

Water & fascia : Micro-tornadoes, hydrogenated diamonds and nanocrystals
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Several years ago I wrote a series of articles for *Massage Today* on the topic of the (then) recent and exciting research into fascia.

If you missed these you might want to search through the archives

<http://www.massagetoday.com/mpacms/mt/> in order to locate them:

- *The Amazing Fascial Web, Part I. May, 2005 (Vol. 05, Issue 05)*
- *The Amazing Fascial Web, Part II. June, 2005 (Vol. 05, Issue 06)*
- *Breathing Patterns, Connective Tissue and Soft-Shelled Eggs. October, 2005 (Vol. 05, Issue 10)*

As the 2nd *International Fascia Research Congress* approaches (October 27 to 30), at the Free University, Amsterdam (<http://www.fasciacongress.org/2009/>) a return to some of the fascinating advances touched on in the earlier articles, seems appropriate, together with a few new exciting pieces of research – all of which reflect directly on the work of all manual therapists.

Some of the key fascia related topics covered in those earlier articles were :

- The presence of contractile smooth muscle cells (SMCs)/myofibroblasts) that are embedded in most connective tissues. For example SMCs have been located widely in connective tissues including cartilage, ligaments, spinal discs and lumbodorsal fascia (Ahluwalia 2001, Hastreite et al 2001)
- The facts that the extracellular matrix (ECM) plays a key role in the transmission of forces generated by the organism (e.g. muscle contraction) or externally applied (e.g. gravity, or by means of manually applied therapy).
- Cell-matrix adhesion sites appear to host a ‘mechanosensory switch’ as they transmit forces from the ECM to the cytoskeleton, and vice versa, triggering internal signals following mechanical stimulation, such as occurs in manual therapy (Chen & Ingber 1999).
- There appear to be forms of communication within the fascial matrix, for example caused by tugging in the mucopolysaccharides, created by twisting acupuncture needles (Langevin et al 2005)

German researchers Schleip et al (2005) note that:

“The ability of fascia to contract is further demonstrated by the widespread existence of pathological fascial contractures. Probably, the most well known example is Dupuytren disease (palmar fibromatosis), which is known to be mediated by the proliferation and contractile activity of myofibroblasts. Lesser known is the existence of similar contractures in other fascial tissues which are also driven by contractile myofibroblasts, e.g. plantar fibromatosis, Peyronies disease (induratio penis plastica), club foot, or – much more commonly – in the frozen shoulder with its documented connective tissue contractures. Given the widespread existence of such strong pathological chronic contractures, it seems likely that minor degrees of fascial

contractures might exist among normal, healthy people and have some influence on biomechanical behavior."

Anyone using myofascial release approaches, or acupuncture, should be able to appreciate the potential therapeutic implications of these discoveries.

Research involving fascia and water's amazing crystalline properties

And more recently, even more evidence has emerged of the mysteries of fascia.

For example:

The behavior of water that interacts with protein in the human body is becoming clearer. Professor Martin Gruebele of the University of Illinois explains: "*Water in our bodies has different physical properties from ordinary bulk water, because of the presence of proteins and other biomolecules. Proteins change the properties of water to perform particular tasks in different parts of our cells.*"

He continued: "*Water can be viewed as a 'designer fluid' in living cells.*" For more on this topic go to <http://news.biocompare.com/newsstory.asp?id=239323>

Sommer & Zhu (2008) note that interfascial water plays a key part in what is termed 'protein folding', the process necessary for cells to form their characteristic shapes – and that nano-crystals are a part of this process – and that these are influenced by light.

"In the course of a systematic exploration of interfacial water layers on solids we discovered microtornadoes, found a complementary explanation to the surface conductivity on hydrogenated diamond, and arrived at a practical method to repair elastin degeneration, using light."

Leading researcher in this field, Pollack (2006), has shown that water can at times demonstrate a tendency to behave in a crystalline manner. He has discussed interfacial water in living cells known as vicinal water. Interfacial water exhibits structural organizations that differ from what is termed 'bulk' water. This 'vicinal' water seems to be influenced by structural properties that make up the cell. In discussion of one example of this, in relation to the water in a temporomandibular joint, Pollack says: "*The combined data from three different methods lead to the conclusion that all or almost all of the water in the intact disc is bound water and does not have properties consistent with free or bulk water.*"

For a fascinating insight into water research I suggest you download the free video of Professor Pollacks recent address at the University of Washington:

<http://www.uwv.org/programs/displayevent.aspx?rID=22222>

Fascia, water and manual therapy

Several years ago Klingler & Schleip (2004) showed that the water content of fascia partially determines its' stiffness, and that stretching, or compression, of fascia (as occurs during almost all manual therapies, causes water to be extruded (like a sponge) – making the tissues more pliable and supple. After a while the water is taken up again and stiffness returns, but in the mean time structures can have been mobilised and stretched more effectively and comfortably, than were they still densely packed with water.

- Klingler et al measured wet & dry fresh human fascia, and found that during an isometric stretch, water is extruded, refilling during a subsequent rest period
- As water extrudes during stretching, temporary relaxation occurs in the longitudinal arrangement of the collagen fibers
- If the strain is moderate, and there are no micro-injuries, water soaks back into the tissue until it swells, becoming stiffer than before

All this suggests that much manual therapy, and the tissue responses experienced, may relate to sponge-like squeezing and refilling effects in the semi-liquid ground substance, with its water binding glycosaminoglycans and proteoglycans.

Muscle energy technique-like contractions and stretches almost certainly have similar effects on the water content of connective tissue, as do myofascial release methods, and the multiple force-loading elements of massage.

The speed with which research is uncovering the secrets of fascia is mind-boggling, and I hope to see you in Amsterdam to discover even more!

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