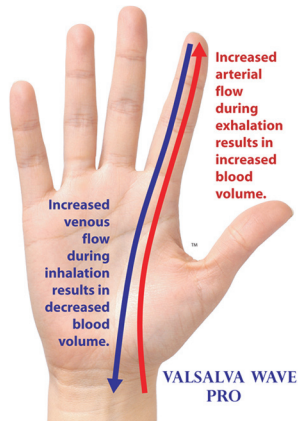


Hello all,

Welcome to the August *COHERENCE Newsletter*. This month I'm very pleased to announce the availability of *Valsalva Wave Pro*, the new COHERENCE instrument that allows us to observe and train the "Valsalva Wave", the breathing induced blood wave that occurs with each cycle of respiration when we breathe "coherently". To find out more click on the hand below...



Also, Dee Edmonson and I will be presenting the workshop "*The Valsalva Wave - The Changing Landscape of Heart Rate Variability Biofeedback*" at the upcoming annual meeting of the *International Society for Neurofeedback and Research* in Indianapolis. Click here for more information. We'll also be exhibiting a long term study that examines blood pressure as a function of heart rate variability (HRV) amplitude, the conclusion to the study that I shared with you in my October and November 2008 newsletters. I'll be sure to make it available to you a bit later.

I hope you enjoyed last month's newsletter, "*The Whole Valsalva Wave*". Toward the end of that article, I mentioned that the *whole Valsalva wave* is the blood aspect of the pulse that acupuncturists assess at the wrist when taking "the pulse". This month I'd like to put that comment in context.

Huang Ti, the "Yellow Emperor", circa 2500 B.C., one of China's three legendary emperor immortals, is considered the founding father of Traditional Chinese Medicine, even as practiced to this day. His system is documented in the *Huang Ti Nei Jing* or *The Yellow Emperor's Classic Of Internal Medicine*. The *Huang Ti Nei Jing* is considered the oldest "medical text" in existence. It is clearly an understatement to say that Huang Ti was an early master of human anatomy and physiology. His *very early* ideas are the basis of a system of medicine that has treated more people than any other known to man.



Huang Ti - Circa 2500 BC  
(Wikipedia.com)

Even without the aid of today's high tech instrumentation, Huang Ti understood the significance of breathing, and to a large degree the relationship between breathing and the blood. There is no better way to demonstrate his insight than to share with you a couple of favorite passages from the "Classic". Its important to remember that that we are discussing a text that is nearly 5000 years old.

The "Classic" consists of 9 books, the number "9" having very special significance in Taoist philosophy and science.

From **Book 5, Chapter 18: Treatise on the Manifestations of Health in Man** (original translation by Ilza Veith, secondary translation and interpretation by Dr. Meng-Sheng Lin, S. Elliott, C. Elliott): “Inhalation and exhalation determine the beat of the pulse. When there are 5 pulse beats to 1 inhalation or 1 exhalation, this is a deep breath of a healthy and well balanced person. A healthy and well balanced person is not affected by disease.”

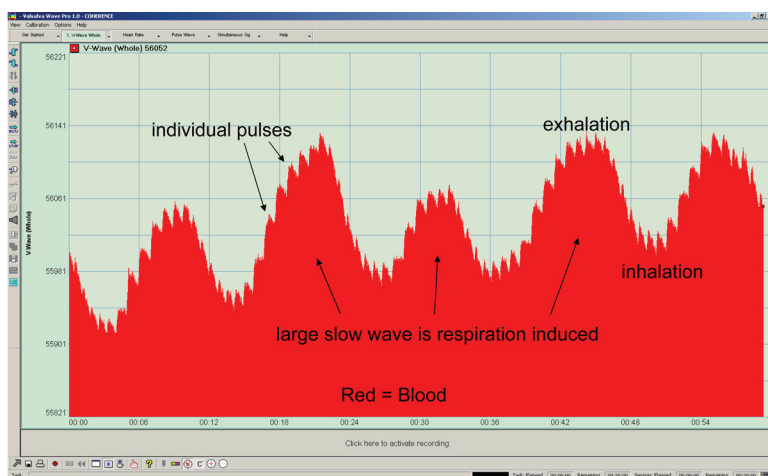
Veith, I., *The Yellow Emperor's Classic Of Internal Chinese Medicine*, University of California Press, 2002, p. 168. Portions reprinted with permission University of California Press.

Elsewhere in the Classic, it is made clear that the practitioner should have at least 4 beats per inhalation and exhalation and should use their own breathing pattern as a reference to gauge that of their patients. If we take the average heart rate to be 72 beats per minute, then 4 beats per inhalation or exhalation is 9 breaths per minute; 5 beats per inhalation or exhalation is 7 breaths per minute.



We now know more about why breathing slowly, deeply, and rhythmically is important. Because breathing literally pumps the blood (and when it's not, problems arise). We

can see this wherever we monitor it. To the right I'm using Valsalva Wave Pro to monitor the affects of breathing on the blood at the wrist. [Red equals “blood”.] The pulse is the small wave riding on the much larger respiratory “Valsalva Wave”. If you count the pulses you'll find about 7 beats per inhalation or exhalation, i.e. breathing is ~5 breaths per minute. While not depicted, the more shallow the respiration, the smaller the Valsalva Wave until it all but disappears, in which case, all we see is the pulse.



Whole Valsalva Wave At Wrist (~5 cycles of respiration)

The above demonstrates the affect of respiration on the blood at the radial artery of the wrist. Possibly of greater importance is the affect of breathing on blood flow to the head and the brain. From **Book 1, Treatise On The Natural Truth in Ancient Times**: “...the sages caused Yin and Yang to be in harmony. *They caused their muscles and pulses to be in harmony*, they made their bones and their marrow strong, and *they caused their breath and blood to be obedient*, so that the internal and external organs are harmonious with each other and the evil influences can do nothing that bring harm; and the ears and the eyes are quick of hearing and clear of vision, and man's force of life remains in its original state.”

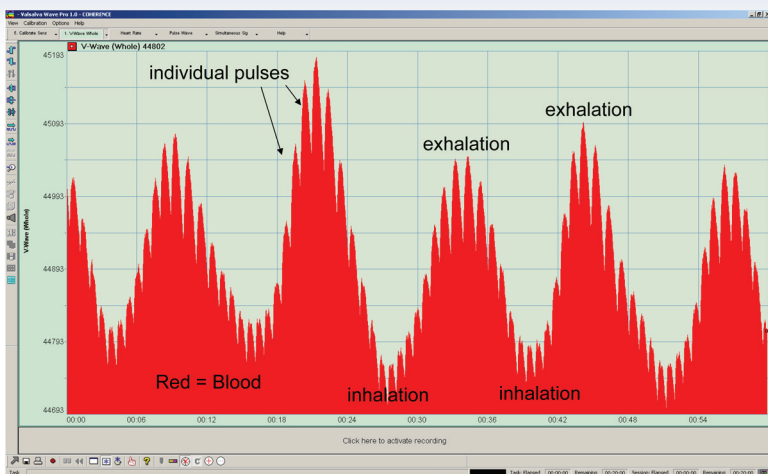
Veith, I., *The Yellow Emperor's Classic Of Internal Chinese Medicine*, University of California Press, 2002., p. 108. Reprinted with permission, University of California Press.

I have no doubt that here Huang Ti is referring to the coordination of breathing and heart rate, what we generally know today as “respiratory sinus arrhythmia” or what I like to call “breathing induced heart rate variability.” [The term should be “respiratory sinus *rhythmia*” as its absence is “arrhythmic”.]

Let's have a look at the Valsalva Wave in the head, most easily measured at the ear lobe.

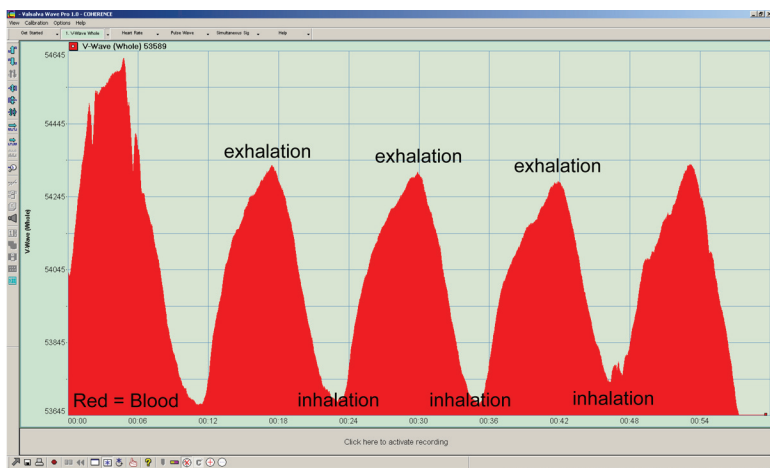


Blood to the ear is supplied by the posterior auricular artery, arising from the external carotid artery, making blood action in the ear roughly representative of blood action to the brain and the head in general.



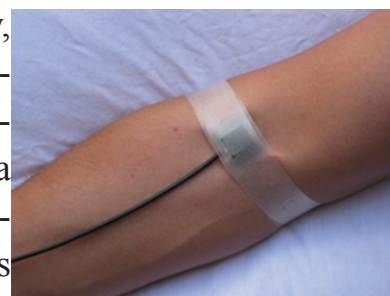
Valsalva Wave At Ear Lobe (~5 cycles of respiration)

Here again we see approximately 5 cycles of respiration. In this view, both the respiratory wave and the pulse are more definite than at the wrist. There are a few reasons for this difference. First, the distance between the chest and the ear is shorter than from the chest to the wrist. Second, the arteries and veins supplying the head are larger than those supplying the arm, and third, the ear lobe is a “terminus” for the blood, much as a finger tip is a terminus. Whereas, at the wrist, we’re looking into the radial artery and at the blood flow in the vicinity of the artery. I usually explain that resonant blood flow to the head operates much like a coffee percolator, bathing the brain and head in blood during exhalation, and emptying them of blood during inhalation..... this is the notion.



Valsalva Wave At The Medial Cubital Vein (~5 cycles)

In this last view, the sensor is attached at the medial cubital vein, a major point of collection for venous blood flow in the arm. Here we see no pulses and would not expect to. Like the ear, blood volume at the medial cubital vein also tends to rise during exhalation and fall during inhalation (at resonance).



At first I was surprised by this but now believe that this is because the vacuum created in the chest during inhalation draws blood out of the veins faster than capillary circulation replaces it, in effect creating the capacity for increased capillary blood flow. In retrospect, this is consistent with my understanding of cardiopulmonary operation while breathing “coherently”. The end.

Thank you for your interest and consideration.

Stephen Elliott, COHERENCE