

GUEST EDITORIAL/COMMENTARY

The Scientific Value of Ayurveda

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Two recent experimental investigations into the theory of Ayurveda, the Vedic system of medicine from ancient India, published in this Journal, by Joshi (2004) and, in this issue, by Bhushan and colleagues (pages 349–353), are very timely. Ayurveda has had a great increase in popularity in the last 2 decades and many trained practitioners of Western biomedicine are now putting its simple and profound system of understanding health and disease, known as *tridosha*, into practice. These two papers begin the process of empirically confirming the validity of *tridosha*. The Joshi paper analyzed questionnaires that were used in determining which *doshas* dominate the functioning of the patient's physiology (the *prakriti*), while Patwardhan and colleagues show that various *prakritis* have genomic correlates. Both studies are significant in that they begin to establish the fundamental biology behind Ayurvedic theory and practice—a process that Cooper (2004) has suggested should be applied to all disciplines of complementary and alternative medicine (CAM).

The concept of *tridosha*, the Ayurvedic theory of physiologic regulation involving the integrated function of the three *doshas*—*vata*, *pitta*, and *kapha*—is a cornerstone of Ayurveda, named in the first chapter of the earliest text, *Caraka Samhita* (Angot, 1993; Sharma, 1981–1986). Its connection to modern science, showing that the *doshas* constitute systems of regulatory function, each with a particular area of responsibility (Hankey, 2001) and its present preliminary validation, are first steps to bringing the discipline wider acceptance within modern medicine.

The paucity of independent empirical validation of concepts within CAM, or lack of theory for them, presents a challenge to doctors and scientists alike. Without a theory, a clear empirical attitude is needed. Practitioners require clear phenomenological understanding and scientists restraint from summarily dismissing areas lacking theoretical underpinnings. Jobst (1998) has correctly pointed out that such lack of theory should never deter us from taking unusual phe-

nomena seriously, or from trying to determine their characteristics and establishing them empirically. This applies particularly to the question of accepting the possibility of phenomena, even if, as is the case for homeopathy, they may appear to contradict most of what we know from previous scientific experience. It is also important to take the wisdom and practices of other traditions seriously, even though they are set in foreign cultural contexts, and even if we do not understand them at all. “For the truly open-minded scientist, nothing is implausible” (Wootton, 2001).

For many of us however, accepting the usefulness of things we do not, or cannot pretend to, understand may be very difficult or well-nigh impossible. The need for theory is therefore acute. As Smith has repeatedly stated (Smith, 1999; 2002; 2004), “What is needed is a physics of physick.” In discussing the “Homeopathy Debate,” Jonas (2000) says: “What is needed . . . is a set of reasonable, testable theories that can even partially explain both the positive and negative results.” This is true of much, if not most, of CAM.

Developing such theories is another matter. Finding the right place to start, a possible clue on which to found a theory, is as much a matter of luck as of insight. Milgrom (2002) suggests that “biomedicine, with its dependence on older deterministic scientific paradigms, is probably not the best place to go looking for it,” because “the biomedical sciences . . . are largely steeped in the over-simplistic determinism of the eighteenth and nineteenth centuries.” Hyland (2001a; 2001b) points out that since CAM is holistic, holistic theories such as systems theory are required.

A proposed theory of *tridosha*, being based on systems theory, fulfills this requirement (Hankey, 2001). The proposed theory begins to substantiate many *tridosha* properties. This may seem unlikely, because the *doshas*' integrated hierarchical pattern of functioning has no corresponding identified concept in modern biology, making them unique, and essentially untranslatable. *Vata dosha* is said to govern movement, including that of the mind; its primary location

is said to be the lower abdomen. *Pitta dosha* governs energy; its primary location is said to be the middle of the body. *Kapha dosha* governs cohesion, lubrication, and structure, and is located in the chest and upper torso (Sharma, 1998).

HOW *DOSHAS* FUNCTION IN THE INDIVIDUAL—THE *PRAKRITI*

The ancient texts name many other properties of the *doshas*. For example, all human beings can be classified according to the dominance of one or more *doshas* in their physiology, their *prakriti* (literally, “nature”). The classification gives a good indication of physiologic strengths and weaknesses, mental tendencies, and susceptibility to illnesses of different kinds. According to Ayurveda, the *prakriti*, including its distortion by life history, is of fundamental importance in maintaining health: It provides a guide to lifestyle and ways of healthy living appropriately individualized for each person.

Early, prepathologic stages of the development of illness depend on the pressure on the functioning of the *doshas*. Do they have the ability to cope with challenges presented? Simple knowledge of how they function, and what their state is at any time, can prevent disease, and help restore health more quickly.

A university dean described to me how monitoring the pulse of his 5 children every morning one winter to detect *dosha* imbalances, and keeping them home if weakness manifested, transformed his family’s health from having 1 child sick every week to none being sick for the rest of the season (personal communication, G. Wells). The Ayurvedic system of health assessment is simple to learn and understand, and is easy to use.

A THEORY OF *TRIDOSHA*

Knowledge of the *doshas* is widespread. Tibetan medicine names three factors—rLung, mKriśh-pa, and Badkan—which govern human physiology (Neumann, 2003) with properties identical to those of *vata*, *pitta*, and *kapha*. Similarly, in Traditional Chinese Medicine, the three *doshas* have their equivalents, and are said to hold a more central place in theory than *yin* and *yang* (personal communication, G. Clements).^{*} From these ancient traditions, and during the intervening millennia, the *doshas* have been the foundation of medical practice for the majority of human beings. A vast amount has come to be known and understood about them and their functioning, yet none is contained in courses in Western medical schools, despite increasing recognition of their empirical validity.

What is the modern scientific inquirer to make of this situation? With empirical validation, the *doshas* can no longer be dismissed as vague concepts of an unscientific people. These results rather indicate the respect we should have for the ancients. Having watched many medical colleagues and other friends learn the ancient system and be amazed at its power and simplicity, healthy respect seems well-merited. It appears that *tridosha* represents a valid way of looking at physiology, containing insights about its structure and function, which we in the West have somehow missed. For this reason, the *doshas* seemed to me a challenge to biology. This has slowly led to the insight that the *doshas* represent a more advanced understanding of physiologic function than is currently available in modern biology, so that, if Ayurveda is used as a clue, fundamental advances in biology may result.

Three additional ideas proved to be a major help in my search for a theory: first, from unwritten traditions within Ayurveda, that *doshas* are fundamental not just to human life or mammals, but can be found functioning in all living organisms; second, from other scientifically and medically trained Westerners, that the *doshas* are concerned with organism regulation; and third, the breakthrough clue, that all nontrivial open systems must contain processes of input/output, turnover, and storage. The scientific theory (Hankey, 2001) grew out of these ideas. The *doshas* constitute biologically universal mechanisms regulating those functions identified as fundamental by systems theory: input and output (*vata*), throughput or turnover (*pitta*), and storage (*kapha*).

As such, the *doshas* are fundamental to living systems and must be present in all organisms. In the human body, input and output of nutrients and water occur principally in the colon and kidneys, both governed by *vata* and in the lower regions of the body; the main process driving energy, digestion, occurs in the stomach and duodenum in the central part of the body; and principal mucous secretions responsible for lubrication originate in the upper part of the body—the ancient traditions of *dosha* location are maintained by this theory. The reasons why this should be the case follow from the mechanics of gastrulation in biological development.[†] The overall systems approach may be confirmed by considering the universality of the pathway connecting turnover and storage in single cells (Hankey, 2005b). Together, these ideas begin to substantiate many of the properties of *tridosha* in the traditional literature and their practical use. A full theory in terms of all the modern sciences, open to empirical testing, is beginning to emerge.

In modern biology, regulation is regarded as the *sine qua non* of life. An organism cannot be competitive without effective regulation. Failure of regulation means failure of life, as in cancer or other chronic diseases. Life only survives by

^{*}Clements toured China in 1984 lecturing on Vedic science.

[†]Hankey A. Scientific approach to the three *doshas*: Their principal physiological locations. Submitted for publication to the Journal of Alternative and Complementary Medicine.

maintaining itself far from equilibrium by means of homeostasis and metabolic regulation necessary to maintain negentropy production. Maintenance of structure and form is also fundamental to life, and is the basis for all identification, classification, and taxonomy. The concepts of regulation (homeostasis), metabolism (negentropy production), and stability of form, held to be fundamental by modern biology, are identical to the three concepts behind the three *doshas*. In *tridosha*, Ayurveda turns out to have named the three most fundamental, universal properties of living organisms, of life itself.

THE INHERITANCE OF *TRIDOSHA*

If *tridosha* is present in all organisms, then the ways it is implemented must be inherited. In biology, we are used to looking at the inheritance of form at both the gross level of overall appearance and gross structure, and the subtle level of internal structures, organ systems, organs, and organelles. These are realms of the anatomist and microscopist. All is identified for the purpose of naming and classifying the organism. Inheritance of structure, though still mysterious, is acknowledged to be fundamental. Biology also takes for granted inheritance of molecular structures—the DNA sequence, the focus of the modern science of genomics, and proteins, with their corresponding amino acid sequences—as the modern basis for measuring distance between different species and branches in the kingdoms of life. The catalytic properties of protein enzymes make possible biochemical reactions, so their heritability leads to the inheritance of metabolic pathways.

Despite regulation being a fundamental requirement of all living organisms and the key to maintaining function and health, little seems to have been undertaken so far concerning the genetic basis for the inheritance of regulatory mechanisms. The major exception is in inheritable susceptibility to cancer[‡] and other diseases (e.g., oncogenes and similar single gene problems). True metabolic regulation is far more complex in nature.

Metabolic regulation is made possible by cyclic sets of biochemical reactions. The one element necessary for regulatory control is feedback (Wiener, 1948), and in cellular biochemistry, feedback requires cycles of biochemical reactions (Prigone, 1985). The existence of a cycle of chemical reactions requires all enzymes catalyzing reactions in the cycle to be present, while the detailed physics of control depends on the details of the reaction kinetics of each and every enzyme in the loop. Control and regulation are therefore not the properties of single genes, but sets of genes. A particular process of regulation will depend on the com-

bined properties of all the genes encoding every aspect of every enzyme in the feedback loop. Possibly the sheer complexity of regulation and its elaborate genetic basis have deterred previous investigation of this essential foundation of life.

The logic is simple: If protein enzymes are inherited, then metabolic pathways requiring several enzymes are inherited. So are patterns of regulation requiring cyclic biochemical pathways for their implementation. From this, and the new understanding of *tridosha*, it follows that in all species, the precise ways *tridosha* is implemented must be inherited. There must be a genomic basis for *tridosha*, and all the individual differences in the expression of each, the personal *prakriti* (and this must also be true of the 15 subdoshas).

EMPIRICAL VALIDATION OF THE CONCEPT OF *DOSHA*

In this light, the paper of Patwardhan and colleagues in this issue assumes added significance. What they have accomplished is the beginning of a verification that the *vata*, *pitta*, and *kapha* traits of the *tridosha prakriti*, or morphologic and metabolic tendencies of a human being, are genome-based. This is work of fundamental importance. It is not at all obvious. As Patwardhan and colleagues point out, the genomic basis of morphologic traits such as superficially identifiable racial characteristics is not established. *Tridosha* characteristics are evidently qualitatively different. Present theory indicates that they are more fundamental to life, both because they are present in single cells, preceding the morphogenesis of multicellular organisms (Hankey, 2001), and because regulation depends on sets of enzymes catalyzing complete feedback loops of biochemical reactions. For these reasons, the *prakriti* of an individual depends on the inheritable properties of encoded proteins and their identifiable alleles in the genome, as Patwardhan and colleagues hypothesize and confirm.

Traditionally, the *prakriti* and detailed state of the *doshas* are determined by Ayurvedic pulse reading, still the most accurate method for expert practitioners, but difficult to evaluate in objectively validated quantitative terms. In the late 1980s, questionnaires were designed to determine individual differences in *tridosha* function in individuals coming for Ayurvedic consultation. Such a questionnaire has been validated by Joshi (2004). The statistical analysis is similar to that used in the analysis of individual differences in psychology. It may now be possible to show that *vata*, *pitta*, and *kapha*, as types for *prakriti* classification, represent physiologic characteristics as empirically well-defined as psychology's scales of introversion/extroversion and neuroticism (Eysenck, 1965). Here is an empirical discovery inspired by Ayurveda of fundamental scientific importance and originality. While these empirical validations of the *tridosha* concept do not yet verify the scientific theory

[‡]In this light, *tridosha* could provide a wider context for the study of oncogenes.

in detail, they do represent major advances in scientific understanding.

CONCLUSIONS

The emerging scientific work on *tridosha* is beginning to establish its validity from a modern scientific perspective. The self-consistency and value noted by students of Ayurveda in East and West is becoming appreciated in a deeper light. The combination of experimental work and developing theory is in accordance with the suggestion made by Cooper (2004) that every aspect of CAM should have its biology.

If we extend this idea to CAM systems other than Ayurveda, we might hope that a similar approach might help every scientifically valid part of complementary medicine, including traditional medicine, make sense in the context of biology and physical science, even if these have to be extended in the process. This idea can guide theoretical and experimental research in all fields of CAM, and indeed in biology and biophysics (Hankey, 2005a).

Resulting advances would be doubly valued. On one hand, a new understanding of biology would result. On the other, the indications of how and why CAM disciplines work would make them far more acceptable to those schooled in modern science. If such an undertaking were to be successful, acumeridians, or processes of healing central to particular disciplines of CAM, might be seen to have simple origins, and fulfill useful functions. Valid theories of such CAM concepts ought to make sense in terms of biological evolution. Such properties of organisms should be seen to confer a competitive advantage. The existence of *prana* or *qi* might be seen to be fundamental to all organisms. For instance, the mechanism of spiritual healing might somehow be connected to the purpose inherent in living organisms themselves.

Theories of CAM disciplines will not only be of importance in guiding future CAM research; their implications may be much more far-reaching. It may even be that they hold the key to the future of science. Nobel laureate Brian Josephson has proposed a “biological interpretation of quantum theory” (Josephson, 2002). It is possible that out of that and similar insights, a much more profound theory, encompassing wider areas of CAM, could be developed. To give Jonas (2000) the final word: “Who among us can predict which small and seemingly implausible observation will reveal the next great secret of the universe?”

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