What is Hyaluronic Acid?

Hyaluronic acid (HA) also called Hyaluronan is a component of connective tissue whose function is to cushion and lubricate. Hyaluronan occurs throughout the body in abundant amounts in many of the places people with hereditary connective tissue disorders have problems with, such as joints, heart valves and eyes. Hyaluronic acid abnormalities are a common thread in connective tissue disorders. Interestingly, they are also common biochemical anomalies in most of the individual features of connective tissue disorders such as mitral valve prolapse, TMJ, osteoarthritis, and keratoconus.

Hyaluronic acid has been nicknamed by the press as the "key to the fountain of youth" because it has been noted that at least some people who ingest a lot of it in their diets tend to live to ripe old ages. ABC News had a show on a village in Japan and hyaluronic acid entitled, "The Village of Long Life: Could Hyaluronic Acid Be an Anti-Ageing Remedy?" (It should be noted that the people in the ABC news show were thought to get high amounts of HA from starchy root vegetables in their *natural diets*. They were not taking supplements.) Starchy root vegetables convert to glucose in the body. Glucose is the starting material along with the amino acid glutamine, in the body's production of N-Acetyl-Glucosamine (NAG) which is the precursor of HA.

While a number of studies have linked abnormal levels of HA to either connective tissue disorders (CTDs) or conditions common in CTDs, such as premature ageing, there are also a number of studies on Pub Med noting associations of high levels of HA to some forms of cancer. With HA as with other substances in the human body, such as estrogen and cholesterol, there are most likely optimal levels and disease often occurs when these levels become out of range *in either direction*. Low estrogen levels have been linked to bone loss, while high estrogen levels have been associated with breast cancer. High cholesterol levels have been linked to heart attacks and stroke, while low levels have been linked to bleeding problems and depression. HA has been studied less than either cholesterol or estrogen, but the prudent path would be to assume that the body has optimal levels of HA, as it does for cholesterol, estrogen and many other substances.

To ensure optimum tissue levels of HA, if there is a suspected deficiency, it is recommended to take N-Acetyl-Glucosamine (NAG). NAG is the precursor of HA and if the body has enough NAG available to complete the biosynthesis process, and then adequate HA will be formed. Dietary supplementation of Hyaluronic Acid will be of little benefit as it is a very large molecule and it will be broken down by digestive enzymes in the stomach and very little will survive to reach the small intestine.

NAG belongs to a class of compounds known as amino sugars. Amino sugars are formed within the body from glucose and essential amino acids (glutamine in the case of NAG) and are used mainly for tissue rebuilding. NAG and other amino sugars bond together to form long polysaccharide (sugar) chains called glycosaminoglycans, or GAG's. GAG's include **chondroitin sulfate** and **hyaluronic acid**. These long polysaccharide chains combine with various fibrous proteins such as collagen to form the extracellular matrix (the complex meshwork of macromolecules holding cells together forming tissues).

NAG and its polysaccharide chain forms are essentially the "glue" of the tissues. The special chemical properties of NAG are critical in the formation of this ubiquitous "glue" that holds the body together. Because of their negative charge, NAG and glycosaminoglycans (NAG chains) attract water and form huge hydrated gels which swell and fill up the spaces between cells in the tissue. Because of NAG and its gelatinous chains, tissues have the ability to withstand various compression forces without collapsing or fracturing. In addition, the collagen fibers, embedded in the NAG structure, give the tissues further strength as well as resistance to stretching forces. Together these two components, the NAG chains and the fibrous proteins, give tendons and ligaments their tremendous ability to withstand forces without fracturing or falling apart.