

# Body Science



Caroline Barrow

Caroline Barrow is a Shiatsu, Craniosacral and Visceral Manipulation practitioner. She also runs the College of Body Science, offering inspirational CPD courses in Anatomy, Physiology and Pathology, tailored for Complementary Practitioners. Workshops include *Know Your Nerves*, *Know Your Neuroanatomy* and *Know Your Viscera*. Contact: 0845 108 1088 to find out more or visit [www.collegeofbodyscience.com](http://www.collegeofbodyscience.com)

## The Relevance of... The Parasympathetic Nervous System

Last time we explored the relevance of the sympathetic nervous system, so now we will consider its partner in – relaxing – the parasympathetic nervous system. This innervation will slow us down, allow our blood supply to head to the digestive system, stimulating the muscles in our digestive system's tracts to mix and churn their contents, stimulate the secretion of fluids for this process, take deeper, slower breaths and generally relax... So how are we hard-wired to do this?

You will recall that the nerves of the sympathetic system exited the spinal cord between T1 and L2, and that from there the sympathetic chain carries fibres higher or lower.

The location of the parasympathetic fibres is less extensive. There are four cranial nerves that carry parasympathetic fibres and three nerves that exit from the sacrum. The cranial ones are III, VII, IX and X. The sacral spinal nerves carrying parasympathetic fibres are S2, 3 and 4.

Looking at these lower ones first, we see the same term used to name sympathetic internal nerves – splanchnic. The pelvic splanchnic nerves take fibres to the inferior hypogastric plexus, where sympathetic and parasympathetic fibres are paired off to go together to the descending colon, rectum, anus, bladder, prostate in men and other genitalia in both sexes.

In the cranial cavity the parasympathetic fibres that make part of cranial nerve III, the oculomotor (which as the name suggests, create eye movement) head inwards to be available to constrict the pupil. This is part of our autonomic response in relaxation.

The neurons of cranial nerve VII which have parasympathetic action are those that innervate the lacrimal gland as well as the sublingual and submandibular salivary glands (i.e. those in the floor of the mouth). Perhaps the parasympathetic involvement in secretions of the lacrimal gland is one of the reasons we can have a strange feeling of relaxation after a good cry...?

Cranial nerve IX brings parasympathetic fibres to innervate the parotid salivary gland (a strange fact I have always thought since the seventh cranial nerve actually passes alongside this gland and so would have been ideally placed to take the stimulation there, but embryologically things didn't quite develop that way).

And then we come to cranial nerve X. The big one. The wanderer, vagrant, vagus. This is the one that brings our parasympathetic innervation to all the internal organs in the trunk; digestive organs, the heart and lungs and even the kidneys. Leaving the cranial cavity with the jugular vein through the jugular foramen, it shares a pathway through the neck, nestling between the vein and carotid artery, surrounded by the fascia of the carotid sheath. It is not exclusively made up of parasympathetic fibres so there are a few curious offshoots that leave to supply various muscles of the pharynx, innervate muscles of speech and give a bit of taste to the back of the throat.

Parasympathetically however, once in the thorax, the right vagus innervates the sinoatrial node in the heart – this is the group of cells that self-perpetuate their electrical stimulation, enabling the cardiac muscle to beat regularly. The parasympathetic nerves simply slow down the process (just as the sympathetic fibres speed it up). The vagus has fibres that stimulate the muscles of the digestive system, including the pancreas, spleen and liver. The only organ it does not have fibres going to is the adrenals – that is the remit of the sympathetic system.

Also be aware that although the vagus nerve is the main parasympathetic supply to the gut, it is by no means the only source of nervous instruction and coordination. Michael Gershon in *The Second Brain* comments on the research that showed that if both vagus nerves are lesioned (cut), then digestion will continue to happen anyway – the only area that suffers is pylorus and the pyloric sphincter.

Another interesting anatomical observation is that the fibres innervating the kidney, promoting general kidney function during times when 'relaxation' is the key activity, are not solely from the vagus nerve, but from the sacral distribution as well. They meet in the renal plexus before entering the kidney itself. This is not true of any of the pelvic organs, male or female, nor of the descending or sigmoid colons.

While I have mentioned the above innervations of the vagus nerve, also note that these fibres, after entering the abdomen are no longer one specific nerve with many obvious branches, but need to be traced through the mix of other autonomic sympathetics and afferents (carrying information into the brain) that weave their way via the different plexi we mentioned last time – the coelic (thought to relate to what we call the solar plexus), the mesenteric plexi that serve the small intestines as well as the renal plexi. It is by tracing individual fibres back that we can see they travelled via the vagus in the neck and thorax. This mixing is important so nerves can all share information on their way through and therefore continually modulate the messages others are sending out and, therefore, control the activity of the organs and autonomic nervous system.

So when we carry out treatments that help clients relax, we are facilitating a number of the positive effects on digestion, blood pressure, kidney function and our autonomic system generally by our ability to stimulate the parasympathetic system. Conscious slow deep breaths help this directly and switch on this innervation pattern even faster. With an understanding of the anatomy of the system we can hold the cranial base where the vagus exits with greater awareness, support or massage round the sacral area with a deeper connection and hold the space through the whole of the body to key into this system and help ourselves and our clients go more deeply inside.

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