ISSN: 2456-9909 (Online)

International Journal of Research in AYUSH and Pharmaceutical Sciences

Review Article

Correlation Between Awasthapaka and Metabolism: An Ayurvedic and Modern Perspective

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ARTICLE INFO

Article history:
Received: 01-03-2024
Accepted: 10-04-2024
Published: 22-05-2025

Keywords:
Awasthapaka, Metabolism, Agni, Digestion, Pachana.

ABSTRACT

This review article comprehensively explores the intricate correlation between *Awasthapaka*, the Ayurvedic concept of digestive stages, and the broader physiological processes of metabolism. Rooted in classical Ayurvedic texts, *Awasthapaka* describes the sequential transformation of ingested food (Ahara) through three distinct phases: *Madhura*, *Amla*, and *Katu*. These stages are intrinsically linked to the dynamic interplay of Agni (digestive fire), which encompasses *Jatharagni* (gastrointestinal digestion), *Bhutagni* (elemental metabolism), and *Dhatvagni* (tissue-level metabolism). The report delineates the physiological mechanisms of each *Awasthapaka* stage, correlating them with modern scientific understanding of carbohydrate, protein, and fat metabolism.

INTRODUCTION

Ayurveda, an ancient system of medicine, emphasizes a holistic approach to health, viewing the human body as an intricate interplay of Doshas (Vata, Pitta, Kapha), Dhatus (tissues), Malas (waste products), Agni (digestive fire), and Srotas (channels).[1] This system provides a scientific understanding of how the body maintains health (Samyavastha) and homeostasis through these fundamental components.[1] Central to Ayurvedic physiology (Kriya Sharir) is the concept that proper digestion and metabolism are foundational to maintaining health, strength, longevity, and complexion.[1] Any imbalance in these intricate processes is considered the root cause of disease (Vyadhi).[4]

Access this article online

Quick Response Code

https://doi.org/10.47070/ijraps.v9i4.207

Awasthapaka refers to the three distinct stages of food digestion within the gastrointestinal tract, detailing how food is transformed from the point of intake to its eventual absorption.[2]

It is considered the primary stage of digestion, completed by Pachakagni (a form of Jatharagni) in the Annavaha Srotasa (alimentary canal), involving three sub-stages: Madhura, Amla, and Katu.[4] The consistent definition of Awasthapaka as the "three stages of digestion" or "transformation of food" within the gastrointestinal tract, coupled with its explicit linkage to "metabolism" or "metabolic transformations"[2], indicates that Awasthapaka is not merely a breakdown process but the initial, critical phase that dictates the quality and availability of substrates for all subsequent metabolic activities. If this initial processing is incomplete or flawed, it will inevitably have a cascading negative effect on the entire metabolic cascade, from elemental assimilation to tissue nourishment. This positions Awasthapaka as a fundamental "macro-metabolic gateway," where its proper functioning is a prerequisite for efficient "micro-metabolism" (Bhutagni and Dhatvagni). This highlights Ayurveda's deep-rooted emphasis on digestive health as

foundational to systemic metabolic well-being, a concept that is increasingly gaining recognition and validation in modern medicine with emerging research on the gut-brain axis, nutrient bioavailability, and the systemic impact of gut dysbiosis.

Exploring this correlation is essential for bridging the conceptual gap between traditional Ayurvedic principles and modern scientific insights into human physiology and metabolism.[1] Both systems, despite differences in terminology, recognize the paramount importance of digestive processes in maintaining overall health and wellness.[13]

Understanding *Awasthapaka*: The Ayurvedic Stages of Digestion

Awasthapaka, derived from "*Avastha*" (stages) and "*Paka*" (changes taken by *Agni*), describes the sequential transformation of ingested food (*Ahara Dravya*) within the alimentary canal (*Kostha*).[7] This process involves distinct changes in the food's form, structure, and taste as it progresses through the digestive tract.[8] It is initiated and maintained by *Jatharagni* (the main digestive fire), which acts on the ingested food particles.[7] The entire process is understood to begin in the mouth and systematically progress through the *Amashaya* (stomach) and *Pakvashaya* (colon).[8]

The descriptions of *Awasthapaka* consistently emphasize a "stagewise change"[7], with digestion "divided in three stages"[4] where food "passes through different stages".[7] *Amla Awasthapaka* acts on "semi-digested food" from the first stage [2], and *Katu Awasthapaka* on "partly digested food" from the Amla stage.[9] This indicates a clear progression and reliance on the preceding stage. This highlights a critical sequential dependency within the digestive process, where the efficiency and completeness of one stage directly impact the subsequent ones. A dysfunction in *Madhura Awasthapaka* (e.g., inadequate carbohydrate breakdown) would inevitably burden *Amla Awasthapaka*, potentially leading to incomplete protein/fat digestion and a cascade of digestive inefficiencies.

Madhura Awasthapaka (Sweet Stage)

Madhur Awasthapaka occurs in the mouth and the *Urdhwa Amashaya*.[8] *Madhura Rasa* is manifested when food is ingested, [8] This phase correlates with the mechanical breakdown of food through chewing and the initial enzymatic digestion of carbohydrates. *Madhur Awasthapaka* completed in the fundus of the stomach.[10] characteristic of *Madhur Awasthapaka* is production of thin and frothy *Kapha Dosha*. This stage is influenced by the sweet (*Madhura*) nature of the digested food and the *Kledana* and *Snehana* actions of *Bodhaka Kapha* (saliva) and *Kledaka Kapha* in the stomach.[8]

Amla Awasthapaka (Sour Stage)

The second stage takes place in the *Pachyamana Amashaya* (pyloric part of the stomach, duodenum, and jejunum).[2] Here, the semi-digested food (*Vidagdha*) develops a sour (*Amla*) nature as it moves downwards.[2] This stage involves the vigorous digestion of proteins and fats. *Pachaka Pitta*, correlated with hydrochloric acid (HCl) and proteolytic enzymes like pepsin secreted by the stomach's mucus membrane, acts to convert insoluble proteins into soluble forms.[2] The acidic medium (pH 2.0-3.0) is highly favorable for pepsin activity.[9] Fat digestion also commences with emulsification.[9] Pancreatic amylase further acts on any remaining carbohydrates.[2] This process stimulates the production of *Pitta Dosha*, which is inherently sour (*Amla*) and responsible for the acidic transformation of food.[8]

Katu Awasthapaka (Pungent/Acrid Stage)

The final stage occurs in the Pakvashaya (large intestine or colon).[2] In this phase, food products undergo further digestion and significant dehydration, taking on a bolus form and resulting in a pungent (Katu) taste.[2] Key processes include the absorption of water and electrolytes.[2] This stage correlates with the extensive activity of intestinal bacteria, which ferment undigested food materials, leading to the production of gases such as carbon dioxide and methane.[2] This phase is also crucial for the formation of fecal matter.[2] The production of Vata Dosha is stimulated due to the acrid/pungent nature of reactions and the dehydration processes involved in waste formation.[2]

The three stages of *Awasthapaka* align remarkably well with the sequential processes observed in modern physiology: Madhura *Awasthapaka* corresponds to the oral cavity and initial gastric digestion (primarily carbohydrate breakdown); *Amla Awasthapaka* corresponds to gastric and small intestinal digestion (primarily protein and fat breakdown, and chyme formation); and *Katu Awasthapaka* corresponds to large intestinal processes (water absorption, fermentation, and waste formation). Each *Awasthapaka* stage is characterized by the natural predominance of a specific *Dosha*: *Kapha* in *Madhura*, Pitta in *Amla*, and *Vata* in *Katu*.[8] This highlights the dynamic and intrinsic role of *Doshas* in mediating digestive and metabolic processes, serving as both indicators and regulators of these transformations.[6] The explicit association of each *Awasthapaka* stage with a specific

Dosha implies that Doshas are not static humors but dynamic physiological principles that actively govern and reflect the ongoing biochemical transformations. For instance, *Kapha's* qualities of unctuousness and hydration are essential for the initial breakdown and lubrication of food, aligning with Madhura *Awasthapaka*. *Pitta's* fiery and acidic nature directly drives the acidic transformation in *Amla Awasthapaka*. *Vata's* mobile and drying qualities are evident in the peristaltic movement and water absorption processes of *Katu Awasthapaka*. This suggests that *Doshas* serve as a sophisticated, integrated system for assessing and regulating digestive and metabolic states. An imbalance in a particular *Dosha* would directly indicate a corresponding dysfunction in the *Awasthapaka* stage it governs, offering a unique diagnostic and therapeutic framework within Ayurveda. This deep integration contrasts with a purely reductionist view of digestion, emphasizing the body's inherent self-regulatory mechanisms guided by the Doshas.

Table 1: Stages of Awasthapaka: Ayurvedic Description and Modern Physiological Correlation

Ayurvedic Stage	Primary Ayurvedic Location	Dominant Rasa	Associated Dosha	Key Ayurvedic Processes	Modern Physiological Correlation	Key Modern Enzymes/ Components
Madhura Awasthapaka	Mouth & *Urdhwa Amashaya*	Madhura (Sweet)	*Kapha*	*Kledana* (Hydration), *Snehana* (Lubrication), *Sanghata* (Cleavage)	Oral/Initial Gastric Digestion (Carbohydrate Hydrolysis)	Salivary Amylase, Mucus
Amla Awasthapaka	*Pachyamana Amashaya*	*Amla* (Sour)	*Pitta*	*Vidagdha* (Partial Digestion), *Amlabhava* (Sourness)	Gastric/Small Intestinal Digestion (Protein/Fat Breakdown, Chyme Acidification)	HCl, Pepsin, Pancreatic Amylase/ Proteolytic Enzymes, Bile
Katu Awasthapaka	*Pakvashaya*	*Katu* (Pungent/ Acrid)	Vata	Shoshana (Dehydration), *Paripindita Rupa* (Bolus Formation), *Vayu Utpatti* (Gas Production)	Large Intestine Processes (Water/ Electrolyte Absorption, Bacterial Fermentation)	Intestinal Bacteria

Ayurvedic Concept of Metabolism: Agni, Bhutagni, Dhatvagni, and Vipaka

Agni, literally meaning "fire" in Sanskrit, is the fundamental principle governing all metabolic and transformative processes (Paka) in the body.[1] It is responsible for converting ingested food (Ahara) into energy, absorbable nutrients (Rasa), and ultimately nourishing the body's tissues.[3] Ayurveda considers Agni is the cause of complexion, strength, life, health, & nourishment.[17]

The consistent emphasis on Agni as the "key element for digestion and metabolism" [3] and its description as not just breaking down food but "transforming" it into energy and nourishing Dhatus points to a profound understanding. The unique Ayurvedic division into Jatharagni, Bhutagni, and Dhatvagni[3] implies a sophisticated, hierarchical, and specialized metabolic system. Jatharagni initiates the bulk digestion, Bhutagni refines at the elemental level (often linked to liver function) [20], and Dhatvagni governs cellular and tissue anabolism and catabolism.

Ayurveda classifies Agni into thirteen distinct types that work in a coordinated, hierarchical manner[3]:

- **Jatharagni (1 type):** This is the primary and most significant digestive fire, located in the GIT (Amashaya and Pakvashaya).[5] Jatharagni is responsible for the initial breakdown of food into two main parts: Rasa (the essence or nutrient fluid) and Mala (waste products).[15] Its optimal functioning is crucial as it provides strength and governs the efficiency of all other Agnis.[5]
- **Bhutagni (5 types):** These Agnis reside within each of the five Mahabhutas (elements: Prithvi/Earth, Apa/Water, Teja/Fire, Vayu/Air, Akasha/Ether) that constitute both the human

body and ingested food.[3] Bhutagnis act upon the elemental components of the digested food (Ahara Rasa) to transform them into nourishing substances that replenish their corresponding Mahabhutas in the body and support the proper functioning of sense organs (Indriyas).[14] The functions of Bhutagni are understood to commence immediately after absorption, involving the portal circulation, liver, and vascular systems, with the liver considered the central site of Bhutagni activity.[20]

- **Dhatvagni (7 types):** These are metabolic fires specific to each of the seven Dhatus (body tissues: Rasa, Rakta, Mamsa, Meda, Asthi, Majja, Shukra).[14] Each Dhatvagni operates within its respective tissue, facilitating the assimilation of nutrients into that tissue and driving the sequential transformation of one Dhatu into the next (e.g., Rasa Dhatu transforming into Rakta Dhatu).[14] Dhatvagnis are crucial for the proper formation, nourishment, and functioning of all bodily tissues, ensuring growth, energy production, and overall health.[19]

Awasthapaka represents the initial, macroscopic digestion occurring within the gastrointestinal tract, characterized by the three sequential stages (Madhura, Amla, Katu) and their associated Dosha manifestations.[7] It is sometimes referred to as "Prapaka".[12] Vipaka, on the other hand, refers to the ultimate post-digestive transformation of food and its final, irreversible effect on the body after the initial digestion is complete.[11] It is the final transformation that determines the food's long-term impact on Doshas, Dhatus, and Malas.[22] Vipaka commences only after Awasthapaka has ceased, signifying a distinct temporal and functional separation.[23]

It is described as a sticky, foul-smelling metabolic toxin that cannot be easily neutralized or eliminated by the body's natural processes.[25]

Table 2: Types of Agni and Their Metabolic Functions

Type of Agni	Number of Types	Primary Location/ Scope of Action	Key Metabolic Function	Modern Physiological Analogy/ Correlation	Impact of Impairment
Jatharagni	1	Gastro intestinal Tract (Amashaya, Pakvashaya)	Initial digestion of food into Rasa & Mala	Digestive Enzymes (e.g., HCl, Pepsin, Amylase, Lipase)	Ama formation, Grahani Vyadhi
Bhutagni	5	Elemental components of food (liver, vascular system)	Transformation of elemental components for body's *Mahabhutas* & Indriyas	Liver Metabolism (e.g., detoxification, nutrient processing)	Elemental imbalance, impaired sense organs
Dhatvagni	7	Specific Dhatus (tissues)	Assimilation of nutrients & sequential tissue formation/ nourishment	Cellular Metabolism, Anabolism/ Catabolism	Dhatu Dusti (tissue vitiation), Srotorodha, specific tissue disorders

The Interplay: Correlation Between Awasthapaka and Metabolism

Awasthapaka, primarily driven by Jatharagni, is responsible for producing "Ahara Rasa" (nutrient fluid or chyle) from ingested food.[3] The quality and proper formation of this initial nutrient fluid are paramount, as it serves as the essential substrate for all subsequent metabolic processes.[14] Awasthapaka's primary function is to break down complex food into "simpler forms" [7] and "essential nutrients" [2], which then constitute the "Ahara Rasa".[3] This Ahara Rasa circulates to nourish the Dhatus.[14] If Awasthapaka is incomplete (e.g., due to weak Jatharagni), it produces Ama [25], which is described as "partly digested material" that "cannot be used by the system, and acts to clog it".[26] This implies that Awasthapaka is not merely about mechanical or chemical digestion but about creating bioavailable and non-toxic substrates for subsequent cellular (Dhatvagni) and elemental (Bhutagni) metabolism.

Following Jatharagni Paka, Bhutagni acts on the elemental components (Panchabhautika components) of this Ahara Rasa.[14] This process, occurring largely in the liver and vascular system, transforms these elemental components into nourishing substances for the body's own Mahabhutas and Indriyas.[14] If Awasthapaka is incomplete or impaired, the resulting Ahara Rasa will be "unripe" or laden with Ama, significantly hindering Bhutagni's ability to perform proper elemental transformation and leading to systemic imbalances.[25] Subsequently, the seven Dhatvagnis act

on the refined Ahara Rasa at the tissue level, facilitating the proper formation, nourishment, and sequential transformation of the seven Dhatus.[14]

Specific Correlations with Macronutrient Metabolism

- ***Madhura Awasthapaka* and Carbohydrate/ Glucose Metabolism (including insulin sensitivity):** *Madhura Awasthapaka* is directly correlated with the digestion of complex carbohydrates into simple sugars (e.g., disaccharide maltose, glucose polymers) by salivary amylase in the oral cavity and upper stomach.[2] These simple sugars are sweet in nature, hence the name "*Madhura*".[2] Ayurveda links metabolic disorders like diabetes mellitus (*Prameha*/ *Madhumeha*) to an imbalance of *Kapha* and *Vata doshas*, diminished Agni (specifically *Agnimandya*), and the accumulation of *Kleda* (excess moisture).[34] Impaired Agni leads to the accumulation of unmetabolized glucose, resulting in hyperglycemia.[35] Ama accumulation, particularly in *Meda Dhatu* (adipose tissue) due to *Kapha* dominance and *Agni* dysfunction, is explicitly stated to worsen insulin resistance and obesity.[29] Ayurvedic herbs such as Jamun, Gurmar, and *Vijaysaar* are noted for their potential to increase insulin sensitivity and reduce blood sugar levels through mechanisms like slowing sugar release, boosting insulin production, and protecting pancreatic beta cells.[34]
- **Amla *Awasthapaka* and Protein/Fat Metabolism:** *Amla Awasthapaka* is identified as the primary stage for the vigorous digestion of proteins and fats.[2] This process involves the action of *Pachaka Pitta* (correlated with HCl and pepsin enzyme) secreted in the stomach, converting insoluble proteins into soluble ones.[2] Further protein digestion occurs in the upper small intestine by pancreatic proteolytic enzymes.[9] Fat digestion begins with emulsification, breaking down fat globules into smaller sizes for enzymatic action.[9] Ayurveda recognizes the crucial role of bile (*Pitta*) in fat metabolism.[11] Dyslipidemia (*Medovriddhi* or *Medodushti*) in Ayurveda is linked to impaired *Agni* and *Ama* accumulation, particularly affecting *Kapha* and *Pitta Doshas*.[37] Consumption of heavy, oily, and sweet foods, coupled with a sedentary lifestyle and stress, can aggravate *Kapha* and weaken digestion, thereby promoting fat accumulation and disrupted lipid metabolism.[37]
- **Katu Awasthapaka, Gut Microbiome, and Short-Chain Fatty Acids (SCFAs):** Katu Awasthapaka occurs in the large intestine, where remaining undigested food undergoes fermentation by intestinal bacteria, leading to the production of gases (e.g., carbon dioxide, methane) and the formation of fecal matter.[2] Modern research extensively highlights the gut microbiome's crucial role in metabolic health, including its functions in digesting food, synthesizing nutrients, regulating host immunity, and producing vital metabolites like Short-Chain Fatty Acids (SCFAs).[23] SCFAs are recognized for their significant physiological and pharmacological effects on the host.[40] Ayurvedic principles, such as seasonal diet adjustments and the use of prebiotic-rich herbs (e.g., turmeric, amla, black pepper, guduchi), are increasingly being validated for their positive impact on gut microbiota composition and SCFA production. These interventions promote beneficial microbes (e.g., Akkermansia, Lactobacillus) and can suppress harmful strains, suggesting a deep, albeit implicitly understood, Ayurvedic influence on the gut-microbiome-metabolism axis.[23] The Dynamic Role of Doshas in Mediating These Metabolic Correlations

Clinical Significance: Awasthapaka Imbalance and Metabolic Disorders

Impairments or disturbances in any Awasthapaka phase can directly disrupt Dosha balance and vitiate Agni, leading to the manifestation of various diseases (Vyadhis).[6] This highlights the central role of proper digestion in maintaining overall health.

Pathogenesis of Metabolic Disorders

- **Grahani Vyadhi:** Vitiated Agni (Agnimandya) is considered the fundamental cause of Grahani Vyadhi (a digestive disorder often correlated with Irritable Bowel Syndrome or malabsorption syndromes).[4] Abnormal Awasthapaka, such as the production of thick, sticky Kapha in Madhura Awasthapaka or excessive dehydration and Vata Prakopa in Katu Awasthapaka, directly contributes to its pathogenesis, leading to symptoms like sticky, undigested stools, or severe constipation.[4]
- **Obesity (Sthaulya/Medovriddhi):** Classified as one of the "Santarpanajanya Vyadhis" (diseases arising from over-nutrition or defective tissue metabolism).[32] Its etiology involves excessive indulgence in Kapha-aggravating foods (heavy, sweet, unctuous) leading to Kapha Prakopa and Jatharagni Mandyata (weakened digestive fire).[9] This results in the production of Ama and "Medo Dhatwagni Mandya" (impaired fat tissue metabolism), causing excessive accumulation of immobile fat (Meda Dhatu) and obstruction of channels (Margaavarana), ultimately leading to the malnourishment of other Dhatus.[29]

- **Diabetes Mellitus (Prameha/Madhumeha):** Characterized by frequent abnormal micturition, metabolic dysfunction, and systemic tissue degradation.[35] It is strongly correlated with obesity and metabolic syndrome in modern understanding.[45] Ayurvedic understanding attributes its progression to Kapha and Vata dosha imbalance, diminished Agni, and Kleda (excess moisture) accumulation.[34] Specifically, Agni dysfunction leads to the accumulation of unmetabolized glucose (hyperglycemia).[35]
- **Dyslipidemia (Medovriddhi/Medodushti):** Elevated triglyceride levels and other lipid imbalances are linked to impaired Agni and Ama accumulation, which disrupt the balance of Kapha and Pitta Doshas.[37] Dietary habits (consumption of heavy, oily, sweet foods), a sedentary lifestyle, and emotional stress can aggravate Kapha and weaken digestion, thereby promoting fat accumulation and disrupted lipid metabolism.[37]
- **Metabolic Syndrome:** Ayurveda correlates metabolic syndrome with Santarpanajanya.

Vyadhis, describing it as a cluster of clinical findings and laboratory abnormalities including obesity (central), impaired glucose tolerance, insulin resistance, and atherogenic dyslipidemia.[27] The underlying root cause is consistently identified as a malfunction of Agni leading to Ama formation, which in turn causes Srotorodha and Dushita Meda Dhatu.[27]

Ayurvedic Therapeutic Approaches for Metabolic Health

Ayurveda offers a comprehensive and personalized approach to managing metabolic disorders, focusing on restoring Agni, eliminating Ama, and balancing Doshas.[16] The treatments are tailored to the individual's unique constitution (Prakriti) and the specific nature of their imbalance.[28]

Principles of Ayurvedic Management

The primary goal is to strengthen the digestive fire (Agni) and remove accumulated toxins (Ama).[16] A well-balanced Agni ensures proper digestion, absorption, and assimilation of food, preventing the formation of Ama.[16] Interventions aim to support the body's natural detoxification processes, reduce symptoms, increase disease resistance, and restore overall harmony.[46]

Challenges and Future Directions in Research

The integration of Ayurvedic concepts like Awasthapaka and Agni with modern metabolic science presents both opportunities and challenges. While Ayurveda offers a holistic framework, its concepts often require scientific validation to gain broader acceptance in contemporary healthcare.[54]

Conclusion

The Ayurvedic concept of Awasthapaka provides a sophisticated and ancient framework for understanding the sequential stages of digestion and their profound correlation with overall metabolism. This review has demonstrated how the three stages-Madhura, Amla, and Katu Awasthapaka-align remarkably with modern physiological processes of carbohydrate, protein, and fat digestion, respectively. The intrinsic link between Awasthapaka and the multifaceted Agni (Jatharagni, Bhutagni, Dhatvagni) underscores Ayurveda's comprehensive view of metabolic transformations, from macroscopic food breakdown to cellular assimilation.

A central theme emerging from this correlation is the critical role of proper Awasthapaka and robust Agni in preventing the formation of Ama, an undigested metabolic toxin. The accumulation of Ama, stemming from impaired digestive and metabolic fire, is identified as a fundamental pathogenic factor in a wide array of chronic metabolic disorders, including obesity, diabetes mellitus, and dyslipidemia. This Ayurvedic understanding of the "Agnimandya-Ama-Srotorodha" cascade offers a unifying model for disease etiology, emphasizing the importance of digestive health as a primary determinant of systemic metabolic well-being.

Furthermore, the dynamic interplay of Doshas (Kapha, Pitta, Vata) within each Awasthapaka stage and their influence on metabolic functions highlight Ayurveda's personalized approach to health and disease. This framework allows for a nuanced understanding of metabolic dysfunctions as manifestations of specific Dosha imbalances, guiding individualized therapeutic strategies.

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Cite this article as:
Yusuf Ahemad Latif A. Ansari, Sanket Chandrashekhar Rawekar, Priyanka Jaipalsingh Bandwal. Correlation Between Awasthapaka and Metabolism: An Ayurvedic and Modern Perspective. International Journal of Research in AYUSH and Pharmaceutical Sciences, 2025;9(4):1-9.
https://doi.org/10.47070/ijraps.v9i4.207
Source of support: Nil, Conflict of interest: None Declared

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