

Clinical Ecology and its Repercussions on General Medicine and Epidemiology

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Abstract

The need for ecological perspectives in medicine and epidemiology is now obvious. The grand interconnected challenges of our time (infectious diseases, non-communicable diseases, global socioeconomic inequalities, biodiversity losses, climate change, disconnect from the natural environment, etc.) demands that all of medicine be viewed from an ecological perspective. It is increasingly clear that each person maintains complex, biologically-relevant microbial ecosystems, and those ecosystems are, in turn, a product of the lived experiences within larger social, political, and economic ecosystems. Biodiversity maintains a microbiota or microbial ecology, and its dysbiotic drift is associated with contextual changes (environmental contamination, chemical modification, altered absorption of macronutrients, etc.) that cause dysregulation that affects the anatomy, physiology, immunology, growth and evolution of living beings, leading to changes in health / physical and mental illness, and that leads to responses in clinical medicine and interventions on lifestyle factors (dietary patterns, hygiene, physical activity, sleep hygiene, etc.), which in turn act on biodiversity and microbiota, in different contexts that are modulated by psychosocial factors, family, work, community, socioeconomic groups, age, sex, vulnerable populations, etc. Clinical ecology is a perspective that sees illness as a response to the total lived experience and the surroundings in which "exposures" accumulate. Clinical ecology is manifesting itself in the ecosystems at the tip of an intestinal villus and elsewhere in and on the body. Clinical ecology is a development towards another clinical medicine and another epidemiology that must understand the experiences of man in terms of multidirectional, simultaneous and sequential causal interrelationships of the microcosm and the macrocosm.

Keywords: Clinical Ecology; Microbiome; Holistic; Bio-Psycho-Social Medicine; Biodiversity; General Practice; Epidemiology; Framework

Introduction

The patient does not have a disease but "make it". It could be said that the disease is "wanted" by the patient's biography. Richard Siebeck (1883-1965), together with Ludolf von Krehl and Viktor von Waizsacker, who were the pillars of the Heidelberg Anthropological School, gave special importance to the biography of the patient, its pathographic evolution and its historicity. The health / disease dichotomy, it develops as a moment in a person's life (1-3).

The health-disease process is the set of interrelated events of adaptation and physical, mental and social maladjustment of the individual or the social group and their environment, which occurs in a bidirectional and constant manner and which results in positive or negative affection to life. Although disease is the opposite of health, both are in a process in which one passes from one state to another and vice versa, and it is impossible to separate. Process of health-disease is the response to the active presence of external agents in the course of a person's

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biography. According to an ecological concept of health, this period of health is the balanced and compensated ecological relationship, that is, favourable to human biology, but in a permanent process of biological variation and adaptation of man to his environment (4).

In a context or theoretical framework of biological assistance, the disease tends to be considered an organic event isolated from the total context. But, at the other extreme, from a psychological theoretical framework, is the danger of "psychologization" and the consequent deformation of the professional relationship: in this approach the disease is seen only in terms of psychological conflicts. In this way, both visions are partial: the form is changed, but the substance of the doctor-patient care relationship remains deformed and essentially unchanged (5).

Nature is organized as a hierarchical unit that reflects a continuity of complexity: from the small and little complex or complicated to the big and complex (... cells, tissues, organs, systems, person, community ...) each with its own qualities and methods of study that are appropriate to them. The permanent presence of the biopsychosocial is a fact more visible in the most complex levels of life. The need to consider the psychological and social components in healthcare has been articulated for years, and there is an acknowledgment that organic and mental health are a common field of study, so that while in some diseases physical factors predominate and in others psychics factors, both coexist in their etiology, symptoms and treatment (6-8).

The word "ecology" entered the common language long ago, but it is not yet in common use in the medical field. Clinical ecology does not refer to classic allergic pathology (pollens, fungi, etc.), or to toxicity from environmental causes (chemicals, gases, industrial toxins, industrial wastes) or food allergy and chronic food intolerance. Nor does it refer solely to the field of immunology. These fields are just small peripheral plots of biopsychosocial medical or clinical ecology. Clinical ecology has little or nothing to do with alternative medicine or natural medicine. By contrast, clinical ecology focuses on the study of the

health and disease effects of the biopsychosocial context (9).

In clinical medicine to diagnose is to collect data to analyze and interpret them, which allows evaluating a certain condition. In medicine, therefore, a diagnosis seeks to reveal the manifestation of a disease from observing and analyzing its symptoms. However, this observation of the signs of a disorder to recognize a disease is mediated by the theoretical framework in which we move (biological/psychological theoretical framework) (10).

Despite the importance to all branches of science and medicine, the relevance of ecological health to clinical medicine and specifically to the daily practice of general practitioners and epidemiologists may seem obscure.

In this scenario, where it is a matter of moving from defensive or unilateral or partial positions (biological vs. psychological vs. social) to integrative positions, this article, which is a personal view, aims to conceptualize and summarize the clinical ecology, based on an unsystematic or opportunistic search for information and the author's experience.

Methods

The comments in this article should be considered as a personal point of view, based on the author's experience during 30 years of work in general medicine, plus an unsystematic or opportunistic search for information. The search for information was based on a non-systematic review considering the bibliographic references of selected articles, reviews of books related to the topic and opportunistic searches on the Internet. This non-systematic review was carried out, which aimed to explore, describe and discuss the topic of biopsychosocial clinical ecology, in a broad way.

Discussion

Biopsychosocial Clinical Ecology

"Clinical ecology" is a perspective that sees illness as a response to the total lived experience and the surroundings in which "exposures" to contextual factors accumulate (11). Clinical ecology is that discipline or conceptual vision that includes those aspects of human health, including

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quality of life and social well-being that are determined by physical, chemical, biological, social and psychosocial environmental factors. It also refers to the theory and practice of evaluating, correcting, controlling and preventing those factors in the environment that can potentially adversely affect the health of present and future generations. Clinical ecology is the study of behavior and biology. Clinical ecology aims to formulate a precise theory that explains man's adaptive capacity to changes in his biopsychosocial context, its causal connections, procedures to address health problems from this broad framework, and how to protect himself from new diseases that have not yet been discovered, or they are unknown, or not yet recognized. Biopsychosocial clinical ecology can be seen as a complementary methodology to classical medicine (9).

Adaptation to the disease situation and the resulting reciprocal interaction with the context, affects the patient (5). It is increasingly clear that each person maintains complex, biologically-relevant microbial ecosystems, and those ecosystems are, in turn, a product of the lived experiences within larger social, political, and economic ecosystems (11).

From the prevalence of infectious (polio pathology, tuberculosis, smallpox, etc.) there was a constant transition towards a predominance of chronic pathology: vascular (myocardial infarction, ictus), digestive, psychiatric, degenerative and allergic. From the point of view of biopsychosocial medical ecology, this epidemiological change is related to changes in the context. These contextual changes include, but are not limited to, environmental pollution, alteration and mutation of the environment and climate change, the introduction of chemicals such as pesticides that mix with the natural terrain, the inappropriate use of antibiotics, hormonal substances, etc., which The massive use of preservatives, emulsifiers, dyes, etc., that modify the chemistry of the food chain, the consumption of refined foods without the natural content of vitamin compounds, or excess exposure to themselves. Likewise, it includes the theory of altered absorption of macronutrients in the intestine by bacterial dysbiosis (9).

More and more is known about of the human microbiome (microorganisms, and their collective genome residing in an anatomic niche. The related breakthroughs with functional proteins (proteomics), metabolites (metabolomics), gene expression (epigenomics and transcriptomics) and genetic influences on drug and nutrient metabolism (pharmacogenomics), are allowing researchers (and increasingly clinicians) to witness the biological impact of a dynamic environment (11-15).

Microbial influence can extend its reach to human behavior, including those that promote vitality or increase the risk of diseases. For example, various lines of animal and human evidence suggest that microbes may play a role in mood, cognition, and motivations (16-18). Also, the connections with the rest of the factors must be included here: relational, family, work, and socioeconomic changes. Factors in a patient's family, home, work, or neighborhood are central to clinical medicine, and these factors are included in the discipline of ecology: from microbial ecology to the biopsychosocial elements of the context and vice versa (11).

In addition to recognizing the importance of the personality and the constitutional peculiarity in the disease and in the experience of the disease, the position or place of the patient before the world, as well as the external conditions of his life in the disease, must also be taken into account. The disease always develops in the course of a life replete with history; it always has multiple roots, both internal and external, the same in the somatic as in the psychic sphere and in the personal and social ligaments. Health and disease should not be interpreted solely because of their biological references, but also because of their personal references. The transformation from healthy to sick, either unforeseen or very slow, is linked to a general commotion, derived from the more or less conscious experience of suffering, knowledge of the diagnosis and interpretation of its meaning (1-3)

From the perspective of clinical ecology, each patient and each community are considered inseparable from the total environment lived over time (19). All these changes are interconnected in a complex

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network of causes and effects, and have repercussions, among other effects, in the human biopsychological system (including the immune system, but not only this one). The biopsychological system must respond effectively to the constant exposure of stressors from the external context. Depending on the intensity and frequency of this exposure to stressful agents (environmental, climatic, social, economic, chemical, Infectious, psychological, physical, hormonal, etc.) different degrees of alteration of the functioning of the person's biopsychological system occur, giving instead of symptoms of disorder or disease, which includes metabolic, degenerative, dermatological, digestive, neurological, psychiatric pathologies, etc., that are related to a microbial ecological background and its alteration (9).

From the classical point of view, events external to the organism provoke a response from the adrenal gland, which tends to control and maintain homeostasis or internal balance. For Seyle, stress is the body's effort to maintain life against a harmful agent. Possibly, a small limited dose of stress is positive for the body to trigger certain reactions. Cortisol is especially used by the body as protection to mobilize in defence of harmful external agents. It is accepted that the hormonal, immune and nervous systems are interrelated. These systems are part of the person's network or biopsychological system. The organism tends to react in a specific way to stressors (to biopsychosocial trauma): this is the basis of the classic general adaptation syndrome, which includes from the biological field:

-A first alarm phase: in the first hours, increased body temperature, loss of muscle tone, hypotension, release of adrenaline and cortisone, etc., which aims to decrease symptoms and restore balance.

-A second adaptation phase: from the first days the body adapts to stress with remission of symptoms, and the body tends to return to normal. In this phase, the body is adapting through changes in hormonal production. This is a state of adaptation to the environment and tries to achieve the ability to function under the best conditions in this environment (20).

-And a third phase of deterioration: when the organism succumbs after a more or less long period of apparent improvement, the symptoms gradually reappear. It is in this phase where the disease unfolds (9).

Diseases and Symptoms as Effects or Consequences of Biopsychosocial Ecological Changes in the Body

Medicine tends to be a holistic discipline, according to which the individual should be treated as a whole and provide comprehensive biopsychosocial health care and also in relation to environment (21). It should be considered the body in its entirety biopsychosocial as a physical, psychological and spiritual spokesperson for health problems of the ecological clinic (22). Illness is a relational concept. It is related to contexts; appears between the person and their relationships with the contexts; it does not exist isolated from the contexts. The disease depends on individual contexts and in turn produces consequences in contexts: social, cultural, economic, environmental and political in which it occurs (20, 23-26).

The fact of confronting the body with the surrounding reality can lead to ecological pathology, such as anorexia and bulimia eating disorders. The external world talks to the body and vice versa (22). The doctor must master a new science focused on the effects that the total environment exerts on the human condition; the knowledge of environmental biology must therefore become one of the essential bases of medical science and practice (11).

Classically, a series of diseases and symptoms have been described as effects or consequences of ecological biopsychosocial changes in the body:

-Typically allergic diseases: asthma, conjunctivitis, rhinitis, eczema, urticaria, etc.

-Psychiatric diseases: depression, anxiety, behavioral changes, psychosis.

-Alterations of the nervous system: headache, neuralgia, vertigo, tinnitus, seizures, vasovagal syncope, etc.

-Cardiovascular diseases: high blood pressure, angor, tachycardia, etc.

-Metabolic and hormonal diseases: obesity, dysmetabolism, sterility,

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amenorrhea, dysmenorrhea, hypo and hyperthyroidism

-Digestive diseases: Peptic ulcer, ulcerative colitis, Crohn's disease, irritable bowel syndrome, non-ulcer dyspepsia, constipation, diarrhea, thrush, etc.

-Renal diseases: kidney failure, chronic cystitis, enuresis, vaginitis

-Osteo-muscular diseases: osteoarthritis, arthritis, myalgias.

-Dermatological diseases: psoriasis, acne, itching, etc.

-In pediatrics: recurrent tonsillitis, eczema, asthma, otitis, abdominal colic, diarrhea, headaches, enuresis, learning delay, behavioral disturbances, insomnia, dyslexia, etc. (9).

Stressors can predominantly affect a certain organ or system, perhaps based on genetic predisposition, and giving specific symptoms of that organ; In these cases, the clinical picture corresponds to that described and classically accepted in the books of medical pathology. This type of reaction of the organism is usually attended by the different specialists according to organ or system (cardiologists, pulmonologists, endocrinologists, psychiatrists, etc.). But, the clinical presentation of health problems that do not correspond to the classically described pictures is habitual and frequent in general medicine; these symptoms cannot be classified or diagnosed under the heading of any of the known diseases: they are biopsychosocial ecological pathology symptoms or syndromes. A series of particular symptoms of this biopsychosocial ecological pathology that can be expressed psychosomatically can be described initially: asthenia, halitosis, oral thrush, palpitations, weight changes, aerophagia, meteorism, digestive difficulties, edema, mental clumsiness, hypersudoration, pruritus, etc. (9).

The clinical ecology model transcends the oldest psychosomatic paradigms and considers that it should move from "functional somatic syndromes" to concepts that are derived from the unique interaction of an individual's genome with their environment and lifestyle and that is rooted in the development of systems biology. The perspective of clinical ecology requires that

we also ask about vital ecosystems at place and planet scales to assess whether they are "lost or altered" and pressuring the patient (11).

What is the Correct Classification, Clinically and Epidemiologically, of Ecological Diseases?

On the basis of the observation of the effects of the biopsychosocial context on the human organism, as well as the observation that a high prevalence of symptoms and health problems cannot be explained and classified or diagnosed within the usual clinical nomenclature, the multiple relationships and links in human life need to be considered to understand the health and disease (9). Not all discomfort, or any deviation in structure and function, or all "bad mood", or any wrong posture or poor performance are "pathological." Where should we set the limit? Health and illness make sense; they have a meaning for life, existence, position and performance within the community. The disease develops as a time of life, changes or progresses, and always leaves its lasting traces. Illness is the destiny that man carries within him, that reaches him from the outside. The doctor has to decide between healthy or sick, not for this or another concept, but as offered by life.

It must be borne in mind that the more frequent and serious the functional disturbances are, the more an organic defect can be counted on. Clinical disease is the history of a lifetime (problems, desires, failures, successes, efforts, etc.) and marks exacerbations or improvements. The disease demonstrates clear diaphanous dependence of its course and prognosis of personality and it also points out the importance of context. And also, disease demonstrates dependence of the treatment established in time (before deep or irreversible structural anomalies are produced) (1, 2).

The Symptom as Part of a Whole

Curing in the dominant biologic care model is curing somatic symptoms without taking comprehensive assessment into account. It is based on the concept of symptom as an isolated entity and not as part of a totality, and the objective consideration of the disease, but not of the patient. The patient's personal problems

are prohibited in the patient's language. Thus, in order not to incur "errors" in this relationship with the doctor, the patient expresses the psychosomatic as organic symptoms (5).

But, 50% of patients treated in general medicine present, at any time, disorganized symptoms or diseases in which the patient presents us with complaints confusing, multiple, erratic, recurrent, and does not conform to patterns described. They are high entropy queries, with maximum uncertainty; with hidden data. This concept of disorganized disease overlaps with others such as frequent attenders, difficult patients, additional demands, multimorbidity and polypharmacy. This situation can overwhelm even experienced professionals. In the consultations that present "disordered" symptoms, these symptoms probably have a different meaning to what they would be given in an "ordered" query (27).

They can help identify different categories of psychosocial and socio-environmental conditions that favour positive responses to treatment (or, conversely, work against the desired results) (11). Biological and social systems are inherently complex, so it is surprising that any human disease can be said to have a single cause or cure. To classify patients' problems as easy, complicated, complex and chaotic is a conventional one, which can only have pedagogical purposes: all problems are always very complex, and to characterize them in another way depends on where we arbitrarily stop our inquiry (28).

In practice, to the classic pathological history, a biopsychosocial ecological history (emotional, relational, family, work, environmental, and in relation to microbiota or microbial ecology) should be added in general medicine, taking into account the lifestyle of the patient in his context. The recurrent presence of particular symptoms of biopsychosocial ecological pathology allows us to hypothesize the need for this holistic approach to the patient is essential.

These particular symptoms of biopsychosocial ecological pathology are usually recurrent or chronic, polysymptomatic, and may accompany other well-defined underlying diseases

within the usual clinical classifications. The recurrent presence of these symptoms should alert us to the influence of the patient's biopsychosocial context. Within the conventional biological framework, these symptoms are classified as psychosomatic or neurotic; in reality, the psychosomatic is an expression of the biopsychosocial ecological pathology (immune, hormonal, metabolic, psychological, social, relational, environmental, dysbiotic, etc.). The proposal from the point of view of general medicine is that they should be classified as indicators of ecological alterations in the patient, as the presence of biopsychosocial ecological pathology. (9).

In the face of global challenges of new infectious diseases, non-communicable diseases, environmental degradation, climate change, loss of biodiversity and an increasing disconnection from the natural world, it is no longer sustainable to isolate the ecology of clinical medicine. There is an urgent need to bring an ecological mindset to the clinical and epidemiologic encounter.

Since more than 80% of disease mortality in westernized nations is determined by modifiable variables this means a deeper layer of "lifestyle" thinking. The clinical ecologist will be concerned with the best way to educate patients about personal and planetary health. Significant amounts of research already demonstrate that personal connections to the natural world are associated with physical and mental health. In fact, research indicates that connection to nature may be a fundamental human need. This suggests another avenue (beyond what is described as social and psychological) of nature's relationship to functional aspects of health and biological responses to the total environment. Social epidemiologists, well versed in how the environment gets "under the skin" and "inside the gut," are in an ideal position to provide scaffolding for the discourse of bio-eco-psychological medicine (11).

Within this concept, ecological terrain can link dysbiotic lifestyles, family, social, work, psychological, environmental situations and large-scale biodiversity with local microbial ecosystems associated with humans that might otherwise seem very distant from each other (29, 30).

TABLE 1. H. Pylori as a Marker of Clinical and Epidemiological Ecology in the Relationships between Humans and Their Microbial Ecosystems: The Complexity of Microbe-Host Interactions and the Clinical and Epidemiological Relevance of Ecosystems

Ecological Complexity Levels	The Example of Helicobacter Pylori
1	Peptic ulcer was thought to be driven exclusively by stress, anxiety and moods
2	The microorganism Helicobacter pylori, and not stress, is the causative agent in most cases of peptic ulcer
3	The influence of H. pylori on the disease does not begin and ends with an ulcer: H. pylori (the presence or, in fact, the lack of exposure thereof) is now implicated in many noncommunicable diseases that were once considered psychosomatic (including, but not limited to, migraine, diabetes, rheumatoid arthritis, autoimmune and asthma and allergic diseases)
4	The direction of association between H. pylori and the disease is not always towards its presence as a pathogen. It is clear that the pathogenicity of Helicobacter depends on the strain. Eradication of H. pylori and lack of exposure in the first years of life can eliminate a layer of protection against the subsequent development of noncommunicable diseases such as asthma and atopic disease
5	As with many aspects of clinical medicine, especially those involving microbes, the history of H. pylori and the ulcer is also complicated by the questions surrounding the host's vulnerability, which results in psychoecological and biological interaction. While H. pylori is a cause of duodenal ulcer, why don't all human carriers of the microorganism, that is, more than 50%, have no ulcer? How could psychosocial and, perhaps more importantly, ecological factors alter the terrain and influence virulence? Also, what are the consequences of trying to eradicate a microbe that has evolved with humans in a generally peaceful way? What are the consequences of the loss of contact with other microbes with which humans coevolved?

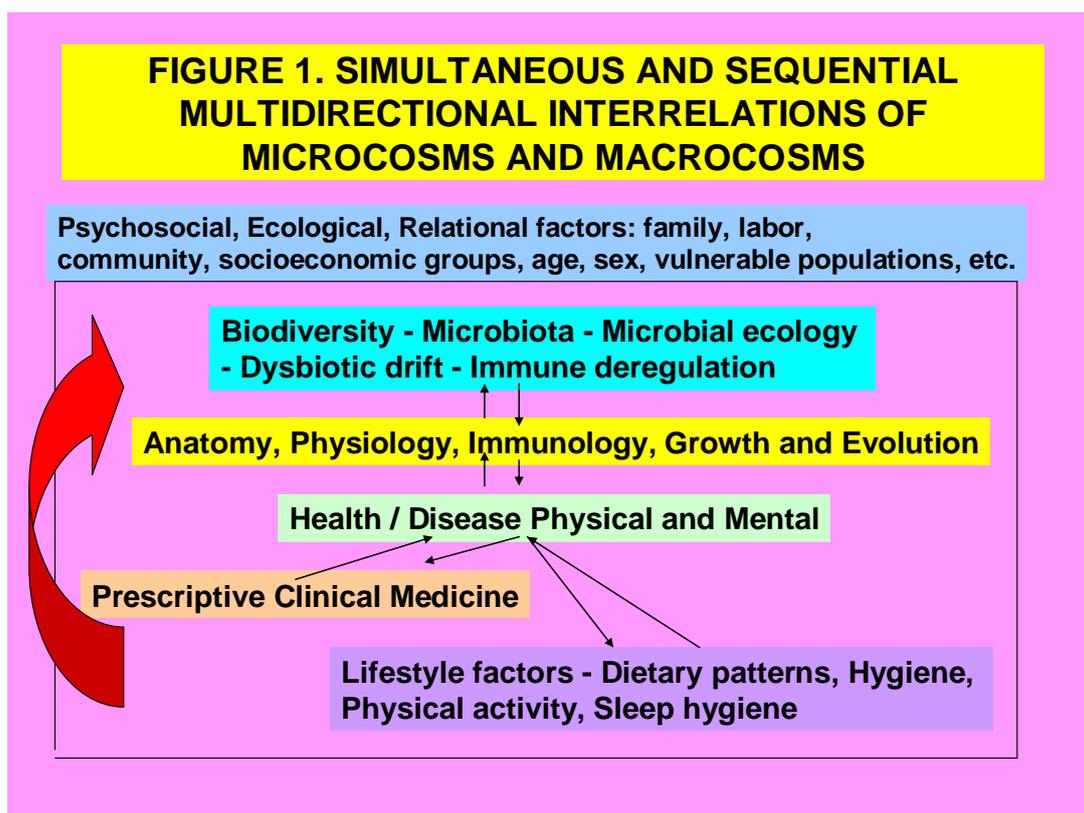


Figure1. Simultaneous and Sequential Multidirectional Interrelations of Microcosms and Macrocosms

Presents the clinical and epidemiological ecology approach in the example of peptic ulcer. The biological elements within the biopsychosocial paradigm (simultaneous assistance to the biological, psychological and social dimensions of the disease) will occupy a central place in this new clinical ecology, which is largely based on the concepts of microbial ecology. It is now evident that the Animal life cannot be seen as functionally separate from organisms that live in symbiosis with it, and this is critically important to unit of anatomy, physiology, immunology, growth and evolution. **FIGURE 1** shows an outline of the clinical-epidemiological possibilities of simultaneous multidirectional interrelationships and sequential between microcosm and macrocosm

Conclusion

The need for ecological perspectives in clinical medicine and epidemiology is now obvious. The grand, interconnected challenges of our time, as the new infectious diseases, non-communicable diseases, global socioeconomic inequalities, biodiversity losses, climate change, disconnect from the natural environment, etc., demands that all of medicine be viewed from an ecological perspective. Probably, clinical medicine and epidemiology will increasingly focus on microbial ecosystems, their psychosocial connections and their disorders.

Biosocial clinical ecology is manifesting itself in the ecosystems (health determining, biologically relevant ecosystems) from the tip of an intestinal villus and elsewhere in and on the body, even in the community and its social, economic and environmental elements. Clinical ecology is a healthcare approach that considers the interconnected vitality of the person, the place and the planet. It is a development towards another clinical medicine and another epidemiology that must learn the biological foundations of the continuum of personal, public and planetary health, and understand the experiences of man in terms of multidirectional relationships, and the simultaneous and sequential causal interrelations of microcosm and macrocosm.

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