the help of *quwwat dafi'a* (expulsive faculty) through the pylorus. Now attractive faculty of intestine attracts *kaylūs* and retentive faculty retains this *kaylūs* till the digestive faculty completes its action over it. Here, *ruṭūbat mi'wiyah* (intestinal juices) along with heat and peristalsis help in digestion [7].

As a result protein, fats and carbohydrates are completely transformed into amino acids, fatty acids and glycerols, and glucose respectively [10, 11].

In alimentary canal nutriments are acted upon by digestive faculty which converts the beneficial substances of nutriment into an entity that can be utilised by the body (after further processing into the liver). Along with this digestive faculty also tries to convert even non beneficial portion of nutriment into beneficial substances. And if latter is not possible then to at least make it suitable for excretion [5]. The non beneficial portion of nutriment is then excreted by expulsive faculty in the form of faeces [1].

kaylūs (chyme) that is obtained from digestion of nutriment is a fluid like material that resembles with thick barely water [2]. However, it is absorbed from stomach and intestines. Absorption takes place through the fine but otherwise tough mesenteric vessels adjoining intestines. From there *kaylūs* passes into portal vein. Any disturbance in retentive faculty leads to flatulence in stomach [3]. Diseases like dyspepsia, Acid peptic disorder, maldigestion, steatorrhea etc. results from the disturbed digestive functions of stomach and intestine [12]. Semi-digested nutriment passes into stool in weakness of retentive faculty or of digestive faculty. Weak expulsive faculty of stomach causes smell of nutriment comes with burping and stay of nutriment than normal in the stomach [13]. Constipation can be hypo-functioning while loose motion can be over functioning of expulsive faculty [14].

2.2 *Haḍm kabidī*

This is second stage of digestion [1]. Liver transforms *kaylūs* (chyme) into blood that comes to it from stomach and intestine through mesenteric vessels. This process is known as *haḍm kabidī* [2, 14]. Besides, it is a fact that most of the metabolic processes take place in the liver [10, 11]. Hence it is considered as *matbakh* (kitchen) of the body. Ibn Rushd (1126-1198AD) has stated that transformation of nutriment into blood occurs within the liver which is capable of nourishment. That is why, Jalinus (Galen: 129-200AD) considered the liver as *Ra'is Muṭlaq* (chief organ) for Nutritive faculty [14]. Like all other organs of the body, liver is also furnished with four faculties. Attractive faculty attracts *kaylūs* from stomach and intestine into liver. Then there is a retentive faculty which retains this *kaylūs* in liver till action of digestive faculty on them is completed [14]. Digestive faculty or transformative faculty transform this *kaylūs* into blood which is distributed to the organs for their nourishment mb, Blood is actually consists of four humours. These are *Dam* (sanguine), *Balgham* (phlegm), *Ṣafrā* (bile) and *Sawdā'* (black bile) [4]. Thus normally, in blood froth is the *Ṣafrā* and sediment is the *Sawdā',* and material which is partially matured is *balgham* while that which is clean and pure is *dam* [4, 15].

Since transformative faculty of liver transforms *kaylūs* into blood which is capable of nourishment of whole body. That is why Ibn Sina has stated that digestive faculty of liver perform such extensive and vast function, which is beneficial for the entire body [4]. Rabban Tabri (810-895AD) has stated that liver converts the attracted nutriment into its own colour and takes out its own share (from blood), thereafter this blood reaches to the heart, which sends to all the organs their share of nutriment [16]. As a matter of fact liver is a seat of chemical changes in digested and absorbed nutriment. Synthesis of various chemical compounds takes

place in liver, which circulate through cardio-vascular system and reach to the cells of body to provide the nourishment. Plasma proteins, cholesterol, phospholipids and certain amino acids are synthesised in liver. Glycogenesis, gluconeogenesis, synthesis of bile, deamination of amino acids, urea formation and even detoxification of toxic substances etc. take place in liver [10, 11]. Expulsion of waste products from liver takes place with the help of expulsive faculty [1, 2, 4].

2.3 *Haḍm urūqī*

In the vessels blood or humours undergo transformation that is referred as *haḍm urūqī* [2]. This is third stage of digestion. Jalinoos has not described third stage of digestion i.e. *haḍm urūqī.* Zakaria Razi (d. 925AD) and Abu Sahl Masihi (d.1011 AD) followed Jalinoos. Ibn Rushd also mentioned that it is better not to consider *haḍm urūqī* as the third stage of digestion because transformation of nutriment (blood) inside vessels is not as apparent as it is in other stages of digestion [14].

Physicians like Ibn Sina, Ismail jurjani and Abbas Majoosi (930-994 AD) have mentioned third stage of digestion. This digestion refers to transformation of *ruṭūbat ūlā* (primary fluids i.e. humours) towards *ruṭūbat thanwi* (secondary fluids) in such a way that components of *ruṭūbat thanwi* are similar to the *a'ḍa-e-mughtadhi* (organ to be nourished). In a nutshell the *akhlat* (humours) reach the vessels so that they attain the *mizāj* of organs of which they are to become a part of [17].

The transformation of humours into the *ruṭūbat thanwi* is a continuous process; however, some humours are always present inside the vessels. Therefore, at any given point of time vessels contain varying amount of both *ruṭūbat thanwi* and *ruṭūbat ūlā* [17]. It can be inferred that in this stage humours are further processed into an approximate principle just ready to incorporate into the organ.

Various pathologies that are observed inside vessels, most of them are somehow concern with nutritional imbalance. e.g. Dislipidaemia, in which ratio of triglycerides, cholesterol and fatty acid are not normal. It is supposed that disturbed ratio causes adherence of lipid to intima which is key factor in atherosclerosis. Actually there is disturbance in retentive and expulsive faculties. If these were optimum, humours should disposed towards organs and nothing would have been retain adhere to intima [12].

2.4 *Haḍm uḍwī*

In *haḍm uḍwī* Unani physicians have described the changes occurring in the blood that have entered the organs for nutrition. This is actually fourth stage of digestion. According to Ibn Sina in this stage of digestion *ruṭūbat thanwi* (secondary fluid) that is capable of nourishment is transformed into organs [4]. This transformation is brought about by Nutritive faculty [14]. Inside the organ, function of nutritive faculty is accomplished in three steps; *Tahseel* (acquisition/reception), *ilsaq* (adhesion) and *tashbih* (resemblance/similarity) [6].

When blood passes through the vessels of the organs, those substances which are appropriate to the organ in respect of *kaifiyat* (qualities) are acquired by the organs from blood with the help of *quwwat mohassila* (receptive faculty) [5]. This function is known as acquisition/reception. For example, towards the bone receptive faculty attracts that part of blood which is cold and dry. Contrary to this, towards brain it attracts cold and moist part of blood [1].

Quwwat molasseqa (adhesive faculty) is responsible for adhesion of these substances which are acquired by receptive faculty into the organ. Finally, the nutriment which is acquired and adhered into the organ becomes absolutely like it in all respects, i.e. temperament, consistency and colour with the help of *quwwat mushabbeha* (assimilative faculty) [1, 4] *Quwwat mushabbeha* is actually *quwwat mughayyira thāni* [5]. That is why Ibn Sina has said that every organ of the body has its own specific *quwwat mughayyira thāni* (secondary transformative faculty) which transforms the nutriment according to organ in every respect i.e. temperament, consistency and colour. That means *quwwat mughayyira thāni* of bone transforms nutriment into bone-like substance whereas that of muscle transforms nutriment into muscle-like substance [1]. It can be inferred chemical changes which the nutrients undergo into the cells and tissues for the sustenance of life. In this process certain chemical compounds and even wastes are produced in the cells and tissues [10]. These compounds which are not required to those tissues /organs are expelled out with the help of expulsive faculty [10, 11].

When *quwwat jādhiba* or *quwwat mohassila* is disturbed, organ fails to absorb available nutriment. As a result *huzal* (a condition in which person loses weight) may occur. When *quwwat mughayyira thāni* of the organs are disturbed then diseases like *Bars* (vitiligo) occurs. In this case nutriment is available to the organ but is unable to transform according to organ [5].

3. Discussion

After nutriment intake, transformation begins within the mouth because of mastication. Then it is passed to stomach and intestine nutriment is broken down here and changed into *kaylūs*. This *kaylūs* is delivered to the liver through mesentericvessels where the four humours are produced. Finally these are delivered to the target tissues where these are utilised for the purpose of wearing of tears i.e. repairing the various cells and tissues. In target tissues part of blood/humours appropriate to that tissue is attracted, then adhered and assimilated i.e. nutriment transformed according to temperament, consistency and colour of the organ [1-4]. From above description it is evident that Unani physicians were aware of gradual changes brought in ingested nutriment. The transformation described in respect of *haḍm mi'dī* is almost similar to the present day description of gastric digestion. Both modern and Unani physicians say that nutriment is converted into *kaylūs*(chyme) in stomach [1, 4, 10]. Regarding the hepatic digestion little difference is there Unani physician are of view that chyme delivered to liver is transformed into *akhlāt/kaymūs* (humours) [6]. In modern physiology exhausting details of metabolism is given in respect of hepatic digestion. Liver not only transforms the nutriment into transportable forms but a part is stored for future use also [10]. In Unani literature storage function of liver is not mentioned. Vascular digestion is described briefly in modern as well as in Unani literature. Vascular lipase acts on lipoprotein to change their density [10]. Some Unani physicians considered vascular digestion as part of organ digestion, whereas some have given its description [1-4, 14]. Whatever changes are brought in nutriment inside the vessels comes under vascular digestion. From the vessels

transformed and ready to incorporate nutriment is delivered to organ. Unani physicians believed that incorporation of nutriment occurs in three steps that is reception, adhesion and resemblance/similarity. These three steps are performed by receptive faculty, adhesive faculty and secondary transformative faculty. This secondary transformative faculty is organ specific [1, 3, 5, 6]. These three steps are not described in modern physiology. Filtration of plasma along with contents at arterial end of capillary fills the interstitial spaces of tissues. From here nutriment enters into cells as per physicochemical principles and ultimately anabolized and catabolized as per need of the tissue [10]. Unani physician believed that *mizāj* specific nutriment is picked up by organs from the admixture of humours by attractive or receptive faculty [1]. However, in modern physiology specific channels are described for amino acids and glucose etc. for their transport into the cells. Once glucose and amino acids etc. are entered into cell get anabolized or catabolised according to need of cells/tissues [10, 11].

4. Conclusion

Unani medicine when compared with conventional knowledge, it seems that Unani medicine furnishes a comprehensive view of the transformation and incorporation of nutriment into the body, but the details of present medical science need to be suitably incorporated so as to validate Unani view which is based on the observations analysed through logical deduction.

5. References

1. Majoosi AHBA. Kamil-us-Sana (Urdu transl. Hkm. G.H.Kantoori). New Delhi: Idara Kitab us Shifa, 2010.
2. Jurjani I. Zakhira khwarizam Shahi. New Delhi: Idara kitab us Shifa, 2010.
3. Masihi ASIBYBI. Kitab-ul-Mia. Vol.1 (Urdu Translation). New Delhi: CCRUM, 2008.
4. Ibn Sina. Al Qanoon fit Tibb (Urdu Translation by Kantoori GH). New Delhi: Idara Kitab-us-Shifa; YNM.
5. Nafis BU. Kulliyat-e-Nafisi (Urdu Translation by Kabiruddin M). New Delhi: Idara Kitabul Shifa; 1954.
6. Baghdadi IH. Kitab-al-Mukhtarat Fit Tibb. Vol.1. New Delhi: CCRUM, 2005.
7. Kabiruddin M. Ifadae kabir. New Delhi: CCRUM, 2001
8. Cacciafoco P. Food as therapy -Elements of history of nutrition in ancient Greece and Rome. Fiori di Cactus 2012.
9. Dobson JF. Ereasistratus. Proceedings of the royal society of medicine, 1927.
10. Hall JE. Guyton & Hall Textbook of Medical physiology. 12th ed. New Delhi, Elsevier, 2013.
11. Sembulnigam K, Sebulnigam P. Essential of Medical Physiology. 6th ed. New Delhi: Jaypee Brothers, 2012.
12. Zulkifle M, Zaidi IH, Ansari AH. Quwate tabiya-A concept. UNIMED 2005-2006; 2(2).
13. Khoshzaban F, Borhani M, Jodeiri B, Naseri M, Kamlinejad M, Talei D, *et al*. Functional gastro intestinal disorders (FGID) and Iranian Traditional of medicine. Advances in Environmental Biology. 2014; 8(9).
14. Rushd AWI. Kitab-ul-Kulliyat. New Delhi: CCRUM, 1987.
15. Kulliyate Qanoon (Urdu Translation by Kabiruddin M). New Delhi: Aijaj publication house; YNM.
16. Tabri AABSR. Firdaus-ul-Hikmat (Urdu Translation by Sambhali MAS). New Delhi: Idara Kitab-us-Shifa, 2010.
17. Arzani MA. Mufarrehul quloob. New Delhi: Idara Kitabu shifa, 2006; 21.