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GUT-BRAIN AXIS AND AYURVEDIC CONCEPT OF AGNI

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Keywords	***Abstract***
Ama, *Agni and Gut-Brain-Axis*	Digestive function, psychological stability, and overall health are all impacted by the gut-brain axis, a complex network of bidirectional signals that connects the GI tract to the central nervous system. Ancient Ayurvedic texts are in harmony with modern scientific understanding of the importance of gut flora, immunological signalling, and neurological connections. The Ayurvedic theory of health emphasises the interdependence of the Sharira (body), Manas (mind), and Atma (consciousness), with proper digestion playing a pivotal role in maintaining harmony among these three aspects of being. Together, the vagus nerve, spinal nerve, hormonal and immunological signalling, and microbial metabolites create the microbiome gut-brain axis, which has a vast reciprocal relationship with the human brain. Additionally, the gut flora may be impacted by lifestyle variables such drug usage, lack of physical exercise, stress, sleep habits, and junk food consumption. Negative effects on microbiome balance and metabolite release might result from chronic stress and sleep deprivation. A number of medical difficulties have been associated with dysbiosis, including gastrointestinal illnesses, metabolic diseases (such as diabetes and obesity), autoimmune disorders (such as rheumatoid arthritis and multiple sclerosis),

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	allergies, and mental health problems (such as anxiety and depression). This article compares and contrasts the two entities' structures and functions, explains how they differ, and asks if a microbial metabolite or dysbiosis falls under the umbrella of Agni Dusti.

INTRODUCTION

Ayurveda is an old medical system that emphasises the interconnectedness of the whole person, including their mind, spirit, and physical self. That was a long time ago, before Ayurvedic wise men and women made claims about GBA that are similar to what we know now from scientific research. According to Ayurvedic principles, the foundation of health and wellbeing is the abdomen, namely the Amashaya and Pakwashaya. It explains the function of the digestive fire (Agni) in breaking down food into the vital life force energy (Oja or Prana) that supports one's mental and physical health.

Two ancient Ayurvedic scriptures, the Charaka Samhita and the Sushruta Samhita, describe the relationship between the Sharira (body), the Manas (mind), and the Atma (consciousness). This is consistent with the human experience, according to which one's digestive health controls one's mental and physical well-being as well as their emotional and spiritual encounters. Thus, Ayurveda's knowledge encompasses both preventative and curative techniques for achieving gut-brain harmony and maintaining homeostasis. Previous research has provided insight into the incredible complexity of the digestive system. An extensive network of neurones called an ENS may be implanted into the lining of the digestive tract and then connect with the central nervous system (CNS) via a neural route. A vast network of neurones that can integrate into the intestinal lining and connect with the central nervous system via neuronal pathways, immunological signalling, and the microbiota. This gives new life to an ancient adage from Ayurvedic texts on the importance of the digestive tract to overall wellness.

Grahani is the location of Agni; it gets its name from the fact that it has the capacity to retain food; it is located above the umbilical area and receives support and nourishment from Agni. Ayurvedic therapy focuses on regulating and controlling Agni since it is believed that an imbalance in this energy field promotes the creation of Ama. There are four varieties of Agni: Samagni, Vishamaagni, Tikshna Agni, and Manda Agni [1]. A major source of internal illness, ama is a toxic, pro-inflammatory waste product that plugs the body's channels and stimulates unfavourable immunological responses.Externally visible disorders might also cause the body to create Ama. Misunderstandings and unsettled emotions give birth to potentially destructive mental states like wrath, selfishness, and greed, which in turn cause psychological pain, which in turn causes a psychological form of Ama [2].the thirdFor this reason, treating ama—also known as the "Root cause of all diseases"—includes getting rid of it.[3] Whether a host is healthy or sick, the gut microbiota is a key player. The diverse community of microbes that inhabit the gastrointestinal system includes bacteria, archaea, eucharia, viruses, fungus, and bacteriophages. Digestive,

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metabolic, immunological, and environmental activities are mostly mediated by bacteria. A person's microbiome may change over the course of their lifetime due to changes in their environment, diet, stress, genetic predisposition, medications, location, age, and gender. Dysbiosis refers to this change in gut microbial composition and is linked to a variety of health problems, including gastrointestinal illnesses, metabolic diseases (such as diabetes and obesity), immunological disorders (such as allergies and asthma), and mental health difficulties (such as anxiety and depression). It has only recently come to light that the bacteria in our guts might influence the inflammation and function of our central nervous system (CNS). Biochemical signals go in both directions along the gut-brain axis, which connects the GI tract to the CNS. [4]

METHODOLOGY

In this narrative overview, we seek to comprehend how the contemporary scientific knowledge of the Gut-Brain Axis relates to the ancient Ayurvedic idea of Agni, or digestive fire. This review brings together modern findings on the microbiome, the gut microbiota, and the two-way connection between the brain and the digestive tract with the traditional Ayurvedic concepts of Agni, Ama, and Grahani.

Search Strategy: The following electronic databases were used to do a thorough literature search: Web of Science, AYUSH Research Portal, PubMed, Google Scholar, Scopus, and DHARA. We looked at the original texts and commentaries of classic *Ayurvedic* works including the *Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya*. Boolean combinations of keywords such as *"Agni," "Jatharagni," "Ama," "Grahani," "Gut-Brain Axis," "Gut Microbiota," "Microbiome," "Dysbiosis," "Ayurveda and Gut-Brain Axis," "Ama and Endotoxins," "Agni and Microbiota*," and appropriate combinations of these were used.

Review Methodology: The primary focus was on literature written between 2000 and 2025, while classical Ayurvedic works were considered regardless of when they were published. We found and evaluated full-text publications, review papers, and genuine commentary. Digestive health, immunity, metabolism, and mental health were among of the areas where the conceptual, structural, and functional connections between Agni/Ama and the gut-brain axis were highlighted. To combine traditional Ayurvedic knowledge with current scientific findings, a narrative synthesis method was used. Since this review is more theoretical and exploratory in character, no meta-analysis was conducted.

Data Synthesis: Topics covered in the extracted data include: an overview of Agni and the gut-brain axis; a breakdown of its structure and function; the function of Agni in the connection between the gut and the brain; the role of Ama and microbial endotoxins in the development of illness; and clinical correlations. In particular, similarities between gut dysbiosis and microbial metabolites and Agni Dushti/Ama were considered.

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Ethical Consideration: Ethical clearance was unnecessary for this study since it is a survey of existing material and classic works. Proper citation of all sources has been ensured to maintain academic integrity.

INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria Literature was included in this review if it fulfilled the following criteria:

- The Agni (particularly Jatharagni), Ama, and Grahani (and their functions in digestion, metabolism, and overall health) as described in classical Ayurvedic writings and commentary.
- Peer-reviewed research on neurological and physiological processes pertaining to dysbiosis, the gut microbiota, the gut-brain axis, and the microbiome.
- Research examining the similarities and differences between Ayurvedic ideas about Agni and Ama and current theories about the gut-brain axis from a philosophical, structural, or functional perspective.
- Books, scholarly papers, and genuine Ayurvedic texts published in English that have undergone peer review.
- Classical Ayurvedic works written between 2000 and 2025 are included, regardless of publication date.

Exclusion Criteria The following were excluded from the review:

- Pieces that gloss over Agni and Ama in favour of other Ayurvedic ideas (such as Prakriti and Dinacharya).
- Research that has nothing to do with digestive physiology or the gut-brain connection.
- Articles that have not been peer-reviewed, such as editorials, conference abstracts, and opinion pieces, often lack extensive references to classical or scientific works.
- Studies that don't apply to healthy people or that use animal models to study diseases do not contribute to our conceptual knowledge of the world.
- Non-English language articles published in periodicals.
- Works that have already been published or are missing key conceptual or methodological information.

GUT-BRAIN AXIS AND THE BRAIN

The gut-brain axis refers to the intricate network of nerve impulses sent by the vagus nerve, which in turn involves hormones, microbial activity, and the gastrointestinal system. Several mental health concerns have been associated with imbalances in the gut microbiota, which may affect neurological,

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emotional, and mental well-being. Illness and bad health are the results of an imbalance of the doshas, which are biological energies in Ayurveda. The goal of most medical treatments is to restore the body's natural equilibrium, or homeostasis, in order to alleviate illness. According to Eliot Steer, who cites Ayurvedic scriptures, the link between digestive health and neurodegenerative toxins is an imbalance in digestion and the buildup of toxins (ama) in the body. Ayurvedic ideas about Agni (digestive fire) and Ama (toxins) provide a framework that is comparable to modern worries about gut dysregulation and microbial imbalances, and poor digestion is associated with chronic inflammation and illness [5].

Many gastrointestinal disorders, including GERD, irritable bowel syndrome (IBS), and ulcerative colitis, have their roots in the stomach's acidity level, which is a manifestation of Agni. A simple definition of ama would be "the accumulation of toxic by-products that the body is unable to neutralise or eliminate due to an abnormal or impaired process of digestion and metabolism" [6]. For optimal health, the body's Agni and Ama energies must be in harmony, and Ayurveda offers a wide variety of treatments to bring this harmony back. Modern gastroenterologists and dietitians advocate for prebiotics and probiotics as a means of sustaining the stomach microbiome, or the "good bacteria" that contribute to digestive health. Irritable bowel syndrome (IBS), Crohn's disease (Crohn's), and leaky gut (a toxin-releasing illness) are all symptoms of a bacterial deficiency that may have serious consequences for brain function.

STRUCTURAL UNDERSTANDING OF THE AGNI AND GUT– BRAIN AXIS

The digestive fire, Agni, is associated with all of the body's metabolic processes. All the Acharyas agree that the Grahani is where Agni is placed. There are three ways to look at the term "grahani": as an anatomical structure, as a dosha, and as roga. In order to grasp Grahani's function in Pachanakriya, we treat Grahania as a physical building. Grahani is described as Agnyaadhisthana Nadi [7], which means tubular construction, according to Shabdakalpadhruma Grahani. Based on the information provided by Acharya Sushruta and Vagbhata, we may deduce that the gastro-intestinal tract is situated between the Amashaya and Pakwashaya. Mucosa, submucosa, a layer of circular muscle, and a layer of longitudinal muscle make up the gastrointestinal system. The submucosa and mucosa layers contain one hundred trillion microorganisms. People's guts are home to a diverse community of bacteria and archaea. Eucharia, fungus & viruses which help indigestion of meals. The central nervous system and the endocannabinoid system of the body are connected in a two-way street via the gut-brain axis. Integral to the lining of the digestive system is the ENS, a network of sensory neurones, motor neurones, and interneurons. Beginning from the base of the throat and continuing all the way to the rectum. The gut-brain axis is a complex network that includes the autonomic nervous system, the immunological system (cytokines and chemokines), and the hypothalamic-pituitary-adrenal axis, which are endocrine systems. [8]

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UNDERSTANDING THE PERSPECTIVES FROM AYURVEDA ON GUT MICROBIOTA

Some of the most crucial neuro-cognitive processes, including longevity, strength, vitality, motor functioning, and immunity, are believed by Ayurveda to be rooted in the state of "Agni" (metabolic factors) in the body. [9] Given the makeup of the gut flora, it is vital to comprehend the roles played by Agni in the duodenum and intestines, known as "Grahani," in the current setting.

Various Doshas, which are regulatory functional aspects of the body, orchestrate the digestive tract's breakdown of food particles into absorbable nutrients.[9] According to Ayurveda, the existence of a varied microbiota in the gut is necessary for the process of "Paka (~digestion or transformation)" which involves converting nutrients into forms that the body can absorb better.[10]

The disruption of "Agni" owing to pathogenic flora causes an imbalance in the gut microbiota, which in turn disturbs the gut-brain axis pathways and ultimately causes cognitive deficits. "Grahanyashrita Agni Dosha" means "gut dysbiosis" in a nutshell.[9]

In order to cure cognitive deficits using the "Rasayana (rejuvenation and revitalisation)" therapies—which aim to restore virility and youthfulness in the ageing life—Ayurveda also describes "pathogen evacuation" from the stomach as the first stage.[11] The term used to describe the process of cleansing the body of toxins, including gut pathogens, is "Shareera Shodhana (~bio-cleansing therapy)." For this purpose, it is recommended to combine the fruits of Haritaki (Terminalia chebula) with those of Amalaki (Emblica officinalis Gaertn.), Salt (Saidhava variety), Jaggery, Vacha (Acorous calamus L.), Vidanga (Embelia ribes Burm), Haridra (Curcuma longa L.), Nagara (Zingiber officinale Roxb.), and Pippali (Piper longum L.).[12]

Improved gut-brain axis function via increased neurotransmitter synthesis results from beneficial gut bacteria outcompeting harmful bacteria. It is possible that this occurrence is the rationale for the Ayurvedic practice of recommending bowel cleaning methods prior to the use of Rasayana (rejuvenating) medications.the eleventh

Because there is a considerable probability of eliminating helpful gut flora along with the infections, cleaning alone does not rejuvenate and may even create greater damage. After colon cleansing, it is recommended to follow a specific diet plan called "Samsarjana Krama" (a dietary regimen for restoring Agni, or gut microbiota). This plan includes foods like barley gruel, red rice gruel, and green gram gruel, among others. These grains are typically cooked with herbs that are both medicinal and delicious, and ghee is added for flavour [13]. After the stomach is emptied, this signifies the beginning of the process of re-establishing a balanced microbial flora. Research on possible treatments to enhance cognitive abilities in the elderly has consistently shown that these programs lead to a more diverse gut microbiota with more good bacteria and less harmful ones. Rasayana medications may help improve and recover impaired cognitive capacities in the elderly by restoring gut flora balance, which in turn leads to exceptionally complete nutritional absorption [14].

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In Ayurveda, there is vital and extensive information about the eating habits that can cause an imbalance in the gut microbiota, indigestion, and constipation. According to Ayurveda, "Gramyaahara (~Urban food/Processed food)" is the main cause of cognitive defects and structural impairments in the entire body.[15] Confirming this Ayurvedic assertion, modern science has shown that eating processed meals, especially ultra-processed foods, may significantly increase the number of pathogens in the gut microbiota, leading to dementia and cognitive impairment in the elderly.[16]

FUNCTIONAL UNDERSTANDING OF AGNI AND GUT MICROBIOTA

- The mucosal barrier is kept intact by microbiota. Intestinal microbiota produce essential nutrients including vitamins, metabolites, neuroactive substances, gut hormones, and short-chain fatty acids. Propionate, butyrate, and acetate are some of the most important short chain fatty acids. Intestinal gluconeogenesis, homeostasis (maintained by butyrate as the energy source for human colonocytes), and the prevention of gut microbiota dysbiosis (via B-oxidation) are all processes that are comparable to those of Agni -Aarogyam.
- The meal is fermented and digested by microbiota. The function of Agni, also known as Tejas Microbiota, aids in induction training, and acetone, one of the main short-chain fatty acids, plays a role in the control of central hunger.
- Influencing and controlling the local immune response as well as the systemic innate and adaptive immune response. Similar to the Agni's described Bala and Ojas actions, the immune system's action on short-chain fatty acids reduces inflammation.

ROLE OF AGNI IN GUT-BRAIN AXIS

The gut-brain axis is essential for general health because of the two-way communication it provides. However, digestive fire (Agni) may be disrupted by reasons like eating unsuitable foods (Viruddhaahara), having irregular eating patterns (Vishamashana), and making bad lifestyle choices. A disturbance like this causes the Doshas and Dhatus to become unbalanced, which in turn causes illness. Dysbiosis occurs when the diversity of gut microbiota is altered, often as a result of a sedentary lifestyle, sugar consumption, and processed food consumption. The microbiota that lines the inside of the digestive tract is similar to Agni in that it is essential to the process of breaking down food. As a condition of Agni Dusti, or digestive impairment, dysbiosis may be seen via this lens. Agni Dusti, which might progress to disease, can be caused by both physical and mental and emotional elements, including Manasika bhava.Serotonin synthesis occurs in the gut microbiota, and any disruption to this ecosystem may lead to brain disorders such as depression. Ancient Ayurvedic academics stressed the importance of mental forces in disturbing Agni. Some psychological elements, as stated by Madhava Nidana, include

- Irshya (jealousy)
- Bhaya (fear)
- Krodha (anger)

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- Lubdha (confusion)
- Ruk nipidita (physical pain)
- Dainya nipidita (depression)
- Pradvesha yukta (food aversion) [17]

Moderate consumption of healthy meals does not guarantee normal digestion for those dealing with:

- Chinta (worry)
- Shoka (grief)
- Bhaya (fear)
- Krodha (anger)

Agni is directly impacted by these mental aspects, which may lead to dysbiosis and decreased digestion. Anger, for example, may upset Pitta Dosha, which can cause digestive issues and even neurological diseases if left unchecked. Agni may be disturbed by both mental and behavioural issues; for example, by choosing to stay up late (Ratrijagrana). This may cause dysbiosis, gastrointestinal problems, and an imbalance of Vata Dosha, which in turn can aggravate mental health problems. An important function in many disorders is the gut-brain axis, which is formed when the vagus nerve connects the brain to the stomach and vice versa. to activate the vagus nerve while under stress. The cortisol releasing hormone (CRH) is secreted by the HPA axis. This will have an effect on immunocytes, which secrete peptides from mast cells and other cells. The gut lining is destroyed, the gut microbiota is altered, and dysbiosis (Agnidusti) occurs.

Agni and Hunger Regulation:

The Merging of Ayurveda and Neuroscience The continued importance of Agni is supported by contemporary ideas of appetite regulation. Jean Mayer postulated the glucostatic hypothesis, which states that the brain's glucose supply affects appetite.[18] When glucose is scarce, hunger rises; when glucose is plentiful, fullness sets in. Research using the Oral Glucose Tolerance Test (OGTT) suggests that those whose glucose levels drop after the test can end up feeling more hungry than usual, which might lead to weight gain.[19] Ayurvedic viewpoints are congruent with this process. Stable metabolism and regulated hunger are results of a robust JatharAgni (digestive fire), which guarantees effective meal breakdown and promotes correct DhatvAgni operation. But problems with JatharAgni may lead to unstable metabolism and erratic hunger signals, which in turn can lead to obesity, insulin resistance, and metabolic syndrome.In [20], Agni is more than just digestion in both ancient and contemporary systems; it is the intellectual power that controls the creation, distribution, and consumption of energy. It is a vital part of the body's comprehensive health maintenance system because of the wide range of processes it regulates, from digesting at the gastrointestinal level to cellular respiration.

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Scientific understanding of gut microbiota

The gut microbiota is the extensive and varied microbial population that mostly inhabits the human digestive system. It includes bacteria, viruses, fungus, and archaea. Beneficial microorganisms promote digestion, produce vitamins, regulate the immune system, and ward off harmful pathogens; all of which are essential to good health. The varied and well-balanced gut microbiota has recently come to light because to advances in genome sequencing technology, which have made extensive characterisation of these microbial communities possible.[21] Butyrate, acetate, and propionate are short-chain fatty acids (SCFAs) produced by microorganisms in the digestive tract from undigested food fibres. These SCFAs provide energy to colonocytes and have anti-inflammatory effects throughout the body. Both mental health and the control of metabolism are affected by the gut microbiota, which in turn affects the gut-brain axis.[22] Many diseases and illnesses, including as inflammatory bowel disease, diabetes, obesity, and neurodegenerative disorders, have been associated with dysbiosis, which is an imbalance in the makeup of the gut microbiota. We now know that intestinal homeostasis and general health are dependent on the dynamic interplay between the host and gut flora.There is an exciting biological basis that fits with ancient ideas like Agni in Ayurveda, as the scientific study of gut microbiota highlights its vital role in digestive processes, immunological regulation, and systemic health [23].

AMA AND MICROBIAL ENDOTOXINS IN PRODUCTION OF THE DISEASES

Sancaya, Prakopa, Prasara, Sthanasamsrya Vyakti, and Bhedadvstha are the six stages that, according to Sushruta, lead to the development of a disease.When it comes to Ama-related illnesses, Sancaya of Ama is the first line of defence. This occurs because Agniat is impaired in that area. Similarly, microbiomes may change the gut lining. Metabolites (endotoxins) such lipopolysaccharides (LPS) are released when there is dysbiosis. Multiple disorders are caused by the release of LPS into the bloodstream, which occurs when the gut lining thinnings. In little amounts, this Sancaya or buildup does not cause any damage. However, when therapy is not provided, it surpasses the threshold. After then, it enters the Prakopa stage, when it begins to cause very little symptoms. Similar to how LPS enters circulation after this condition, Ama does the same. Now that Ama has found a place to cause sickness in the form of Khavaigunya [24], it is important to note that any tissue in which Ama may be present, whether it be Sthanasamsraya or many other cells, is vulnerable. In the event of LPS endotoxin leakage from the intestinal lining, the inflammatory response manifests in the liver, which in turn promotes fatty liver, insulin resistance, type 2 diabetes mellitus, and raised inflammatory markers including TNF and IL-6. Inflammation in the astrocytes is caused by LPS endotoxin when it penetrates the blood-brain barrier. Depression may emerge as a result of LPS endotoxin.

It follows that the same causative agent, the Ama or LPS endotoxin, might manifest in several ways depending on the location of Khavaigunya. Sthanasamsrya is the current stage. Now we can see the signs of illnesses. This period is when all the diseases that are known to current science originated.

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Progress up to this point is almost never discussed in contemporary scientific discourse. Pathology at a more superficial level becomes apparent after this stage. If the condition is not treated even at this point, it might develop to complications, which are detailed in the Updravas, in the ancient Ayurvedic texts. Given the above, it is easy to see how both contemporary and Ayurvedic literature provide comparable descriptions of the fundamental process of illness formation.

CONCLUSION

Hypothetical role of the body's digestive faculty; primary element in Amais Mandagni creation. Ama is a result of both emotional pressures and dietary indiscretion. The functioning of the gut-brain axis may be compromised as a result. The build-up of bacterial by-product metabolites is another cause of ama production, which may occur as a result of changes in the gut microbiota. It is important to remember that Ama is the only substance that can be created when Agni's activity is impeded, leading to incorrect metabolism. These days, Ama may be more often known as lipopolysaccharides, a by-product of changes in the gut flora. In terms of structure, function, and pathophysiology (the role of Ama and metabolites in disease generation), the whole debate to the conclusion that there are several parallels between Agni and the gut-brain axis.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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