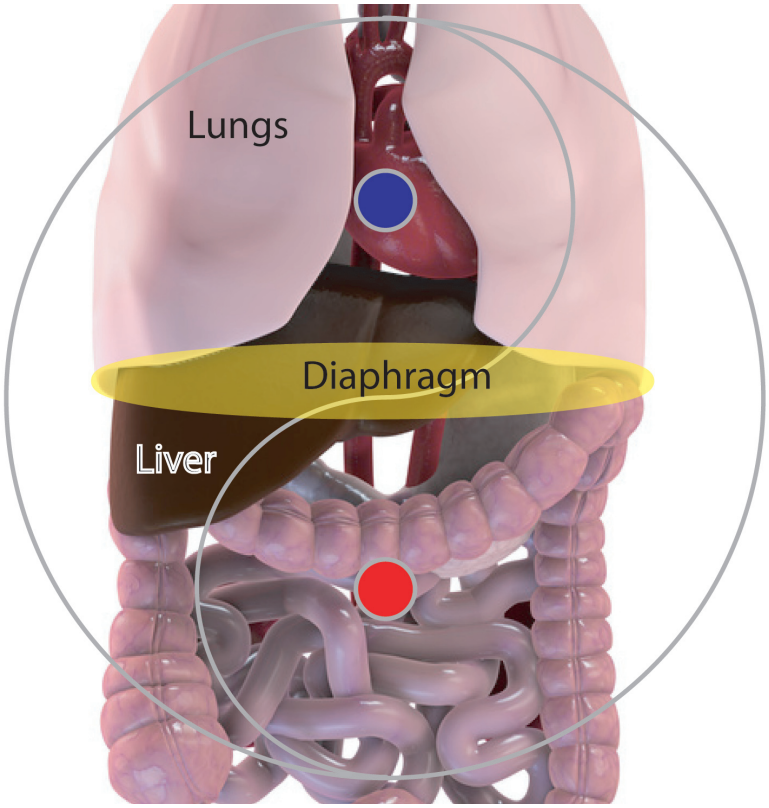
Dear Reader,

Welcome to the February edition of the ***COHERENCE Newsletter***. This month's letter is titled ***The Tai Chi Diaphragm***. In it we'll consider the action of the diaphragm and how it sets up *Tai Chi* or "dynamic equilibrium" in the body. I'm sure you'll find it interesting. Last month's topic was ***Catching The Wave*** where I described an exercise for cultivating the respiratory arterial pressure wave with the goal of actually *feeling* the wave in the body. If you happened to miss it, you can find it here, along with previous ***COHERENCE Newsletters***.

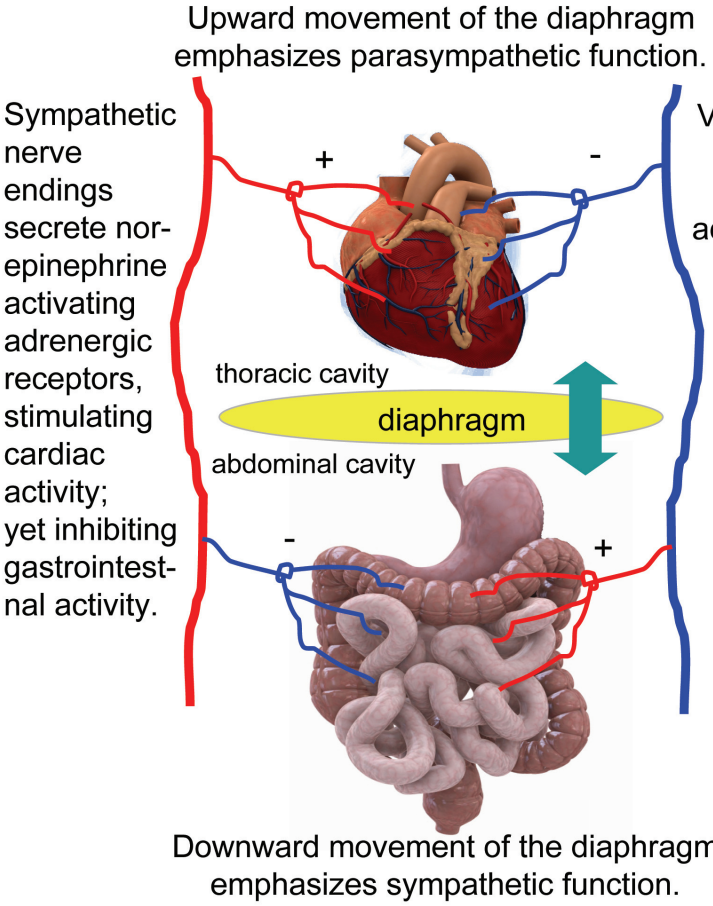
In recent ***COHERENCE Newsletters*** we've spent a good deal of time focusing on the thoracic cavity, where we examined the relationship between the heart and lungs, as a function of the diaphragm. There we found that the autonomic nervous system exerts an ***elegant coordination*** over breathing, blood flow, and the action of the heart. However, we've not ventured below the diaphragm, expanding our inquiry to include the abdomen. Might it be that there is a like coordination *below* the diaphragm, as *above*? I'm confident that the answer is "yes", specifically as it relates to the gastrointestinal tract. Yet, the way that it manifests is particularly surprising – the "wiring" is *opposite*! And here begins this month's COHERENCE Newsletter, ***The Tai Chi Diaphragm...***



The Tai Chi Diaphragm

Before we talk physiology, let's take a moment to acquaint ourselves with "Tai Chi". Tai chi is a central idea in Taoist thought as well as other Eastern cultures. The notion is very old, preceded only by the even more basic and ancient concept of "Heaven & Earth". The tai chi "principle" is embodied in the "Tai Chi Diagram", sometimes referred to as "yin/yang", however, this terminology does not do justice to the meaning of "Tai Chi". Why not? Because "Tai Chi" is not about either yin or yang, but the *dynamic equilibrium* that exists between them, the very force that gives rise to them. We might best conceive of "Tai Chi" as the *primordial vibration*, giving rise to the universe characterized by "poles" or opposites, e.g. summer/winter,

day and night, hot and cold, inhalation and exhalation – we can also think of it as an ancient theory of relativity. As you may know, tai chi remains the guiding principle of Traditional Chinese Medicine as practiced today. (Here, I'd like to acknowledge Colleen Timmons, L.Ac., who introduced me to the term "Tai Chi Diaphragm", it's taken me a while to understand it.)



The diaphragm is a strong sheath of muscle that separates the thoracic cavity "*above*", from the abdominal cavity "*below*", each cavity being an airtight chamber. When we inhale, the diaphragm moves downward increasing the capacity of the thoracic cavity and decreasing the capacity of the abdominal cavity. Internal pressures in thoracic and abdominal cavities decrease and increase, respectively. The opposite occurs during exhalation. This is the reason that the abdomen protrudes when we inhale and flattens when we exhale.

We've established that *above* the diaphragm, inhalation results in acceleration of heart rate. The heart accelerates due to the net influence of increasing sympathetic action, involving increased secretion of nor-epinephrine, acting on adrenergic receptors of the heart, and decreasing parasympathetic action, involving decreased secretion of acetylcholine, serving to deactivate cholinergic receptors, thereby diminishing vagal inhibitory affect. I argue that a key goal of this coordination is to facilitate venous return to the increasingly low pressure environment of the lungs during inhalation. *Below* the diaphragm, pressure increases, and all of the organs of the abdomen are compressed. The increased secretion of nor-epinephrine that results in activation of adrenergic receptors in the heart, has the opposite effect on the gastrointestinal tract, inhibiting activity of the enteric nervous system, "slowing" digestion.

During exhalation, the diaphragm moves upward. *Above* the diaphragm, pressure increases, blood exits the lungs via the left side of the heart, flowing through the arterial tree. Vagal emphasis increases, heart rate slows.

Below the diaphragm, organs of the abdomen decompress. The net influence of increasing parasympathetic action involving increased secretion of acetylcholine acting on cholinergic receptors of the gut, stimulating enteric nervous system activity.

While the enteric nervous system can act with a large degree of autonomy, sympathetic and parasympathetic systems serve to further inhibit or activate, respectively. Parasympathetic stimulation yields an increase in overall enteric nervous system activity, affecting most gastrointestinal functions including the secretion of conducting fluids and locomotion. (Medical Physiology, 2002). Below the diaphragm, where parasympathetic emphasis "activates", sympathetic emphasis "inhibits", with opposite effect.

	Diaphragm Action	Autonomic Emphasis	Thoracic Pressure	Abdominal Pressure	Enteric Nervous System Activity	Heart Rate	Arterial Blood Flow	Venous Blood Flow
Yang	Diaphragm Moves Up (Exhalation)	Parasympathetic	Increases	Decreases	Increases	Decreases	Increases	Decreases
Yin	Diaphragm Moves Down (Inhalation)	Sympathetic	Decreases	Increases	Decreases	Increases	Decreases	Increases

We see that the elegant coordination that exists *above* the diaphragm, also exists *below,* via a change of phase in both sympathetic and parasympathetic systems. *Above* the diaphragm, during inhalation the heart rests, allowing the vacuum in the thoracic cavity (as a function of diaphragm flexion) to facilitate blood flow through the right heart into the low pressure zone of the lungs. During exhalation, the heart works to transport blood to the extremities under high pressure. *Below* the diaphragm, during inhalation the diaphragm presses downward on the abdomen, facilitating movement of food through the digestive system, *the diaphragm doing the work*. The enteric nervous system rests. During exhalation, the enteric nervous system is stimulated to move things along. Accordingly, during inhalation, both the heart and enteric nervous system "relax" allowing the diaphragm to do the "work". During exhalation, the heart moves blood, the gut moves food.

According to this theory, we see that human physiology is such that the ***Tai Chi Diaphragm*** plays a very central, *if not critical*, role in locomotion of both blood and food − the autonomic nervous system is "wired" in this way. Although, in the end, we see that we cannot attribute *dynamic equilibrium* to the diaphragm alone. And as it should be. ***"Tai chi"*** is more basic than that, just as it is more basic than "yin" or "yang".

Thank you for your interest and consideration,

Stephen Elliott, COHERENCE