

Review Article

Toward a New Definition of Psychogastroenterology: From the Brain–Gut Axis to the Human Holobiont

Massimo Agnoletti¹

1. Humanitas University, Rozzano, Italy

This theoretical paper argues that currently used definitions of psychogastroenterology are correct but incomplete because they do not adequately incorporate the bottom-up evidence of the microbiota-gut-brain-mind axis.

The currently available definitions have become partially obsolete because they were formulated prior to the current scientific understanding of the microbiota-gut-brain-mind axis in the context of the modern concept of the person as a biopsychosocial holobiont.

A new definition of psychogastroenterology is therefore proposed that seeks to fill this conceptual gap while respecting the bidirectional complexity of the causal dynamics that characterize the biopsychosocial holobiont.

The principal conceptual contribution of the present paper is the shift of psychogastroenterology's unit of analysis from the brain–gut relationship to the human holobiont viewed from a biopsychosocial perspective.

The paper presents some clinical implications and future directions of the proposed new definition of psychogastroenterology.

Correspondence: papers@team.qeios.com — Qeios will forward to the authors

The conceptual foundations of modern psychogastroenterology have developed progressively over more than one century, reflecting the broader evolution of medicine from reductionist models toward increasingly integrated conceptions of human health.

The first milestone can be traced to the emergence of **psychosomatic medicine** during the first half of the twentieth century. Authors such as Alexander^[1] proposed that psychological conflicts and emotional states could influence the onset and progression of physical diseases, including gastrointestinal disorders. Although revolutionary for its time, the psychosomatic approach was largely characterized by a predominantly **top-**

down causal perspective, according to which psychological processes influenced bodily functions. This model represented an important departure from purely biomedical explanations but offered only a limited account of the biological mechanisms linking psychological experiences to gastrointestinal physiology^[1].

Psychosomatic medicine has historically played an important role in challenging biomedical reductionism by highlighting the contribution of psychological, relational, and contextual factors to somatic illness. Nevertheless, from an epistemological perspective, part of the psychosomatic tradition has been characterized by the formulation of arbitrary psychological explanatory interpretations that often lack sufficient empirical support. This tendency raises important epistemological concerns and, when translated into clinical practice without adequate evidential grounding, may also introduce potential iatrogenic risks^[2].

A second major conceptual advance occurred with the publication of the biopsychosocial **Model** proposed by Engel^[3]. Rejecting the reductionism of the biomedical model, Engel argued that health and disease emerge from the dynamic interaction among biological, psychological, and social factors. This framework profoundly influenced clinical medicine and psychology by promoting interdisciplinary assessment and treatment. Nevertheless, although the biopsychosocial Model acknowledged multidimensional causality, it preceded many of the major discoveries regarding the intestinal microbiota and therefore could not explicitly incorporate microbial ecosystems as fundamental biological determinants of health^[3].

Beginning in the late twentieth century, advances in neurogastroenterology led to the formulation of the **Brain–Gut Axis**, emphasizing the bidirectional communication between the central nervous system and the gastrointestinal tract through neural, endocrine, and autonomic pathways^[4]. This represented a substantial conceptual improvement over traditional psychosomatic theories because it recognized that communication between the brain and the gut is reciprocal rather than exclusively descending from the mind to the body. Moreover, it marked a transition from predominantly descriptive or interpretative accounts toward the investigation of the specific causal mechanisms underlying these bidirectional interactions.

Over the last fifteen years, however, rapid advances in microbiome research have profoundly expanded this framework. Accumulating evidence has demonstrated that the intestinal microbiota actively participates in bidirectional communication with the nervous system through immune, endocrine, metabolic, and neural pathways, giving rise to the **Microbiota–Gut–Brain Axis**^{[5][6]}. Within this model, the gut microbiota is no longer viewed merely as passive inhabitants of the gastrointestinal tract but as active contributors to host physiology, behaviour, emotional regulation, cognition, and disease susceptibility.

More recently, increasing recognition of the complexity of human health has highlighted the limitations of models that conceptualize the interaction solely between the microbiota, the gut, and the brain. Although

these frameworks successfully incorporate microbiota biology, they generally treat psychological phenomena as direct products of brain activity, without explicitly recognizing the mind as an emergent level of organization that is grounded in, but not fully reducible to, the neural activity.

Consequently, the Microbiota–Gut–Brain Axis only partially represents the multidirectional dynamics through which lived experience, social context, cognition, emotions, behaviour, and microbiota ecology reciprocally influence one another.

The Microbiota–Gut–Brain–Mind (MGBM) Axis extends the previous microbiota–gut–brain axis to better represent the integrated biopsychosocial nature of the human holobiont and to avoid reductionistic interpretations that equate psychological phenomena exclusively with neural activity^[7].

The MGBM axis further reinforces the need for a PNEI-oriented interpretation of the MGBM axis, highlighting the reciprocal interactions among psychological states, neural regulation, endocrine responses, immune activity, intestinal permeability, and microbiota ecology.

In parallel, evolutionary biology has increasingly emphasized the concept of the holobiont, according to which multicellular organisms and their resident microbiota communities constitute an integrated ecological and functional unit rather than independent biological entities^{[8][9]}.

This perspective suggests that health cannot be fully understood without considering the reciprocal interactions among host cells, microbiota communities, and environmental influences operating across multiple organizational levels.

Building upon these developments, the biopsychosocial Holobiont Model of Health extends the traditional biopsychosocial perspective by explicitly integrating the microbiota as a constitutive component of the human organism and recognizing the health as a global property of neural, endocrine, immune, metabolic, microbiota, psychological, and social systems^[10].

Within this framework, psychogastroenterology is no longer limited to the study of brain–gut interactions but becomes the science of the dynamic relationships among mind, brain, gastrointestinal physiology, microbiota, and the broader holobiont biopsychosocial context.

This historical progression suggests that the current definitions of psychogastroenterology, largely developed within the Brain–Gut Axis paradigm, no longer fully reflect contemporary scientific knowledge. The convergence of advances in microbiome science, systems biology, psychoneuroimmunology, and holobiont theory therefore provides the conceptual foundation for proposing an updated definition of psychogastroenterology capable of encompassing these new dimensions.

In other words, psychogastroenterology was born in a scientific context that predated modern knowledge of the human microbiota. The definitions presented so far tend to underestimate the influence of the bottom-up causality of the microbiota-gut-brain-mind axis and therefore the clinical implications that this knowledge represents for healthcare professionals.

Throughout its historical development, psychogastroenterology has undergone a progressive expansion of the biological complexity incorporated into its explanatory framework. Rather than replacing previous models, each conceptual transition has preserved their central insights while introducing additional levels of organization and causal interaction.

Early psychosomatic medicine emphasized the influence of psychological processes on gastrointestinal function, challenging purely biomedical explanations of disease.

The subsequent biopsychosocial model broadened this perspective by recognizing the contribution of psychological and social factors to health and illness.

The emergence of the Brain–Gut Axis represented a further conceptual advance by demonstrating the bidirectional neurophysiological communication between the central nervous system and the gastrointestinal tract, while also beginning to identify the specific biological mechanisms underlying these interactions.

The subsequent Microbiota–Gut–Brain framework expanded this model by incorporating the gut microbiota as an active biological participant capable of influencing neural, endocrine, immune, and metabolic pathways.

More recently, the MGBM perspective has proposed that psychological processes cannot be reduced entirely to neural activity, recognizing the mind as an emergent level of organization arising from—but not reducible to—the functioning of the holobiont.

Taken together, these developments reveal a consistent trajectory toward increasingly comprehensive models that integrate additional layers of biological, psychological, and social complexity.

From this perspective, the present proposal should not be interpreted as a departure from previous frameworks, but rather as their logical conceptual extension, providing a more comprehensive theoretical foundation for contemporary psychogastroenterology.

The conceptual evolution outlined above is summarized schematically in Figure 1, highlighting the progressive expansion of biological complexity incorporated into the theoretical foundations of psychogastroenterology.

- **Psychosomatic Medicine** → Recognizes the role of psychological processes in gastrointestinal health and disease.
- **Bio-Psycho-Social Model** → Incorporates psychological and social dimensions into the understanding of health and illness.
- **Brain-Gut Axis** → Introduces the concept of bidirectional neurophysiological communication between the brain and the gastrointestinal tract.
- **Microbiota-Gut-Brain Axis** → Incorporates the gut microbiota as an active biological component of this bidirectional communication.
- **Microbiota-Gut-Brain-Mind Axis** → Distinguishes the mind from the brain by recognizing it as an emergent level of organization that cannot be fully reduced to neural processes.

Figure 1.

Current Definitions of Psychogastroenterology

To introduce the present proposal for a revised definition of psychogastroenterology, it is first necessary to examine the principal definitions currently available in the literature, highlighting both their conceptual evolution and their limitations.

Over the past decade, psychogastroenterology has progressively emerged as an interdisciplinary field dedicated to the study of the relationships between psychological processes and gastrointestinal health. Despite the rapid growth of scientific research in this area, formal definitions of the discipline remain relatively few and have been derived primarily from the work promoted by the Rome Foundation.

Keefer^[11] was among the first authors to formally describe psychogastroenterology as an emerging field focused on the application of evidence-based psychological principles and interventions to reduce the burden associated with gastrointestinal disorders and improve clinical outcomes through behavioral and psychological treatments^[11].

This perspective was subsequently expanded by Knowles, Keefer, and Mikocka-Walus^[12], who defined psychogastroenterology as *"the application of psychological science and practice to gastrointestinal health and illness"*^[12]. This definition conceptualizes psychogastroenterology as the application of psychological knowledge and interventions to gastrointestinal health and disease, emphasizing its clinical dimension and the integration of psychologists within multidisciplinary models of patient care.

In the same volume, the authors further elaborated this concept by describing psychogastroenterology as a discipline that integrates gastroenterology and psychology to understand the relationships between brain processes and gastrointestinal function, while treating digestive disorders through brain–gut therapies within a multidisciplinary framework^[12].

Likewise, van Tilburg, Drossman, and Knowles^[13], in reviewing the evolution of the discipline, offered a particularly concise definition, describing psychogastroenterology as the field concerned with the brain–gut connection and its clinical applications^[13] while Keefer^[14] argues that “Psychogastroenterology, the application of psychological science and practice to gastrointestinal (GI) health and illness, leverages the best practices and scientific tools from the fields of behavioral intervention science, cognitive science, neuroscience, experimental psychology, and psychophysiology”^[14].

Taken together, these definitions share several fundamental characteristics. They recognize the interdisciplinary nature of the field, adopt a biopsychosocial perspective, and assign a central role to the bidirectional interactions between the brain and the gastrointestinal tract. However, they primarily reflect the conceptual framework of the brain–gut axis and largely predate the full integration of more recent evidence concerning the intestinal microbiota, immune and metabolic signaling, microbiota–gut–brain communication, and the recognition of the mind as an emergent level of organization distinct from, although grounded in, brain activity.

In light of the substantial advances achieved over the past years, it is therefore timely to reconsider whether the currently available definitions remain conceptually adequate or whether a broader theoretical reformulation is now warranted.

The main characteristics of the definitions of psychogastroenterology discussed above are summarized in Table 1.

Authors	Definition (summary)	Underlying Biological Paradigm	Main Focus	Strengths	Main Limitation
Keefer ^[11]	Psychogastroenterology is an emerging field applying evidence-based psychological principles and interventions to improve outcomes in gastrointestinal disorders.	Brain–Gut Axis	Evidence-based psychological interventions for GI disorders	Establishes psychogastroenterology as a distinct clinical discipline and emphasizes evidence-based practice.	Primarily treatment-oriented; does not explicitly incorporate microbiota-related mechanisms, immune–metabolic signaling, or systemic biological complexity.
Knowles, Keefer, & Mikocka-Walus ^[12]	<i>"The application of psychological science and practice to gastrointestinal health and illness."</i>	Brain–Gut Axis	Integration of psychological science into gastrointestinal healthcare	Provides the most widely cited formal definition and reinforces the role of psychology within multidisciplinary care.	Defines the discipline mainly in terms of psychological application rather than as an integrated explanatory framework.
Knowles, Keefer, & Mikocka-Walus ^[12] (expanded definition)	Psychogastroenterology integrates gastroenterology and psychology to understand brain–gut relationships and treat digestive disorders	Brain–Gut Axis	Bidirectional brain–gut communication and multidisciplinary treatment	Recognizes reciprocal brain–gut communication and promotes interdisciplinary collaboration.	Remains predominantly brain-centered and does not fully integrate microbiota-mediated, immune, or

Authors	Definition (summary)	Underlying Biological Paradigm	Main Focus	Strengths	Main Limitation
	through brain–gut therapies.				metabolic communication pathways.
van Tilburg, Drossman, & Knowles ^[13]	Psychogastroenterology is the field concerned with the brain–gut connection and its clinical applications.	Brain–Gut Axis	Brain–gut connection and clinical applications	Concise and conceptually clear definition that highlights the central clinical domain of the discipline.	Highly concise; omits the contribution of the microbiota, systemic biological interactions, and psychosocial complexity.
Keefer ^[14]	Psychogastroenterology applies psychological science to gastrointestinal health using approaches from behavioral intervention science, cognitive science, neuroscience, experimental psychology, and psychophysiology.	Brain–Gut Axis	Methodological integration of psychological and neuroscientific disciplines	Broadens the scientific foundations of psychogastroenterology by integrating multiple behavioral and neuroscientific approaches.	Expands methodological scope without extending the underlying biological paradigm beyond the Brain–Gut Axis.

Table 1.

Why Current Definitions Are No Longer Sufficient

The definitions reviewed above have played a fundamental role in establishing psychogastroenterology as a distinct interdisciplinary field. They have contributed to integrating psychological science into

gastroenterological practice, promoting multidisciplinary care, and recognizing the importance of bidirectional communication between the brain and the gastrointestinal tract. These contributions remain conceptually valid and continue to provide an essential foundation for both research and clinical practice.

However, these definitions were formulated within a conceptual framework that primarily reflects the Brain–Gut Axis paradigm. Although this represented a substantial advance over earlier psychosomatic models by recognizing reciprocal communication between the central nervous system and the gastrointestinal tract, subsequent scientific developments have considerably expanded the biological complexity underlying gastrointestinal health and disease.

Over the past decade, a growing body of evidence has demonstrated that communication within the gut–brain system cannot be adequately understood without considering the intestinal microbiota as an active biological component. Rather than representing a peripheral influence, the microbiota participates directly in bidirectional communication through neural, immune, endocrine, and metabolic pathways, dynamically interacting with both gastrointestinal physiology and central nervous system function. Consequently, the explanatory focus has progressively shifted from a predominantly brain-centered perspective toward a more integrated microbiota–gut–brain framework.

An important conceptual distinction underlying the present definition concerns the relationship between the brain and the mind. Although these terms are often used interchangeably in both scientific and clinical literature, they refer to different levels of description rather than to synonymous entities. The brain is a biological organ composed of neural cells and circuits, whereas the mind refers to the emergent domain of subjective experience and psychological functioning, encompassing processes such as perception, cognition, emotion, motivation, memory, self-awareness, and intentional behavior. Consequently, psychological processes should not be understood as properties of neural tissue itself, but as processes operating at the level of the mind, while remaining grounded in the activity of the nervous system.

This distinction is consistent with contemporary theories of biological systems, according to which higher-order properties arise from the dynamic organization of lower-level biological systems without being fully reducible to them. In this perspective, mental phenomena emerge from the complex interactions among neural, endocrine, immune, metabolic, and environmental processes, while possessing explanatory properties that cannot be entirely captured by describing neural activity alone^{[15][16][17]}. Such a position neither implies a dualistic separation between mind and brain nor denies their biological dependence. Rather, it recognizes that different organizational levels require complementary explanatory frameworks, a principle that is widely accepted in systems biology and complexity science^{[18][19]}.

Within the proposed definition of psychogastroenterology, this distinction has important theoretical implications. If psychological processes are regarded simply as synonymous with brain activity, the discipline risks remaining confined within a predominantly neurobiological interpretation of gut–brain communication. By recognizing the mind as an emergent level of organization, psychogastroenterology can instead accommodate the reciprocal influences among subjective experience, behavior, social context, nervous system activity, gastrointestinal physiology, and the gut microbiota within a single biopsychosocial framework. This perspective is therefore consistent with the conception of the human holobiont as a complex adaptive system whose properties emerge from interactions occurring across multiple biological and psychosocial levels of organization.

A further limitation of current definitions is that they describe psychogastroenterology primarily in terms of clinical application rather than as a comprehensive scientific framework. Most definitions characterize the discipline as the application of psychological science to gastrointestinal disorders or the clinical management of brain–gut interactions. While this emphasis accurately reflects the historical development of the field, it provides relatively limited insight into the biological architecture underlying these interactions or the mechanisms through which different levels of organization are bidirectionally integrated.

In this sense, psychogastroenterology should not limit itself to the "top-down" causality characteristic of psychological influences on the gastrointestinal system, including the microbiota, but should also encompass the reverse causal direction, where microbiota interactions also influence psychological aspects, with all their important clinical implications.

Taken together, these considerations suggest that the current definitions no longer fully capture the conceptual scope of contemporary psychogastroenterology. Rather than requiring the abandonment of previous models, recent advances indicate the need for a broader theoretical framework capable of integrating the microbiota, gastrointestinal physiology, brain function, psychological processes, and the broader biopsychosocial context within a single coherent explanatory model. Such a reformulation would better reflect the current state of knowledge and provide a more comprehensive conceptual foundation for future research, clinical practice, and interdisciplinary collaboration.

Toward a Revised Definition of Psychogastroenterology

The limitations discussed above do not diminish the historical importance of previous definitions. On the contrary, they reflect the progressive evolution of psychogastroenterology alongside advances in neuroscience, gastroenterology, microbiome research, systems biology, and the behavioral sciences. As the

scientific understanding of gut–brain interactions has expanded, the conceptual foundations of the discipline have likewise become increasingly complex.

Accordingly, an updated definition should not simply broaden the list of biological mechanisms involved in gastrointestinal health and disease. Rather, it should provide a coherent conceptual framework capable of integrating the multiple levels of organization currently recognized as contributing to these processes. Such a framework should explicitly acknowledge the central role of the gut microbiota, incorporate the neural, endocrine, immune, and metabolic pathways through which bidirectional communication occurs, distinguish the mind from the brain as an emergent level of organization, and situate these interactions within the broader biopsychosocial context of the human holobiont.

From this perspective, psychogastroenterology should be understood not merely as the application of psychological interventions to gastrointestinal disorders, but as a scientific and clinical discipline devoted to understanding and managing the complex interactions among psychological, biological, and social processes that shape gastrointestinal and mental health.

On the basis of these considerations, the following definition is proposed.

Psychogastroenterology is the scientific and clinical discipline that studies, assesses, and manages the bidirectional interactions among the mind, the nervous system, the gastrointestinal system, the gut microbiota, and the social environment within the broader biopsychosocial framework of the human holobiont. These interactions occur through interconnected psychological, neural, endocrine, immune, metabolic, and social processes.

Its aim is to understand how top-down and bottom-up processes contribute to gastrointestinal and psychological health and disease, promoting integrated assessment and intervention strategies that recognize the dynamic interdependence between mind, nervous system, gut, microbiota, and social context.

Clinical Implications

The proposed definition has implications that extend beyond terminology.

By redefining psychogastroenterology as the scientific and clinical discipline concerned with the bidirectional interactions among the mind, the nervous system, the gastrointestinal system, the gut microbiota, and the social environment within the framework of the human holobiont, it expands both the conceptual scope and the potential clinical applications of the discipline.

Previous definitions have primarily framed psychogastroenterology as the application of psychological science to gastrointestinal health or as the clinical management of brain–gut interactions. This perspective

has been instrumental in establishing the role of psychological assessment and intervention within gastroenterology, particularly through evidence-based psychotherapies, behavioral medicine, and multidisciplinary care. The proposed definition does not replace these contributions but situates them within a broader biological and biopsychosocial framework.

From a clinical perspective, this broader framework encourages practitioners to conceptualize gastrointestinal disorders not as the consequence of isolated psychological or physiological factors, but as the product of bidirectional dynamic interactions occurring across multiple levels of biological and psychosocial organization. Clinical assessment may therefore extend beyond psychological symptoms and gastrointestinal manifestations including, when appropriate, measures of autonomic nervous system function (e.g., indices of vagal activity), immune and inflammatory activity, metabolic regulation, gut microbiota, health-related behaviors, and relevant features of the patient's social environment.

Importantly, the proposed definition does not imply that all these domains should be assessed or treated in every patient. Rather, it provides a theoretical framework that allows clinicians to identify which interacting systems are most relevant in each clinical presentation and to integrate this information into individualized case formulations and treatment planning.

The definition also has implications for interdisciplinary collaboration. By explicitly recognizing the multiple biological and psychosocial processes involved in gut–brain interactions, it reinforces the need for collaboration among psychologists, gastroenterologists, dietitians, microbiome researchers, psychiatrists, neurologists, immunologists, endocrinologists, and other healthcare professionals. In this sense, psychogastroenterology is not conceived as a subspecialty of psychology or gastroenterology alone, but as an integrative scientific and clinical discipline.

Finally, the proposed definition broadens the research agenda of psychogastroenterology. Rather than focusing primarily on the effectiveness of psychological interventions or on brain–gut communication, it encourages investigation of the complex interactions linking psychological processes, neural regulation, immune function, endocrine signaling, metabolism, microbial ecology, and social context. This systems-oriented perspective may facilitate the development of more comprehensive theoretical models, improve the integration of emerging evidence across disciplines, and support increasingly personalized approaches to gastrointestinal and mental health.

In this broader context proposed by the definition of psychogastroenterology proposed here, for example, the psychogastroenterologist, in planning and carrying out his own intervention to support the patient, is not only interested in and competent in the evidence-based knowledge that demonstrates how psychological dynamics influence gastrointestinal ones but also in those that demonstrate the opposite causal direction

such as, for example, the fact that intestinal dysbiosis can interfere with the processes of fear extinction^[20] or that intestinal inflammation can induce states of anxiety or depression^[21].

Future Directions

The definition proposed in the present paper should be regarded as a conceptual framework rather than a definitive endpoint. As scientific knowledge concerning the MGBM axis continues to evolve, the proposed definition is expected to be progressively refined through empirical evidence and theoretical development. Its principal value lies in providing a broader conceptual architecture capable of integrating findings that have traditionally remained fragmented across multiple disciplines.

Several research directions emerge directly from this proposal. First, future studies should investigate whether adopting the human holobiont as the primary unit of analysis improves the explanatory power of psychogastroenterological models compared with traditional Brain–Gut Axis frameworks. Such research may contribute to the development of more comprehensive theoretical models capable of accounting simultaneously for psychological, neural, immune, endocrine, metabolic, microbial, and social determinants of gastrointestinal and mental health.

Second, the proposed definition encourages the development of multidimensional assessment models that integrate psychological evaluation with biological and behavioral markers relevant to gut–brain communication. Rather than replacing existing clinical assessments, this perspective supports the identification of clinically meaningful interactions among multiple regulatory systems and their potential contribution to individualized case formulation.

Third, the proposed framework opens new opportunities for interdisciplinary collaboration between psychology, gastroenterology, microbiology, neuroscience, psychoneuroendocrinology, systems biology, nutrition, and computational modeling. Future research may benefit from adopting systems-oriented methodologies capable of characterizing the dynamic interactions among these domains rather than investigating each mechanism in isolation.

Finally, the present proposal invites a broader epistemological reflection on the identity of psychogastroenterology as a scientific discipline. Scientific definitions do not merely describe existing knowledge; they shape research priorities, influence methodological choices, delimit the object of investigation, and ultimately guide clinical practice. Evaluating the explanatory and heuristic value of the proposed definition therefore represents an important task for future theoretical and empirical research. If supported by accumulating evidence, this broader conceptual framework may contribute to establishing

psychogastroenterology as one of the paradigmatic disciplines through which contemporary systems medicine and the biopsychosocial understanding of the human holobiont converge.

Ultimately, the scientific value of the proposed definition should not be judged by its conceptual novelty alone, but by its capacity to generate new hypotheses, stimulate interdisciplinary research, improve clinical reasoning, and provide a more accurate representation of the biological complexity that characterizes the human holobiont.

Conclusions

The evolution of psychogastroenterology reflects the broader historical transition of medicine from reductionist explanations toward increasingly integrated models of human health. The definitions proposed over the past decade have played a fundamental role in establishing psychogastroenterology as an interdisciplinary discipline and in promoting the integration of psychological science within gastroenterological care. Their contribution remains substantial and continues to provide an essential foundation for clinical practice and research.

However, the rapid expansion of knowledge concerning the gut microbiota, psychoneuroendocrinology, systems biology, and the concept of the human holobiont has considerably broadened the biological and conceptual landscape in which psychogastroenterology operates. Consequently, definitions developed primarily within the Brain–Gut Axis paradigm no longer fully capture the multidimensional complexity of the mechanisms currently recognized as shaping gastrointestinal and psychological health.

The definition proposed in this paper should therefore not be interpreted as a replacement for previous conceptualizations, but rather as their logical extension. It preserves the central contributions of psychosomatic medicine, the biopsychosocial model, and the Brain–Gut Axis while incorporating the additional levels of biological and psychosocial organization that have emerged from contemporary research. In particular, it explicitly recognizes the gut microbiota as an integral component of the system, distinguishes the mind from the nervous system as an emergent level of organization, and situates these interactions within the broader biopsychosocial framework of the human holobiont.

Beyond its terminological value, this reformulation has important theoretical, clinical, and research implications. The proposed definition encourages a systems-oriented understanding of gastrointestinal disorders, supports more comprehensive interdisciplinary assessment and intervention, and provides a conceptual framework capable of integrating evidence originating from neuroscience, gastroenterology, microbiology, immunology, endocrinology, psychology, and the social sciences. It also promotes a shift from

predominantly top-down interpretations of gut-brain interactions toward a fully bidirectional model that equally recognizes the clinical relevance of bottom-up mechanisms arising from the gastrointestinal system and the gut microbiota.

Finally, scientific definitions do more than describe a discipline—they define its object of study, delimit its conceptual boundaries, and influence the questions researchers ask, the hypotheses they formulate, and the models that guide clinical practice. From this perspective, updating the definition of psychogastroenterology is not merely a semantic exercise but a necessary conceptual step toward aligning the discipline with the current state of scientific knowledge. As research on the MGBM axis and the human holobiont continues to evolve, the proposed definition offers a broader theoretical foundation upon which the next generation of psychogastroenterological research and clinical practice can be developed.

The principal conceptual contribution of the present paper is the shift of psychogastroenterology's unit of analysis from the brain-gut relationship to the human holobiont viewed from a biopsychosocial perspective.

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