

Thoughts about the properties of water

I was recently asked by my colleague Dr. Roberto Risi if I would like to contribute to the discussion about the importance of water to life and healing. I do not read Italian and so can only get an approximate understanding of what is written in the various postings in the website he asked me to contribute to [<https://informadacqua.altervista.org/>]. I apologise for writing in English and hope that this is useful.

I am, by training, an acupuncturist who has treated patients for 40 years. During this time, I have also taught and learned from many students (including Roberto), explored historical and modern ideas and written numerous books. As a scientist, I am involved in undertaking and developing further research on acupuncture. My approach to the topic of water, and its perceived and theoretical roles in life and health is two-fold. First of all, to briefly discuss some ideas that can be found in ancient Chinese texts, and secondly to summarise modern scientific descriptions about the properties of water. I will provide references where I can.

Historical Chinese ideas

In early Chinese Cosmological speculations, we find the dual *yin-yang* representation of Heaven – Earth interactions giving rise to the intermediate level of the Person (life). This was described already in the *Yijing* (Book of Change) from at least the 7th century BCE (captured in the *Yijing* ‘trigrams’). As this simple system’s theory type model evolved [Matsumoto, Birch 1988] it expanded to describe the dynamics of how this



unfolded so that more details could be explored. In this context the



Chinese promoted the theory of the *wu xing* or five phases (water-wood-fire-earth-metal). While similar to Indo-Grecian models emerging in the same time frame [Unschuld 1985], the Chinese also prioritised the role of water, which was seen to arise first among other forms of matter. This can be seen in the following passages: “no form is the great

ancestor of matter...the child (of no form) is light, the grandchild (of no form) is water. All are created from no form” & “light can be seen but cannot be grasped; water can be molded but cannot be destroyed. Therefore of all things that have matter, nothing is more respectable than water” [Both quotes from the *Huai Nanzi* {circa 120 BCE} (see Matsumoto, Birch 1988:90)].

As the formal medical literature of China emerged in the *Huangdi Neijing* corpus in the early *Han* dynasty (circa 150 BCE), this five phase classification was codified and emerged as an important framework that helped lay the foundations for the syncretistic thinking embodied within the theories of systematic correspondence that have guided traditional East Asian Medical thinking since that time [Unschuld 1985, 1986]. In this framework, the term water refers to a tool within both a classification system, employed to describe nature and its influences (correspondences, cycles, interactions), and to the physical matter of water. The phase of ‘water’ is seen in the correspondence between the kidneys and the bladder, the two

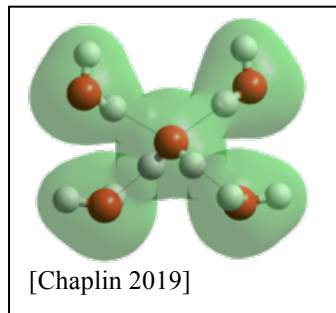
organs most responsible for the regulation of water in the body. It is also sometimes found in the descriptions of the body and its metabolism, creating a blurry distinction between both ontological and correspondence descriptions of things. But, within this water was prioritised within material things and within the five phases. The kidneys were seen as the ‘root’ of the body, storing important stuff¹ (the *jing* or essence), which was described as being fundamental to life [Matsumoto, Birch 1988]. In these descriptions they proposed a more fundamental role for water which both underlays the general theory, possibly underscores emergent descriptions of how things work. In the *Huangdi Neijing* the construct of *qi* was prioritised as the stuff which not only all things are constructed of, but the stuff¹ which when it circulates well in the body maintains a healthy state of the body [Birch et al. 2014]. How did this *qi* move? That is a difficult thing to answer as there were said to be many forms of *qi* each with their own movement, mechanisms and pathways. For example, the *qi* in the *jingmai* or meridians was called the *yingqi* and was described as being driven by respiration. The *weiqi* or protective *qi*, said to be at the surface of the body, is triggered into a cyclical movement across the body surface by the act of waking [Birch et al. 2014]. However there is a very curious description of *qi* movements inside the body in relation to the body fluids (*jin* and *ye*), each obviously related to water but of different consistency and nature [Birch 2003, Birch, Matsumoto 1988:149].

Here we see the first hint that *qi* or at least some forms of *qi* movement are related to fluids (water). This description is important as it arises in the context of speculating about the role of the two forms of fascia in the body (*gao* and *huang*) [Matsumoto, Birch 1988] and where the *Huangdi Neijing* describes how the combination of the *jin* and *ye* forms the *gao* (fascia) [Matsumoto, Birch 1988:149, Birch 2003]. A discussion about the role of the fascia, fluids and the *qi* movements was made within the context of discussing possible fundamental properties of the body [Matsumoto, Birch 1988]. The correspondence and potential importance of these early speculations can be seen below.

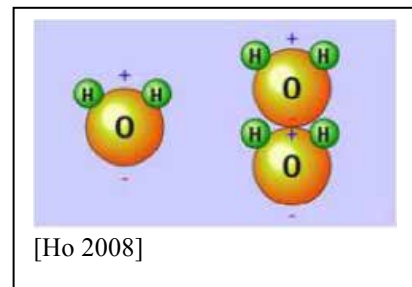
Modern scientific concepts

Water has very unusual properties. A water consists of an oxygen atom bonded to two hydrogen atoms. With one positively charged end and one negatively charged end, the bond angle between the three atoms is approximately 104 degrees.

This structure allows water molecules to act (within certain physical ranges – e.g. temperature) on each other



via secondary electrical, atomic and molecular bonding properties. This allows water molecules to adopt structural alignments that in recent decades have led scientists to describe water as being in a liquid crystal state [Ho 2008, Aguilar 2016]. The interaction of the water molecules can facilitate both electron [Ho 2008] and proton [Ho 2005, Marechal 2007] transmission pathways. These pathways thus facilitate subcellular signal transmission at the level of ambient electromagnetic fields within living structures.



¹ I use the term ‘stuff’ following in the footsteps of many scholars of Chinese thought [Birch et al. 2014].

When dry, proteins can still carry out their specific protein structure mediated function, but when proteins are moist (a condition that arises when water molecules adhere around the protein molecule), this not only enhances the functionality of the protein, but it also facilitates additional information transfer via the signal transmission properties of water. The bond angle of

“Perhaps more fundamentally, biological systems are mostly made of water. How biological molecules (such as proteins) interact with each other likely depends on the specific manner in which water molecules arrange to form a liquid phase.”
[Aguilar 2016]

water is usually thought to be stable, but scientists have found that it can fluctuate around that average angle, depending on exposure to different physical

“Water, with proteins and nucleic acids, is amongst the most important hydrogen-bonded substances. Hydrogen-bonding forms in liquid water as the hydrogen atoms of one water molecule are attracted towards the oxygen atom of a neighboring water molecule. The hydrogen atoms are not only covalently attached to their oxygen atoms but also attracted towards other nearby oxygen atoms. This attraction is the basis of the 'hydrogen' bonds.”
[Chaplin 2019]

parameters [Milovanovic et al. 2020]. This is important since, when the bond angle is reduced, this allows more water molecules to attach themselves to protein surfaces, thereby facilitating more information transmission. If the bond angle increases this results in lower numbers of water molecules attaching themselves to proteins with corresponding reduction in signal transmission. In addition the strength of the hydrogen bond can fluctuate due to various physical parameters [Chaplin 2018, 2019]. If it changes by less than 10% it is not generally viewed as being threatening to living systems, but if it changes by more than 10% it can be considered a possible threat to life [Chaplin 2018]. In summary, these fundamental properties of the water molecule and the properties of water are thought to be very important for how life thrives. There is a kind of ‘goldilocks’ zone where the hydrogen bond properties operate most efficiently in support of life [Chaplin 2019].

In recent decades the ground substance of the body, the extracellular matrix which is mostly constructed of proteins such as collagen, has been found to be increasingly important, not only for its structural properties but also its signalling capabilities. It is said to be one part of the signalling network within the body since moist proteins are said to be semiconductors and can carry signals from any part of the body to any other part of the body [Oschman 2000, Matsumoto, Birch 1988]. During the last decades scientists have uncovered and described the vital functions of these ambient electrical signalling systems in the body, they have long been known to be involved in at least growth, development, healing, repair [Becker 1984, Becker, Marino 1982, Becker, Selden 1985, Ho, Poppe 1993, Jaffe 1982, Nordenstrom 1983, Oschman 2000]. These signalling properties of the extracellular matrix or ground substance are highly dependent on water and the degree of hydration of the tissues [Oschman 2000].

More recently, the fluid system that surrounds the extracellular matrix and the various cellular systems in the body, the ‘interstitium,’ has been found to act as a single organ system [Benias et al. 2018]. This mean the system of fluids which surrounds all cellular and extracellular structures is itself an organised system with, like any organised system, its own regulatory (and signalling) processes. Here we see the vital role of water operating to not only nurture the structural aspects of the living body, but to play an essential role in the

“We propose here a revision of the anatomical concepts of the submucosa, dermis, fascia, and vascular adventitia, suggesting that, rather than being densely-packed barrier-like walls of collagen, they are fluid-filled interstitial spaces. The presence of fluid has important implications for tissue function and pathology.”
[Benias et al. 2018]

transfer of information, thus helping the regulation of the body and all bodily functions. Whilst we already have detailed descriptions of how the nervous and hormonal systems play an important role in how the body regulates itself and mediates its interaction with the environment, we see beneath these that water plays a more fundamental role. In the words of Yoshio Manaka, it can be seen to be part of a fundamental feature of a deeper, more primordial signalling system within the body, the ‘X-signal system’ [Manaka et al. 1995].

What I have described here is part of an emergent picture of the body and I may have overstated, understated or inaccurately stated certain things. I also conducted a very limited literature review, and a more thorough search might have produced more evidence. Despite these potential limitations and caveats, we can however conclude the following: While it may be too early to extend these descriptions too much, since further research is needed to figure out more details, it is realistic to see how some of what is described here reveals the fundamental role of water to life and how it may play that role: namely that water plays an important role in, for example enabling protein functions and assisting in the transmission of regulatory signals within the body.

These emergent descriptions also mirror very nicely the proposed priority of water that we find in early Chinese cosmological and medical descriptions. The notion that the “anatomical concepts of the submucosa, dermis, fascia, and vascular adventitia, suggesting that, rather than being densely-packed barrier-like walls of collagen, they are fluid-filled interstitial spaces” [Benias et al. 2018] seems strangely similar to the *Huangdi Neijing*’s proposal that the *gao* (fascia) is formed from the combination of the two body fluids, the *jin* and *ye*, and it is due to the movements of these fluids that *qi* moves within the body.

I started working on this topic in the early 1980s whilst undertaking the research, translation and writing for the book ‘Hara Diagnosis.’ I am grateful to Roberto for capturing me at home and inspiring me with his insightful work. This has helped bring ideas more into focus for me. Thank you for reading this and I hope you find it useful.

Acknowledgements

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