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REVIEW ARTICLE

Genomic Insights into the Correlation between Gut Microbiota and *Dehagni* A Review

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ABSTRACT

The entire gastrointestinal tract is colonized by a varied range of bacteria, archaea, and eukaryotes, together known as the human gut microbiota. The microbiome is made up of the genes that these resident microorganisms encode. The synthesis of vitamins and other nutrients, energy homeostasis and metabolism, immune system development and regulation, and digestion are just a few of the essential functions that the gut microbiota is involved in. Keeping the immune system in balance and preserving good health depend on a diversified and well-balanced microbiome. When internal or external influences disturb the intricate and delicate ecology of microbial populations, dysbiosis results. Known for his proverb "all disease begins in the gut," Hippocrates is considered the father of modern Western medicine. A balanced diet, regular digestion, and an all-encompassing lifestyle are highly regarded. In Ayurveda, Agni transforms food into energy, which powers all of our body's essential processes. An individual would be perfectly healthy and have a long, happy, healthy life when their Agni is Sama. However, a person's entire body's metabolism would be thrown off balance if their Agni were vitiated, leading to illness and poor health. Agni is therefore referred to as the *mool* or base of life. It may be possible to learn more about how the gut microbiota influences Agni by comprehending the genetic variables that impact it. Important knowledge on the function of the microbiota in preserving a healthy digestive tract has been made possible by genomic discoveries regarding the association between gut microbiota and Agni.

1. INTRODUCTION

The human gut microbiota is rich in diverse microbes such as bacteria, archaea, and eukaryotes colonizing the entire gastrointestinal (GI) tract, and the genes encoded by these resident bacteria constitute the microbiome. It comprises trillions of microbes relentlessly attuned to create a complex repertoire of biochemical mechanisms for an adaptively specific ecosystem. It is an inextricable and resilient part of human metabolism, nutrition, immune mechanism, and mental well-being.[1]

The human body is home to a vast and diverse community of microorganisms, primarily bacteria, which outnumber our own cells by a significant margin. In fact, the collective genetic material possessed by these microbial inhabitants, known as the microbiome, is estimated to be at least 150 times more extensive than the human genome itself.[2] This staggering statistic underscores the sheer magnitude and complexity of the microbial world that resides within us, playing crucial roles in maintaining our health and well-being.

Recent research highlights that the gut microbiota plays a crucial role in maintaining and shaping our physiological functions, effectively acting as an additional organ. Variations in the gut microbiome are associated with numerous host and environmental influences, including diet, genetic factors, and hormonal levels.[3]

Energy, which powers all of our body's essential processes, is transformed from food by *Agni* (digestive fire). It follows that according to Ayurveda, *Dehagni* is the source of all things: *Oja*, *Teja* (energy), *Prana* (living energy), complexion, strength, health, and feed.[4] When Agni stops functioning, an individual dies; however, when Agni is active, a person is perfectly healthy and enjoys a long, happy, and healthy life. These are some of Acharya Charak's teachings on the significance of Agni.[5] On the other hand, a person's entire body's metabolism would be thrown off balance if their *Agni* was vitiated, leading to illness. Hence, *Agni* is referred to as life's foundation (*mool*).[5]

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Modern medicine holds that all of our body's cells (*Dhatu Paramanu*) undergo metabolic activities, division, and multiplication from the moment of birth till death. The body's functional unit is the cell. Charak states that if the body's constituent parts are further divided into atoms, they would become countless, as these cells and atoms are extremely numerous, very small, and highly sensitive. The processes of conjunction and disjunction of these cells are influenced by Vata and the nature of their action.[6]

2. GUT MICROBIOTA

The production of vitamins and other nutrients, energy homeostasis and metabolism, immune system development and regulation, and digestion are all essential functions that include the gut microbiome. In addition, it helps produce a variety of substances that enter the bloodstream and impact different body tissues and organs shown in fig 1.[7]

The gut and other parts of the body may experience issues when the microbiome is out of balance, but when it is in harmony, it offers numerous health advantages. When internal or external influences disturb the intricate and delicate ecology of microbial populations, dysbiosis results. One or more of the many microbial colonies' expansion indicates a disturbed microbiome. An inflammatory condition could be the outcome of a complicated interaction between the immune system and the microbiota. Numerous GI disorders, such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD), have been linked to an unbalanced microbiota.[8]

2.1. Digestive System

Vipaka (metabolic transformation) is the term used by Ayurveda to describe how food and medication are metabolized. In Ayurveda, the metabolic energy is called *"Agni."* Similarities exist between this and the different roles that the gut microbiota plays in the body's metabolism of proteins, carbs, lipids, and other nutrients shown in table 1.[10] *Mandangi* and microbes – In *Mandagni* (low digestive fire), digestive enzymes are not adequate to make correct compounds. Microbes do not work properly over undigested food and form a toxic substance called "*Aama*" (body toxins) which is the root cause for most of diseases. *Tikshagni* and microbes – High, intense digestive fire makes the food completely burnt. Everything is converted into ash resulting in poor nutrition. A well-functioning microbiome can enhance the effectiveness of *Tikshagni* by improving nutrient absorption, modulating inflammation, and influencing metabolism. The composition of the gut microbiome can affect metabolic processes, which are integral to maintaining the energy balance that supports *Tikshagni.*

Vishamagni and microbes – Undigested digested, and partially digested food makes a toxic compound and forms a pathological condition called *Vishabdhajirna* which vitiates the *Apana vayu* and *Samana vayu*. Gut microbes do not make correct interactions with this mixture of undigested, digested, and partially digested food resulting in *Vikriti* of the digestive tract.[10]

2.2. Gut-Brain Axis

Ayurveda perspective Acharya Dalhan in his commentary stated that the *"Purishdharakala"* is the same as *Asthidharakala*, while the *Pittadhara* is similar to the *Majjadharakala*. Considering the modern perspective, few efforts have been taken to establish this correlation in the Ayurveda perspective considering the *Majja* (nervous tissues) to be present in the *Asthi* (bone marrow).[11] However, in this scene, *Majjadharakala* is thought to be associated with the nervous system and the relation between *Pittadhara* and *Majjadhara* can be established through modern anatomy and physiology. The *Pittadharakala* is associated with the function of *Pachan* (digestion) and involves the part of the GI tract. *Acharya Dalhan* in *Kalpasthan* has mentioned *Pittadhara* as *Majjadharakala*. No explicit explanation is found in this regard in the Samhitas. However, a search into modern medicine was helpful in the interpretation of "*Pittdharasaevamajjadharaiti*." Considering the skull as the casing of the brain and the vertebrae as the casing of the spinal cord, *Majja* can be associated with the entire nervous system. In the context of the above, the *Majjadharakala* is associated with the nervous system. The immunological and neuroendocrine systems share ligands, including neuropeptides, hormones, cytokines, and corresponding receptors, which form the basis of the bidirectional pathway. Different invasive and inflammatory stimuli cause the peripheral ends of sensory and efferent neurons to emit a variety of neuropeptides. Because of their anti-inflammatory and antinociceptive qualities, neuropeptides – such as the opioids released during inflammation – have the potential to treat inflammatory and autoimmune disorders by modulating immune homeostasis in a way akin to cytokines. The above description regarding the brain-gut connection is helpful in establishing the fact stated by Dalhan about the relationship between *Pittadhara* and *Majjadhara kala*.[11]

3. DISCUSSION

According to Ayurvedic philosophy, *agni* is responsible for the digestion, absorption, and assimilation of nutrients, and it is considered crucial for overall health and well-being. The gut microbiome, on the other hand, refers to the community of microorganisms (bacteria, viruses, fungi, etc.) residing in the GI tract. These microbes play a significant role in various physiological functions, including digestion, metabolism, immune function, and even mental health. There is growing evidence suggesting a close relationship between the gut microbiome and digestive health, which aligns with the Ayurvedic concept of *agni* shown in table 2.

Alterations in the functionally rhythmic activity of the human body create an imbalance in homeostasis and Ayurveda management of this circadian rhythm is of paramount concern. Therapeutic and dietary interventions in addition to the bed-to-bed activities of daily living, help in maintaining the natural biological rhythm and improve the adaptability of the person in accordance with season and age. Healthy food and feeding practices such as avoidance of incompatible combinations of food, method of preparation, post-feeding practices such as walking, etc. can help improve the gut microbiome status so as to prevent many diseases.[1]

4. CONCLUSION

In conclusion, there seems to be a connection between gut microbial health and the Ayurvedic idea of *agni*, even while scientific research is still needed to fully understand the intricate relationships between the gut microbiome and other aspects of health, such as digestion, metabolism, and immunological function. In line with Ayurvedic principles, maintaining a diverse and balanced gut microbiota through dietary and lifestyle interventions may support good digestive function and general well-being. It is believed that the unique dynamic ecology of the gut microbiota that develops during an individual's early years is a "Organ" that is metabolically active and responsible for both the development of diseases during the course of an individual's lifetime.

Comprehensive and functional research has shown that the gut microbiota may 1 day be used as a biomarker for particular diseases and targeted modifications of the gut microbiota will assist in the progress of the area.

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REFERENCES

1. Dinesh KS, Krishna S, Chitra S, George MJ, Patel A. Concept of human gut microbiome in health and disease-an Ayurveda perspective. World J Pharm Pharm Sci 2020;9:771-8.
2. Qin J, Li R, Raes J, Arumugam M, Burgdorf KS, Manichanh C, *et al*. A human gut microbial gene catalogue established by metagenomic sequencing. Nature 2010;464:59-65.
3. Edwards DP. Regulation of signal transduction pathways by estrogen and progesterone. Annu Rev Physiol 2005;67:335-76.
4. Charaka S. Commentator-Pt. Kashinath Sashtri and Dr. Gorakhnath Chaturvedi. Chikitsasthana, 15/2. Reprint ed. Varanasi: Chaukhambha Bharti Academy; 2014. p. 452.
5. Charaka S. Commentator-Pt. Kashinath Sashtri and Dr. Gorakhnath Chaturvedi. Chikitsasthana, 15/4. Reprint ed. Varanasi: Chaukhambha Bharti Academy; 2014. p. 452.
6. Charaka S. Commentator-Pt. Kashinath Sashtri and Dr. Gorakhnath Chaturvedi. Sharirastana, 17/7. Reprint ed. Varanasi: Chaukhambha Bharti Academy; 2014. p. 452.
7. Mohajeri MH, Brummer RJ, Rastall RA, Weersma RK, Harmsen HJ, Faas M, *et al*. The role of the microbiome for human health: From basic science to clinical applications. Eur J Nutr 2018;57:1-14.
8. Sommer F, Bäckhed F. The gut microbiota engages different signaling pathways to induce Duox2 expression in the ileum and colon epithelium. Mucosal Immunol 2015;8:372-9.
9. Kovatcheva-Datchary P, Tremaroli V, Bäckhed F. The gut microbiota. In: Rosenberg E, DeLong EF, Lory S, Stackebrandt E, Thompson F, editors. The Prokaryotes-Human Microbiology. Berlin, Heidelberg: Springer-Verlag; 2013. p. 87-104.
10. Ranade A, Gayakwad S, Chougule S, Shirolkar A, Gaidhani S, Pawar SD. Gut microbiota: Metabolic programmers as a lead for deciphering Ayurvedic pharmacokinetics. Curr Sci 2020;119: 451-61.
11. Vanita CF, Amol PP, Pranali AN. A critical review of healthy and diseased gut microbiota in accordance with modern science and Ayurveda. Int Ayurvedic Med J 2022;11:1-10.
12. General Gut Microbiome: Marquet P, Duncan, SH, Chassard C, Bernalier-Donadille A, and Flint, HJ. Microbial lactate utilisation and the stability of the gut microbiome. Gut Microbiome 2009;1:1-13.

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Table 1: Relevant metabolic features of members of the human gut microbiota

Microbial group	Species	Metabolic function
Bacteroidetes	*Bacteroidetes* spp. *Prevotella* spp. *B. Thetaiotaomicron*	Polysaccharides breakdown; L-, S- Polysaccharides breakdown; L-, S- Polysaccharides breakdown, Mucin degradation
Actinobacteria	*Bifidobacterium adolescentis* *B. longum* *B. bifidum* *Collinsella*	Carbohydrate metabolism Carbohydrate metabolism Carbohydrate metabolism Carbohydrate metabolism
Clostridium cluster IV	*Ruminococcus bromii* *R. flavefaciens* *F. prausnitzii*	Carbohydrate metabolism Plant fibre breakdown Carbohydrate metabolism
Clostridium cluster IX	*Mitsoukella multiacida* *Megasphaera elsdeni*	Gluconic acid metabolism; A- Gluconic acid metabolism; A-, L-
Proteobacteria	*Desulfovibrio* spp.*: e.g.* *Desulfovibrio piger* *Desulfovibrio desulfuricans*	SRB, L- SRB, L
Verrucomicrobial	*Akkermansia muciniphila* *Victivallis vadenis*	Mucin degradation Cellobiose degradation

*Llactate utilizer, Ssuccinate utilizer[12], Aacetate utilizer, SRB: Sulphate-reducing bacteria

Table 2: Comparison between the functions of Ayurveda concept of *Agni* and the concept of intestinal microbiome

S. No.	Intestinal microbiome	Ayurveda concept of *Agni*
1	Destruction of gut microbiota leads to life-threatening problems	Vitiation of *agni* disturbs the whole metabolism, resulting in ill health and Disease
2	Gut microbiota contribute to the digestive efficiency of the host	Charaka Samhitha has emphasized that when there is normal *agni*, the person would be absolutely healthy and would lead a long, happy, healthy life
3	The gut microbiota has a pivot role in regulating immune homeostasis and the health of the host	*Agni* is the source of strength (immunity) and in turn the source of life
4	Disruption of gut microbiota can impair physical and mental health	Mental Strength, enthusiasm, etc., depends on *Agni*
5	The composition of bacterial communities influences the reproductive, pregnancy, and infant health	Reproductive – Sluggish metabolism affects reproductive health Pregnancy – Abnormal dietetics leads to complications in pregnancy Fetal health – The nourishment of the fetus as a result of the metabolism of the nutritional circulation through the placenta
6	Homeostasis in metabolism gets affected by altered gut microbiota	Ayurveda considers that *Agni* is the cause of life, strength, metabolism, and nourishment
7	All disease begins in the gut	All diseases originate in the gut
8	Changes in microbial population results in the increasing propensity of non-communicable diseases	All non-communicable diseases develop only when the digestive fire is weak and not when it is powerful
9	Gut microbiota plays critical roles in drug metabolism	*Agni* plays an important role in the assimilation of the final end products of drug metabolism
10	The normal gut microbiota imparts a specific function in protection against pathogens	All diseases are caused due to impairment in *agni*
11	Differential diurnal variation in microbial structure and function also depends upon the dietary composition	Age of the individual, circadian rhythm, and metabolism are the basic factors which influence the physiology of the human body[1]

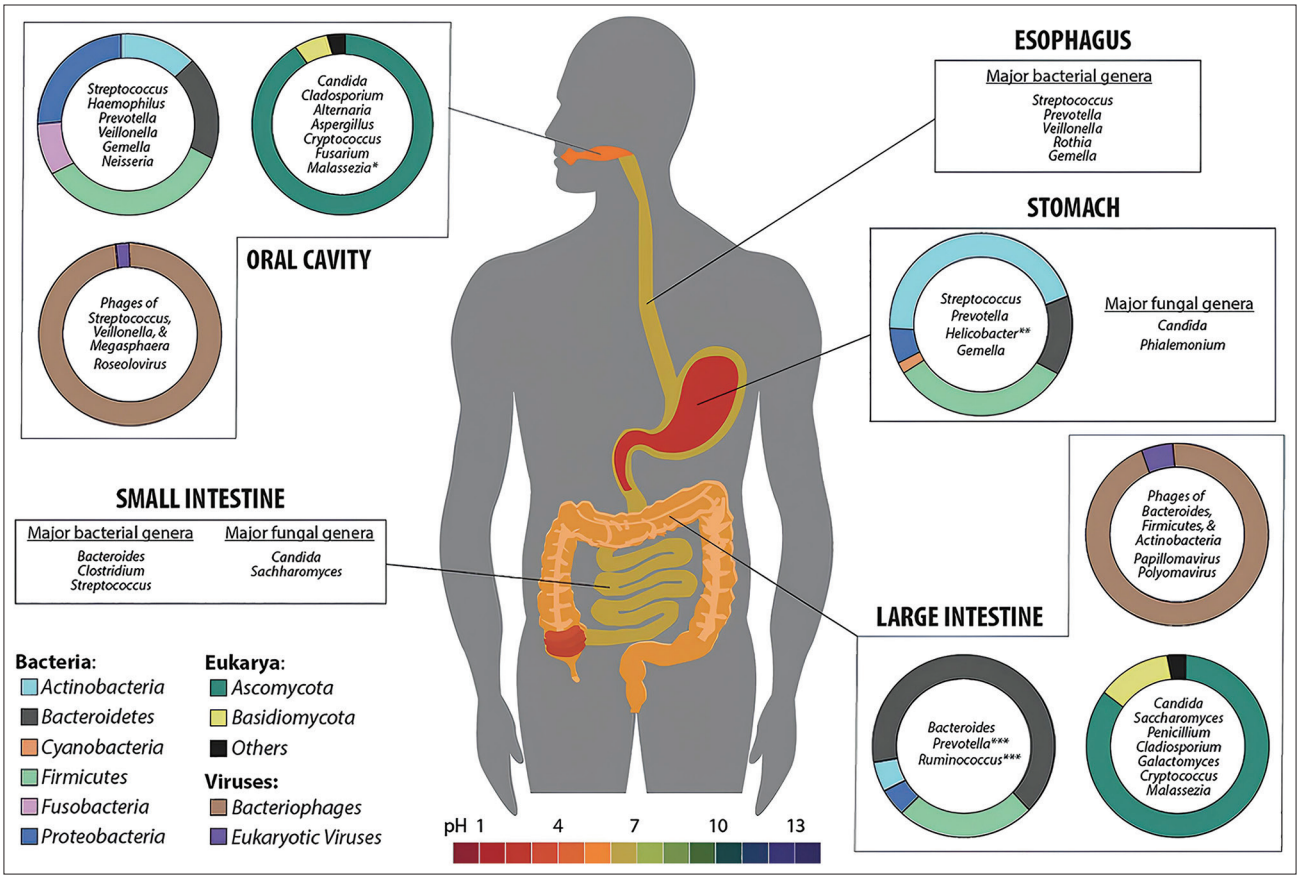

Figure 1: Variations of the gut microbiota composition and numbers along the length of the gastrointestinal tract[9]