



SHORT REVIEW

Agni and the Gut-Liver Axis: An Integrative Perspective on Digestive and Hepatic Health

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Abstract

The gut-liver axis is a dynamic, bidirectional communication system linking the gastrointestinal tract and the liver, essential for regulating immune responses, facilitating detoxification, and maintaining metabolic balance. Disturbance of this axis, commonly resulting from gut microbial dysbiosis, plays a significant role in the development of several liver disorders, such as non-alcoholic fatty liver disease (NAFLD), alcoholic liver disease, cirrhosis, and hepatocellular carcinoma. *Ayurveda* emphasizes the role of *Agni* (digestive fire) in maintaining physiological balance, with disturbances leading to the accumulation of *Ama* (toxic metabolic byproducts), conceptually similar to the gut-liver axis and dysbiosis as described in modern medicine. This review correlates current biomedical literature on the gut-liver axis with classical Ayurvedic texts discussing *Agni* and *Ama*. A comparative analytical approach was employed to identify functional parallels and conceptual intersections between the two systems. Findings indicate significant overlap in the physiological and pathological roles of *Agni* in Ayurveda and the gut-liver axis in modern science. Both models emphasize the centrality of digestive and metabolic integrity in systemic health and disease manifestation. Subtypes of *Agni*-*Jatharagni*, *Bhutagni*, and *Dhatvagni*-demonstrate functional analogs with the metabolic and immunological processes within the gut-liver axis. Despite notable conceptual similarities, direct scientific correlations between *Ayurvedic* and biomedical models remain underexplored. An integrative framework that aligns *Agni*-based Ayurvedic understanding with gut-liver axis physiology may enhance comprehensive approaches to the prevention and management of gastrointestinal and hepatic disorders.

Introduction

The gut microbiota constitutes a diverse and intricate community of bacteria, fungi, archaea, and protozoa that live in a symbiotic relationship with the human host.(1) It plays vital roles in nutrient metabolism, maintaining gut mucosal integrity, modulating the immune system, and protecting against pathogens. Though generally stable in adulthood, the composition of gut microbiota varies across individuals due to factors such as diet, lifestyle, body mass index (BMI), exercise, and cultural practices.(2)The liver, a key immunological organ, is continuously exposed to gut-derived nutrients and endotoxins. (1) The gut-liver

axis refers to the two-way interaction between the gut microbiota and the liver, playing a vital role in maintaining immune balance, facilitating detoxification, and regulating metabolism.(3) An imbalance in the gut microbiota, referred to as dysbiosis, can compromise intestinal integrity, allowing harmful molecules to pass into the liver and induce inflammation and oxidative stress. This process contributes to the development of liver diseases such as non-alcoholic fatty liver disease (NAFLD), alcoholic liver disease, cirrhosis, and hepatocellular carcinoma.(4) These disorders contribute significantly to the global disease burden.

Ayurveda emphasizes a holistic approach to health, centred on balancing the three doshas-*Vata*, *Pitta*, and *Kapha*. *Agni*, a fundamental concept in *Ayurveda* which governs digestion, metabolism, and energy production. (25) *Agni* is classified into *Jatharagni* (digestive fire), *Bhutagni*, and *Dhatvagni* (metabolic fires at the elemental and tissue levels), which work collectively to sustain health.

The functional parallels between *Agni* and the gut microbiota are striking. Disrupted *Agni* leads to the accumulation of *Ama* (toxic, undigested residues), similar to dysbiosis and systemic inflammation in modern science. (26) The *Ayurvedic* perspective on the gut-liver axis-through the lens of *Agni* and *Ama*-mirrors the biomedical understanding of gut-liver dynamics. Contemporary interventions like probiotics, prebiotics, and anti-inflammatory diets align with *Ayurvedic* practices such as *Deepana* (stimulating *Agni*), *Pachana* (digesting *Ama*), and *Rasayana* (rejuvenation therapies).

There is a growing global shift toward integrative health approaches, personalized nutrition, and a deeper understanding of the microbiome's role in managing chronic diseases. Despite this trend, a significant gap remains in frameworks that connect traditional health concepts with modern biomedical insights. This underscores the need for integrative research to bridge these perspectives and explore their therapeutic potential in managing digestive and hepatic disorders.

OBJECTIVES

To explore the *Ayurvedic* concept of *Agni* (*Jatharagni*, *Bhutagni*, and *Dhatvagni*) and its functional parallels with the gut microbiota and liver metabolism, and analyze the pathophysiological consequences of gut dysbiosis and impaired *Agni*, focusing on their roles in the onset and progression of liver-related disorders.

Materials and Methods

A comprehensive literature search was performed across PubMed, Scopus, and the AYUSH Research Portal for studies published from 2000 to 2024. Keywords such as '*Agni*', '*Ayurveda*', 'gut-liver axis', and 'hepatoprotective herbs' were used in combination with Boolean operators. Articles were selected based on relevance to *Ayurvedic* physiology and liver health, with priority given to peer-reviewed articles and classical *Ayurvedic* texts.

Gut microbiome

The gut microbiota consists of a dynamic and diverse population of microorganisms residing within the human gastrointestinal (GI) tract. The human body and this diverse ecosystem-which includes bacteria, protozoa, archaea, fungi, and viruses-have a special symbiotic relationship that has a big impact on health and illness. (4) In early life, the composition of an individual's gut microbiota is influenced by numerous internal and external factors, such as antibiotic exposure, gestational age at birth, mode of delivery, type of feeding, and weaning practices.(5)

Through its involvement in metabolic pathways, the gut microbiota affects energy balance and metabolic health through the processing of complex carbohydrates and fibers. Additionally, it is essential for the immune system's growth and maturation. Furthermore, the conjugate bile acids required for fat breakdown and vital vitamins are produced by gut microbes. Microbial metabolites produced by these trillions of organisms are vital in regulating immune responses, neurotransmitter synthesis, and neural development.

Gut-liver axis

The gut-liver axis represents a mutual interaction between the gut and the liver, interconnected via the bloodstream, portal vein, and bile ducts. (6). This communication relies on two primary components:

1. gut microbiota
2. gut barrier

Role of gut microbiota on gut-liver axis

A healthy gut-liver axis depends on bile acid homeostasis and a functional enterohepatic circulation.(6) In this system, gut-derived products are transported directly to the liver via the portal vein, while the liver secretes bile acids into the intestine. The gut microbiota influences the liver either directly through bacterial metabolites or indirectly by regulating the intestinal barrier.(7)

In normal physiological conditions, the intestine and liver secrete bioactive compounds that either interact with each other or influence the gut microbiota. Intestinal microorganisms produce a range of metabolites that can alter the intestinal barrier's permeability or be absorbed by intestinal tissues. After absorption, these metabolites enter the liver through the portal vein, where they may impact hepatic function.

The gut microbiota is also involved in liver diseases through mechanisms such as increased intestinal permeability, chronic systemic inflammation, and disruptions in bacterial metabolism. This mechanism illustrates the profound and reciprocal connection within the gut-liver axis.

Role of gut barrier on gut-liver axis

The gut barrier is essential for preserving intestinal integrity, functioning as both a structural and functional interface that enables communication between the gut and the liver. (8) It consists of three distinct layers. The outermost layer is the mucus, produced by intestinal goblet cells and rich in mucin. This mucus layer provides a habitat for microbes while preventing direct contact between bacteria and epithelial cells. Beyond the epithelial barrier lies the lamina propria (LP), where immune cells form the gut's immune barrier. (8) These immune cells play a key role in generating defensive responses against pathogens that breach the intestinal epithelium.

Under normal circumstances, intestinal substances pass through several layers of the gut barrier before reaching the liver through the gut-liver axis, allowing regulated microbial transfer.

Dysbiosis

Dysbiosis denotes a disruption in the gut microbiota balance, marked by decreased microbial diversity and an overgrowth of proinflammatory species. (7) Unhealthy lifestyle choices, such as prolonged alcohol consumption, excessive calorie intake, and limited physical activity, can trigger this imbalance. These factors place stress on gut microbiota, leading to dysbiosis. (11,12)

Dysbiosis is frequently linked to compromised intestinal barrier function (often termed leaky gut), leakage of endotoxins, disturbances in bile acid composition, and reduced choline concentrations. (9) These alterations enable the gut microbiota, along with its metabolites and bacterial extracellular vesicles (EVs), to penetrate the intestinal barrier and enter the portal circulation, thereby promoting the development of liver diseases. Conversely, liver disorders can influence gut health by altering bile acid circulation. (10)

Under healthy conditions, the gut-liver axis functions to maintain metabolic balance, immune tolerance, and detoxification. However, disruption of the gut-liver axis occurs due to factors such as gut microbiota imbalance (dysbiosis), increased intestinal permeability, and immune system dysregulation. Dysbiosis leads to an increase in pathogenic bacteria and a decrease in beneficial microbes, resulting in the overproduction of toxic compounds, such as lipopolysaccharide (LPS), an endotoxin derived from Gram-negative bacteria. (8) Simultaneously, damage to the intestinal barrier, also known as "leaky gut," allows the translocation of microbial products, metabolites, and antigens into the portal circulation, thereby delivering them directly to the liver. (14) In response, liver-resident macrophages (Kupffer cells) recognize these endotoxins and trigger an immune response, releasing pro-inflammatory cytokines like TNF- α , IL-1 β , and IL-6. (11)

This persistent immune activation induces hepatic inflammation, steatosis, and tissue injury. Over time, chronic disruption of the gut-liver axis contributes to the development of liver diseases such as non-alcoholic fatty liver disease (NAFLD), non-alcoholic steatohepatitis (NASH), alcoholic liver disease, fibrosis, cirrhosis, and even hepatocellular carcinoma. (9)

Agni in Ayurveda:

In *Ayurveda*, *Agni* is a fundamental concept central to both health and disease. Referred to as the "digestive fire," it governs digestion, absorption, assimilation, and the conversion of food into energy. Since *Agni* is present in every cell (*Dhātu paramāṇu*) of the body, it is considered innumerable and is categorized into three main types: (13)

1. *Jatharagni*
2. *Bhutagni*
3. *Dhatvagni*

Agni encompasses not only the digestion that occurs within the gastrointestinal tract (*Koṣṭha*), where it helps separate the nutrient-rich part (*Sārabhāga*) from the indigestible residue (*Kiṭṭabhāga*), (14) but also plays a crucial role in processes such as energy production, biosynthesis, and metabolic maintenance. A key component of *Jatharagni* is *Pācakapitta* (also called *Jātharāgni*, *Koṣṭhāgni*, *Antarāgni*, *Pācakāgni*, or *Dehāgni*), which resides between the stomach (*Āmāśaya*) and intestines (*Pakvāśaya*). This form of *Pitta* directly manages food digestion and supports the function of other *Pittas* throughout the body.

Types of *Jatharagni* Based on Function (15)

Jatharagni manifests in four forms based on how efficiently it digests food:

- *Samāgni* – balanced digestion
- *Vishamāgni* - irregular digestion (often linked to Vāta imbalance)
- *Tikṣṇāgni* - sharp or excessive digestion (linked to Pitta dominance)
- *Mandāgni* - weak digestion (associated with Kapha)

Bhutagni

In *Ayurvedic* physiology, *Bhutagni* refers to five elemental digestive forces residing within the five *Mahābhūtas-Prthvī* (Earth), *Āpas* (Water), *Tejas* (Fire), *Vāyu* (Air), and *Ākāśa* (Space). Each cell and ingested substance, being composed of these elements, contains corresponding *Bhutagni*. This elemental congruence facilitates efficient digestion and assimilation.

According to *Charaka Samhita* (Cha. Chi. 15/13-14), (16) each *Bhutagni* metabolizes the component of food corresponding to its element, thereby contributing to the nourishment of the body's elemental (*Bhautika*) structure. *Bhutagni Pāka* follows *Jatharāgni Pāka*, finalizing the digestive process and leading to the formation of *Āhāra Rasa* (nutrient essence), which is then absorbed.

From a modern perspective, *Bhutagni* correlates with hepatic and systemic metabolic processes. After initial digestion in the gastrointestinal tract (*Annavaha Srotas*), nutrients are transported via the portal circulation to the *Yakrt* (liver), where further biochemical transformation occurs before systemic distribution to the *Sapta Dhātus* (seven body tissues). This aligns *Bhutagni* with liver metabolism, enzymatic activity, and nutrient assimilation.

Dysfunction in *Bhutagni* disrupts downstream *Dhatvagni* activity, leading to impaired tissue formation and metabolic imbalance, potentially manifesting as systemic disorders.

Dhatvagni

Each of the seven body tissues (*Dhātus*) possesses its own *Agni*, which metabolizes nutrients delivered via their specific channels (*Srotas*). The *Dhatvagni* within each tissue converts *Anna Rasa* (the nutritional essence of food) into *Rasa Dhātu*, nourishing that particular tissue. Every *Dhatvagni* performs selective metabolic functions tailored to its associated *Dhātu*.

As emphasized by *Acharya Charaka* (Cha. Su. 28/15),⁽¹⁶⁾ the seven *Dhātus*-responsible for structural support and bodily functions-require their own *Agni* to digest, assimilate, and transform nutrients for proper nourishment and vitality.

Yakrit vikara and its management

Yakrut Vikara (liver disorders) were first described by Bhavamishra. In the *Parishista Prakarana* of *Madhavanidana*, *Acharya Madhava* provides a comprehensive explanation of *Yakrut Roga*, detailing its causes and symptoms.⁽¹⁷⁾ Consumption of *madya*, *Vegadharana*, the use of *ushna*, *tikshna*, *guru aharas*, *Divaswapna*, *Ratrijagarana*, *Atimaidhuna*, and *kshata* are some of the factors that have an impact on this.

For managing all types of *Yakrit Vikara* (liver disorders), medicines and diets that balance *Pitta*, possess *Deepana-Pachana* (digestive stimulant and carminative) actions, and enhance *Agni*-specifically *Jatharagni* and *Dhatvagni* (the digestive and tissue metabolic fires)-are generally advised. Most hepatoprotective formulations exhibit *Kaphapittahara* properties (balancing *Kapha* and *Pitta*), along with *Katu-Tikta Rasa* (pungent and bitter tastes), *Laghu-Ruksha Guna* (light and dry qualities), and *Ushna Virya* (hot potency). Consequently, these attributes help improve metabolism, particularly catabolic processes, and support the removal of metabolic toxins that accumulate due to impaired metabolic activity.

Several Ayurvedic herbs are renowned for their hepatoprotective properties and play a vital role in maintaining liver health. *Bhumyamalaki* (*Phyllanthus niruri*) is known for its potent antiviral and antioxidant activities, aiding in the normalization of liver enzymes.⁽¹⁸⁾ *Kutki* (*Picrorhiza kurroa*) is a powerful *Pitta*-pacifying herb with anti-inflammatory effects and is particularly effective in stimulating bile flow.⁽¹⁹⁾ *Kalmegha* (*Andrographis paniculata*) is recognized for its hepatoprotective

and immunomodulatory actions, making it beneficial for detoxification and liver support.⁽²⁰⁾ The classical formulation *Triphala*, a blend of three fruits, serves as a mild laxative and antioxidant that improves digestion and supports overall liver function.⁽²¹⁾ *Guduchi* (*Tinospora cordifolia*), considered a *Rasayana*, exhibits strong immunomodulatory properties and offers protection against toxin-induced liver damage.⁽²²⁾ *Daruharidra* (*Berberis aristata*) acts as an antibacterial and liver stimulant while effectively pacifying aggravated *Pitta*.⁽²³⁾ Lastly, *Trivrit* (*Operculina turpethum*) is known for its detoxifying properties and is commonly used in Panchakarma therapies for liver cleansing.⁽²⁴⁾ Collectively, these herbs offer a comprehensive natural approach to supporting and protecting liver health through multiple mechanisms.

Discussion

In *Ayurveda*, *Agni* refers to the vital force responsible for all forms of digestion and metabolism. Vital aspects such as strength (*Bala*), complexion (*Prabha*), health (*Swasthya*), enthusiasm (*Utsaha*), bodily development (*Upacaya*), radiance, energy (*Ojas*), vitality (*Tejas*), ageing (*Vaya*), and even longevity (*Ayu*) are governed by *Agni*. *Acharya Vagbhata* emphasized that all diseases stem from an impaired digestive fire (*Mandagni*), underscoring its critical role in overall health. The gut microbiota, an extensive and diverse community of microorganisms inhabiting the digestive tract, is essential for maintaining human health. It aids in digestion and nutrient absorption by breaking down complex carbohydrates and dietary fibres while producing essential vitamins like B1, B9, B12, and K. Additionally, it regulates the immune system, helping the body distinguish between harmful pathogens and beneficial microbes to prevent autoimmune diseases.

The concept of *Agni* finds a remarkable parallel in modern science through the gut microbiota. Just as *Agni* governs digestion, absorption, assimilation, and overall vitality in *Ayurveda*, the gut microbiota plays a pivotal role in breaking down food, synthesizing vital nutrients, and maintaining immune balance. A properly functioning *Agni* promotes good health, just as a balanced and diverse gut microbiome supports metabolism, immunity, and mental well-being.

The metabolic fire connected to the five basic elements (*Panchamahabhutas*) is referred to as *Bhutagni* in *Ayurveda*. The corresponding elemental components in food must be broken down and metabolized by each *Bhutagni*. This procedure ensures the assimilation of the nutrients and helps to nourish the tissues of the body (*Dhatus*). The gut-liver axis signifies an essential physiological connection in which the liver processes, detoxifies, and metabolizes nutrients absorbed from the intestines before they are distributed throughout the body. Functions of *Bhutagni* and the gut-

liver axis both emphasize how crucial digestion and metabolism are to preserving health. The breakdown and assimilation of elemental components by *Bhutagni* is in line with the gut-liver axis's function in processing nutrients and toxins. Disruptions in *Bhutagni* lead to improper tissue nourishment and disease, much like dysfunction in the gut-liver axis contributes to metabolic disorders, inflammation, and toxin accumulation.

When *Agni* becomes weak or unbalanced, it can lead to incomplete digestion, the buildup of toxins (*Ama*), and disruption in the harmony of the three *Doshas-Vata, Pitta*, and *Kapha*. From a biomedical perspective, this can be compared to gut dysbiosis, where an imbalance in the gut microbiota leads to issues like leaky gut syndrome and systemic inflammation. Both *Ayurveda* and modern science highlight the importance of diet and lifestyle in maintaining this balance.

In *Ayurveda*, *Yakrit* is primarily understood in terms of its functional role rather than its structural attributes. Disorders such as *Pāṇḍu*, *Kāmala*, *Udara*, *Raktapitta*, and *Yakrit Vidradhi* are recognized as the functional impairment of the *yakrit*. Excessive intake of alcohol, suppression of natural urges, taking excessive *uṣṇa*, *tikṣṇa*, *guru* food, sleeping in daytime, night awakening, excessive indulgence in sex, trauma, excessive physical work, and such other activities are considered to be the cause of the *yakṛdrōga*. Recent studies suggest that various factors, such as an unhealthy diet, dysbiosis, and chronic inflammation, can disrupt the gut barrier. This disruption may result in the leakage of viable bacteria, bacterial components, and bacterial metabolites, ultimately causing liver damage. Imbalances in gut microbial communities, known as dysbiosis, can contribute to hepatic steatosis (fatty liver) and liver-related inflammatory processes. Notably, distinct shifts in gut microbiota compositions have been observed in diseases like alcoholic liver disease and primary sclerosing cholangitis.

Both views highlight that unhealthy diet and lifestyle cause liver disease, showing a strong link between ancient and modern understanding. *Ayurveda* identifies *agni vaishmya* (disturbances in digestive fire) and formation of *ama*, while modern medicine highlights the dysbiosis in the gut-liver axis as a crucial factor in disease progression. Together, these insights reinforce the importance of maintaining a balanced diet, optimal gut health, and mindful living practices to prevent liver disorders.

Disruptions in the gut-liver axis occur when the communication between the gut and liver is impaired, commonly as a result of gut dysbiosis, heightened intestinal permeability, and immune imbalance. Gut dysbiosis—an alteration in the normal microbial composition of the intestines—reduces the synthesis of beneficial metabolites like short-chain fatty acids while promoting the formation of harmful compounds such as lipopolysaccharides (LPS). This disturbance in microbial balance can weaken the integrity

of the intestinal barrier, leading to increased permeability—a condition often referred to as “leaky gut.” When this barrier is breached, bacterial products like LPS translocate into the portal circulation and reach the liver, where they activate Kupffer cells via toll-like receptor 4 (TLR4). Additionally, disrupted bile acid metabolism contributes to both microbial imbalance and liver injury. Metabolic dysfunction also plays a significant role, with microbial metabolites like ethanol and trimethylamine (TMA) exacerbating hepatic damage, while beneficial metabolites like butyrate are often depleted. These pathological mechanisms play a pivotal role in the development of several liver disorders, such as non-alcoholic fatty liver disease (NAFLD), alcoholic liver disease (ALD), cirrhosis, hepatic encephalopathy, and primary sclerosing cholangitis (PSC).

While discussing the pathophysiology of *yakrit roga*, *pitta* and *rakta* are the primary *doshas* and *dushyas* involved in it, respectively. *Mandagni* and *Vishmagni* contribute to the formation of '*Ama*', which ultimately leads to *Srotorodha* in the *Yakrit*. This blockage results in *Doshadushya Sammurchana*, leading to the manifestation of *Yakrit Vikara*. The treatment principles of *Yakridroga* are mainly based on the alleviation of *pitta* and *rakta*, along with normalizing the *agni*. Drugs that possess *Deepana-Pachana* (digestive stimulant and carminative) actions, and enhance *Agni*, both *Jatharagni* (digestive fire) and *Dhatwagni* (tissue metabolism), are commonly recommended. Most hepatoprotective formulations exhibit *Kaphapittahara* properties (alleviating excess *Kapha* and *Pitta*), and are characterized by *Katu* (pungent) and *Tikta* (bitter) tastes, *Laghu* (light) and *Ruksha* (dry) qualities, and *Ushna Virya* (heating potency). These attributes collectively support improved metabolism, particularly catabolic processes, and assist in eliminating metabolic toxins that accumulate due to impaired metabolic functions.

The first step involves avoiding harmful substances like alcohol, oily and spicy foods, and promoting a light, easily digestible diet. Detoxification through therapies like *Virechana* is aimed at removing accumulated *Pitta* and toxins, while herbal remedies and classical formulations like *Arogyavardhini Vati* are used to support liver function and reduce inflammation. Rejuvenative therapies including *Amalaki*, *Guduchi*, and *Pippali* help restore liver health and boost immunity. Dietary recommendations include light, easily digestible meals, bitter vegetables, and medicated ghee, while lifestyle practices such as *yoga* and *pranayama* aid in maintaining balance. In contrast, modern therapeutic approaches targeting the gut-liver axis focus on restoring gut-liver homeostasis by modulating gut microbiota, reducing systemic and hepatic inflammation, and addressing intestinal permeability. Key interventions include the use of probiotics, prebiotics, antibiotics like rifaximin, bile acid modulators, and dietary changes aimed at improving microbiota composition and reducing endotoxin load.

Conclusion

The Ayurvedic concept of *Agni*-encompassing *Jatharagni*, *Bhutagni*, and *Dhatvagni*-has clear functional parallels with the modern understanding of gut microbiota dynamics and liver metabolism within the gut–liver axis. Impairment of *Agni*, manifesting as *Mandagni* or *Vishamagni* and leading to *Ama* formation, closely corresponds to gut dysbiosis and increased intestinal permeability described in contemporary biomedical science. These disturbances play a significant role in promoting hepatic inflammation and contribute to the initiation and progression of liver-related disorders.

Furthermore, the *Ayurvedic* description of *Yakrit roga* highlights the impact of improper diet, lifestyle, and suppression of natural urges on liver function, which aligns with modern etiological factors implicated in conditions such as non-alcoholic fatty liver disease and alcoholic liver disease. Both Ayurvedic and modern systems underscore the importance of restoring digestive and metabolic balance through appropriate nutritional regulation and detoxification strategies. While Ayurveda emphasizes *Deepana*, *Pachana*, and *Pitta-Rakta* balancing interventions, modern approaches focus on microbiota modulation, dietary regulation, and inflammation control. Together, these perspectives offer an integrative framework for understanding and managing liver disorders through the lens of gut-liver axis integrity and metabolic homeostasis.

References

- Wang R, Tang R, Li B, Ma X, Schnabl B, Tilg H. Gut microbiome, liver immunology, and liver diseases. *Cell Mol Immunol*. 2021;18:4–17.
- Park KJ, Gao Y. Gut–brain axis and neurodegeneration: mechanisms and therapeutic potentials. *Front Neurosci*. 2024;18.
- Zhang X, Liu H, Hashimoto K, Yuan S, Zhang J. The gut–liver axis in sepsis: interaction mechanisms and therapeutic potential. *Crit Care*. 2022;26.
- Milosevic I, Vujovic A, Barac A, Djelic M, Korac M, Spurnic AR, et al. Gut–liver axis, gut microbiota, and its modulation in the management of liver diseases: a review of the literature. *Int J Mol Sci*. 2019;20.
- Rinninella E, Raoul P, Cintoni M, Franceschi F, Migliano GAD, Gasbarrini A, et al. What is the healthy gut microbiota composition? A changing ecosystem across age, environment, diet, and diseases. *Microorganisms*. 2019;7(1).
- Blesl A, Stadlbauer V. The gut–liver axis in cholestatic liver diseases. *Nutrients*. 2021;13:1–32.
- Zhang S, Wang Q, Tan DEL, Sikka V, Ng CH, Xian Y, et al. Gut–liver axis: potential mechanisms of action of food-derived extracellular vesicles. *J Extracell Vesicles*. 2024;13.
- Pabst O, Hornef MW, Schaap FG, Cerovic V, Clavel T, Bruns T. Gut–liver axis: barriers and functional circuits. *Nat Rev Gastroenterol Hepatol*. 2023;20:447–61.
- Sharma S, Tiwari N, Tanwar SS. The current findings on the gut–liver axis and the molecular basis of NAFLD/NASH associated with gut microbiome dysbiosis. *Naunyn Schmiedeberg Arch Pharmacol*. 2025 Apr 9.
- Tilg H, Adolph TE, Trauner M. Gut–liver axis: pathophysiological concepts and clinical implications. *Cell Metab*. 2022 Nov;34(11):1700–18.
- Zheng Z, Wang B. The gut–liver axis in health and disease: the role of gut microbiota-derived signals in liver injury and regeneration. *Front Immunol*. 2021 Dec 10;12.
- Leung C, Rivera L, Furness JB, Angus PW. The role of leaky gut in nonalcoholic fatty liver disease: a review. *Int J Mol Sci*. 2021;22(15):8161.
- Upadhyaya Y, editor. *Ashtangahrdaya of Vagbhata, Sharir Sthan; Angvibhagsharir Adhyaya: Chapter 3, Verses 50–54*. Varanasi: Chaukhamba Prakashan; 2007. p.188–9.
- Kunte AM, Navre KR, editors. *Ashtangahrdaya (A Compendium of the Ayurvedic System) of Vagbhata, 'Sarvangasundra' of Arunadatta and 'Ayurveda Rasayana' of Hemadri*. Varanasi: Chaukhamba Surbharti Prakashan; 2002. p.193. (Sharir Sthana 3/74).
- Charaka Samhita. Shastri K, Chaturvedi G, editors. Varanasi: Chaukhamba Bharati Academy; 2004. p.452.
- Charaka Samhita. Shastri K, Chaturvedi G, editors. Varanasi: Chaukhamba Bharati Academy; 2004. p.454.
- Vijayarakshta S, Srikandadatta. *Madhava Nidanam of Sri Madhavakara-Madhukosa vyakhya vibhushidam*. Yadunandana Upadhyaya, editor. Reprint ed. Varanasi: Chaukhambha Sanskrit Bhavan; 2004. Part 2, Yakrut roga nidanam/1–7. p.467.
- Bhattacharyya P, Bishayee A. *Phyllanthus niruri*: a review of the pharmacological properties and therapeutic potential in liver disorders. *Phytother Res*. 2020;34(7):1488–1503.
- Sontakke S, Thawani V, Naik M. Role of Kutki (*Picrorhiza kurroa*) in liver disorders: a review. *Indian J Pharmacol*. 2011;43(3):267–70.
- Thakur AK, Sinha P, Singh S, et al. Hepatoprotective activity of oleanolic acid, β -sitosterol and stigmasterol from *Andrographis paniculata* and *Berberis aristata* in INH–RIF-induced hepatotoxicity. *BMC Complement Med Ther*. 2024;24(1):128.
- Sandhya S, Venkatramana DK, Vinod KR, et al. Triphala: an Ayurvedic formulation for treating and preventing liver disorders. *J Tradit Complement Med*. 2011;1(1):49–52.
- Mathew S, Kuttan G. Immunomodulatory and antitumor activity of *Tinospora cordifolia*. *Fitoterapia*. 1999;70(1):35–43.
- Sharma A, Chandrul KK. Pharmacological properties and therapeutic potential of *Berberis aristata* DC. *Int J Pharm Sci Res*. 2011;2(6):1461–8.
- Goyal RK, Singh J, Chauhan A. *Operculina turpethum*: a review on its pharmacological activities and phytochemistry. *Asian Pac J Trop Med*. 2010;3(9):725–8.
- Patil VC, Baghel MS. Concept of Agni in Ayurveda and its clinical importance. *AYU*. 2015;36(2):120–124.
- Afnan N, Shivaprasad SE, Patil AS. Understanding relationship between concept of Agni, Ama and Gut Brain Axis – Contemporary Review. *J Ayurveda Integr Med Sci*. 2025;10(1):223–226.