A Physiology Relevant to Herbal Medicine
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Note: This document provides background context for the conference presentation. The presentation itself will focus on the last section discussed here (i.e. “A Framework for Physiology in Western Herbal Medicine”).

Introduction

Medical theory and practices are built on a foundational understanding of functions and processes in health and disease. As Leon Eisenberg (1977) states, “Working models of the disease process determine the data that physicians gather, inform the ways in which ‘facts’ are integrated into a diagnosis, and circumscribe the boundaries of interventions designated as therapeutic” (p.10). The patient’s disease is not so much revealed by the practitioner as it is constructed by the practitioner. Concepts of etiology, pathogenesis, clinical manifestations, and appropriate therapy all flow from the foundational understanding of how the body ‘works’. The implications of Eisenberg’s statement are vast. For example, if mind-body connections are not part of a practitioner’s working model of health and disease then the practitioner will not be particularly interested in hearing about the patient’s thought patterns or emotions, will certainly not take them in to consideration in constructing a diagnosis, and will see little value in mind-body therapies. It can be argued that the working model of health and disease, as opposed to the primary treatment modality (e.g. herbs, drugs, acupuncture), is the most defining characteristic of a practitioner. So how are such models developed?

Physiology is a key discipline for understanding biological functions and processes and is central to the development of working models of health and disease. The approach to physiology, including how it is taught and studied in preclinical education, can vary significantly. The question for the current article is what is the most relevant framework of physiological study for students and practitioners of Western Herbal Medicine (WHM)? This article will present an overview of the history of physiological science and thought; review the characteristics of WHM; and then propose a meaningful framework for studying physiology in WHM.

History of Western Physiology and Relationship to Medical Paradigms

Early models of Western physiology emerged in ancient Greece and reflect the notion of the human body as a microcosm of the broader environment. Elements (earth, air, fire and water) and their associated qualities (hot, cold, dry, and moist) manifest in the bodily humors (black bile, yellow bile, phlegm, and blood). Balance of the components leads to health; imbalance leads to disease. These concepts, refined by Galen of Pergamon, remained central to Western understanding of physiology and health up until the 18th century. The healthcare paradigm associated with this model of physiology has been described as ‘Bedside Medicine’ (Bynum, 2008). In this paradigm, illness is understood as relational. The medical inquiry and treatment is focused on the ‘whole person’ (body-mind-spirit); the balance of their constitution and behaviors; and their relationship with the environment.

In the 16th century and 17th century, ‘iatrochemists’ such as Paracelsus and Johann Baptista van Helmont promoted chemical explanations of physiology and health. Importantly, they challenged
humoral concepts and the long-standing authority of the ancients. Advances in anatomy, including Harvey’s discoveries regarding the circulation of the blood, contributed further to movement away from Galenical perspectives. The ‘iatrophysicists’ of the time promoted a mechanical understanding of physiology and health, a perspective championed famously by René Descartes. The increasing availability of better-quality microscopes allowed for closer inspection of the physical structures. Significant discoveries by Antonie van Leeuwenhoek, Marcello Malpighi, and others linked microscopic structure to function. In the 18th century, physiologists such as Herman Boerhaave incorporated the expanding knowledge in physics and chemistry, synthesized physiological discoveries, and applied them to medical theory and practice. The medicine of the time still reflected a patient-centered perspective but pieces were falling into place for a more significant change. The work of Thomas Sydenham in the 17th century heralded a shift towards a more disease-oriented approach that continued to gain momentum. Advances in physics and chemistry, renewed interest in empirical medical studies, and the increasing centralization of medical practice and study in hospitals and universities set the stage for the development of modern physiology and biomedicine in the 19th-20th century.

France and Germany were key hubs for the advancement of physiology in the 19th century. Prominent physiologists of the first half of the century were Johannes Müller and François Magendie. A major goal during this period was exploration of morphology to discover the function and biological importance of distinct organs and tissues. Magendie rejected speculation in favor of experimental physiology and was a strong advocate and practitioner of experimentation on living animals. Advancements developed concurrently with a medical paradigm referred to as ‘Clinical Medicine’ or ‘Hospital Medicine’. Particularly in France, concentration of hospital patients and other factors at the time facilitated new types of investigation. Key characteristics of Hospital Medicine include systematized physical diagnosis to help locate lesions; autopsy-based observations linking lesions to clinical presentation; the merging of surgery with medicine; and observations of large numbers of patients to create diagnostic categories (Bynum, 2008). This paradigm of Hospital Medicine remains central to modern healthcare and emphasizes the physical domain over other domains; views disease as localized and organ-based as opposed to a whole-body imbalance; and generally understands disease as distinct from the patient.

German laboratory research came to prominence in the latter half of the 19th century. A significant switch at this time was to an emphasis on quantitative physicochemical research over morphological studies. Carl Ludwig stands out as a key figure and is notable for his rejection of vitalism in favor of physics and chemistry to explain physiological processes. Around the same time, the German anatomist Rudolf Virchow, a student of Müller’s, took advantage of advancements in microscopy to build on Theodor Schwann’s cell theory of life and publish his own seminal works on cellular pathology. Virchow’s work positioned the cell at the forefront of both physiology and medicine. The advancement of germ theory in association with work by Robert Koch (Germany) and Louis Pasteur (France) also favored further investigation of the microscopic world. The medical paradigm that came to prominence at this time has been termed ‘Laboratory Medicine’ (Bynum, 2008). This approach emphasizes the laboratory as the central place for medical investigation; puts the cell and microscopic world at the nexus of medical inquiry; and frequently employs animals in medical experiments. The basic tenets of Laboratory
Medicine, in conjunction with the paradigm of Clinical Medicine, remain central to medical inquiry in the 21st century.

No discussion of 19th century physiology is complete without mention of Claude Bernard. Bernard, a student of Magendie, was a strong advocate of the scientific method and argued for the importance of the controlled laboratory environment in conducting rigorous physiological research. In his early years, Bernard’s laboratory work led to significant discoveries such as the glycogenic role of the liver and the parasympathetic regulation of the heart. Later in life, Bernard’s interests turned to broader themes. Referred to as the “first systems biologist” (Noble, 2008), Bernard was interested in the organism as an integrated whole and emphasized the emergent properties of complex biological systems. He bridged the chasm between vitalist and physicochemical explanations in his highly influential conceptualization of the ‘milieu intérieur’.

Understanding of physiology grew at an exponential rate in the 20th century. Discoveries are too numerous to recount but the following examples give a sense of some developments in the first half of the century. Work by Ernest Starling and William Bayliss led to Starling coining the term ‘hormone’ in 1905 and stimulated a whole new field of exploration. Bernard’s ‘milieu intérieur’ was incorporated into Walter Cannon’s theory of ‘homeostasis’ that remains a central principle of most models of physiology to this day. Cannon also coined the term ‘fight or flight response’ and helped lay the foundation for Hans Selye’s stress research and his model of the ‘general adaptation syndrome’.

In the second half of the 20th century, reductionist perspectives in biology and physiology led to increased organ- and system-specific specialization as well as the splintering of the field into sub-branches such as molecular biology, cellular biology, and genetics. These developments contributed to remarkable progress in the understanding of isolated physiological mechanisms but comprehension of the interconnections and trade-offs at the organismal level were increasingly sacrificed. Some work countered this trend. Investigations in psychoneuroimmunology and the pathways of placebo built on work by Cannon and Selye to explore mind-body connections. Pathways and models linking the social environment to physiology also emerged and the regulatory model of ‘allostasis’ is of particular note. Proposed in 1988 by social activists/physiologists Peter Sterling and Joseph Eyer, allostasis is a model of predictive physiological regulation that is arguably more relevant than homeostasis for explaining organism-wide physiological responses in a complex social environment. Reductionist biomedical approaches to healthcare dominated this time period but models that paralleled emerging research in sociophysiology and psychophysiology gained some ground (e.g. George Engel’s biopsychosocial model of disease).

Other developments aside, 20th century advancements in physiology and biology were centered on genes. Francis Crick and James Watson famously elucidated the structure of DNA in the early 1950s setting the groundwork for research in molecular genetics. The Human Genome Project, completed around the turn of the 21st century, symbolizes both the remarkable achievements and limitations of genetic and biological research in the 20th century. Mapping DNA sequences is one thing; understanding gene functioning in the context of the whole and understanding how genotype relates to phenotype is another. Genes in action have proven to be far more complex
than originally anticipated and reductionist gene-by-gene research has been shown to have significant limitations as a sole approach.

The study of physiology in the 21st century is incorporating both reductionist and integrative (holistic) methods while looking to merge understanding at the cellular and sub-cellular level with higher-level perspectives. The approach of ‘systems biology’ that emerged at the end of the 20th century has reoriented research from a reductionist emphasis on identifying and characterizing individual molecules or genes to investigating molecular and genetic networks in the context of their environment. While systems biology has capitalized on the rapid expansion of ‘-omics’ research (e.g. genomics, proteomics, metabolomics) to generate new insights, the systems biology approach has been applied largely at the cellular and sub-cellular scale. In contrast, the field of ‘integrative physiology’ has primarily emphasized the study of physiological networks and processes at higher levels up through the whole organism (the ‘physiome’). The combination of the two approaches has recently been proposed as ‘Integrative Physiology 2.0’ (Kuster et al., 2011). Further understanding of physiology is currently emerging from fields such as ‘ecophysiology’ and ‘evolutionary physiology’ that consider physiology in the context of the natural environment. In many ways, the direction of 21st century physiology is a return to the relational perspective of the ancient Greeks and offers the possibility of a modern understanding of physiology that reaffirms the wisdom of the ‘Bedside Medicine’ paradigm.

**Characteristics of Western Herbal Medicine**

WHM is a varied but distinct healthcare system with roots in Anglo-American or European thoughts and traditions (Nissen and Evans, 2012). The theory and practice is increasingly informed by biomedicine but remains rooted in more traditional explanatory models of health, illness, and disease. WHM is typically characterized by a holistic, biopsychosocial approach to health and lifestyle assessment. Practitioners are not only concerned with physical symptoms but will inquire about the patients’ thoughts and emotions; the physical environment in which they work and live; their social network and interactions; diet and recreational activities; patterns of activity and rest; and other related factors.

The WHM philosophy emphasizes health promotion, disease prevention, and treatment of root causes as opposed to treatment of symptoms. Therapeutic strategies in WHM are often aimed at supporting *vis medicatrix naturae* (the healing power of nature) and incorporate dietary, lifestyle, and herbal recommendations. Trust in nature, and an emphasis on harmonizing with nature, is demonstrated in recommendations such as the use of whole (unprocessed), seasonal foods; walking in nature; and decreased use of artificial light after nightfall. Herbs are minimally processed and are usually dispensed in compounded liquid formulae or teas.

Patient-practitioner consult times in WHM are typically much longer than in conventional healthcare. The lengthy consult time reflects a philosophy and practice of the telling of and listening to patient stories; patient-herbalist collaboration; and facilitation of patient empowerment (Little, 2009; Nissen, 2008). Qualitative studies on herbalist-patient interactions shows the relationship to be ‘connected’ and professionally intimate (Dennis 2007; Nissen, 2008). Research in the UK found that WHM practitioners facilitated the patients’ reframing and
reinterpretation of individual experiences to create new health narratives with new meanings (Nissen, 2008).

Some questions that arise in connecting the above WHM summary with physiology and explanatory models of health include:

1) If a key goal is “health promotion” how is optimized health understood from a physiological perspective?
2) How are the mind, thoughts, and emotions interconnected with physiology? What is the relevance to diagnostic and therapeutic practices in WHM?
3) How are social networks and interactions interconnected with physiology? What are the physiological implications of the specific type of social interaction between patient and herbalist?
4) How is “living in harmony with nature” interconnected with physiology? What pathways or networks are involved?
5) What is the physiological relevance of using teas, tinctures, and fluid extracts as opposed to the pills and tablets more commonly found in OTC products?

A Framework for Physiology in Western Herbal Medicine

In order to answer these questions, the presentation at the conference will argue for the following framework for studying physiology:

An integrative perspective that emphasizes body-wide coordination of physiological processes. This perspective provides a context for understanding how organism-level challenges are met. Key concepts include salutogenesis, allostasis, and physiological resilience. This perspective provides insights into therapeutic agents such as adaptogens and general tonics as well as broad health-promoting strategies.

A psycho-biological perspective. This perspective provides a context for understanding the relationship between the mind and biophysical health. Key concepts include psychoneuroimmunology; stress physiology; sickness behavior; and placebo effects, ‘context effects’ or ‘meaning responses’. Many benefits of herbal medicines that are unrelated to specific pharmacological effects may be understood best from this perspective. This perspective also provides insight into traditional relationships between organs and moods (e.g. the liver and depression).

A socio-biological perspective. This perspective provides a context for understanding the relationship between social networks, social support, and physiology. Social networks are intertwined with psychological processes as well as behavioral change. Key concepts not already addressed under other headings include social cues and buffering; empathy and compassion; and trust. Patient-herbalist relationships are a specific type of social connection. Significant aspects of patient-herbalist interactions may be understood best from a socio-biological perspective.

An evolutionary and ecological perspective. This perspective provides a context for understanding the relationship between health and evolutionarily familiar resources, stressors,
and sensory cues. Key concepts not already addressed under other headings include chronobiology, co-evolution, hormesis, cellular stress response, and epigenomics. This perspective provides insight into the health benefits of ‘natural’ environments, ‘whole foods’, and broad exposure to phytochemicals. The general pharmacological effects of herbs may be understood best from this perspective.

**A multi-level spatial and temporal perspective.** This perspective provides a context for linking research at different spatial (i.e. genes to organism) and temporal (i.e. microseconds to years) scales in a meaningful fashion. Key concepts not already addressed under other headings include ‘middle-out’ forms of inquiry, emergence, and level of causation. The specific pharmacological effects of herbs as well as the relevance of these effects to health outcomes may be understood best from this perspective.

**References**


