What is Hyaluronan?

Hyaluronan is the accepted scientific nomenclature for hyaluronic acid (HA) and physiological salts of hyaluronate, the conjugate base of hyaluronic acid. Hyaluronan is classified as a glycosaminoglycan (GAG). GAG's are long, unbranched polysaccharides that are made of repeating disaccharides composed of glucuronic acid and glucosamine (Fraser, 1997). The polymer chain of hyaluronan ranges in molecular weight from hundreds of units (or Daltons) up to several million.

Hyaluronan is found ubiquitously throughout the mammalian body. It is either directly or indirectly involved in every physiological function of the body. It is found in dense concentrations in cartilage, synovial fluid, skin, vertebral discs, bones, urinary tract, cardiac valves, eyes, and various other soft tissues. Hyaluronan is most abundant during embryogenesis and declines in overall quantity and quality throughout life (McDonald, 2002).

BONE AND JOINT HEALTH

Canonically, hyaluronan is recognized for its role in the maintenance of joint health. Hyaluronan is naturally synthesized locally by synoviocytes within the joint and once produced, it binds to collagen and elastin to form articular cartilage. It is the presence of hyaluronan that makes cartilage strong enough to handle compressive forces within the joint (Seog, 2002). Hyaluronan is also found in unbound form in the synovial fluid, where it provides the major source of lubrication that allows for smooth fluid movements in joints (Sabaratnam, 2005).

Hyaluronan within the synovial capsule is critical for smooth joint movement: the articular cartilage encapsulates the ends of the bones forming a smooth while synovial fluid forms a film of lubrication over the articular cartilage during movement. Combined, these structures protect the bones from frictional grinding (Walker, 1968).

Within bone itself, the presence of hyaluronan is primarily linked to its roles in bone modeling and remodeling processes. Hyaluronan has been shown to regulate bone remodeling by stimulating osteoblasts and osteocytes as well as inhibiting osteoclasts (Bastow, 2008; Prince, 2004). Intriguingly, hyaluronan taken orally has been shown to reduce urinary markers of bone resorption and ovariectomy-induced bone loss (Gerdin, 1997), indicating that hyaluronan may suppress bone resorption.

THE SKIN

One of the primary functions of hyaluronan is maintaining tissue hydration. Interestingly, hyaluronan is so hydrophilic it can absorb, retain, and deliver over one-thousand times its weight in water (Wand, 2007). The ubiquitous nature of the molecule ensures that hydrophilic delivery takes place throughout all tissue.

Hyaluronan is found most prevalently in the skin; approximately half of total body hyaluronan is located within the dermal and epidermal layers. Primary functions of hyaluronan in the skin include moisturization and hydration (Meyer, 1941). Skin turgor is the result of the ability of hyaluronan to absorb, retain, and deliver water (Wang, 2007). With age, there is a distinct decrease in the percent composition of hyaluronan in epidermal tissue likely correlating with the increase in wrinkles and aged skin (Juhlin, 1997). Experiments have demonstrated that 77% of naturally occurring hyaluronan in the skin is lost by age 70 in humans (Weist, 2008).

OCULAR HEALTH

Hyaluronan makes up a large part of the vitreous humor (the space-filling jelly between the lens and the retina) and is also found in the lacrimal gland, cornea, conjunctiva, and in tears (Gong, 1994). Ocular functions of hyaluronan include homeostasis, miniaturization, and lubrication.

GASTRIC HEALTH

Hyaluronan has established itself as a protectant by its ability to confer defense to gut mucosal tissue. A recent study aimed to evaluate the effects of hyaluronan on gastric mucosa (Al-Bayaty 2011). Laboratory findings revealed that a high-molecular-weight hyaluronan-containing gel significantly protected the gastric mucosa.

OTHER KNOWN BENEFITS

Hyaluronan is a critical molecule for proper structure and function of the urinary tract. Hyaluronan serves as a protective barrier for the lining of the urinary tract; disruption of this barrier is believed to be a causative factor for interstitial cystitis (Iavazzo, 2007). When this hyaluronan-rich protective layer is compromised, it becomes porous and allows for adhesion of bacteria which can lead to inflammation and infection (Iavazzo, 2007).

In the kidneys, hyaluronan is largely responsible for body fluid regulation. It is found in large quantities in the renal medulla and the renal papillae, integral sites for total body water homeostasis. The hydrophilic nature of hyaluronan contributes to its ability to regulate urinary excretion, as it acts as a mechanical support for renal tubules and blood vessels in the medulla (Rugheimer, 2009; Goransson, 2002). The total interstitial renal hyaluronan amount increases during times of water loading and decreases during times of dehydration (Goransson, 2002).

ORAL SUPPLEMENTATION

Oral hyaluronan supplements remain controversial as to their efficacy and ability to be absorbed and utilized by the body. The controversy is mostly due to a prevalence of manufacturers that produce substandard products and fail to conduct proper research studies on their finished products (McIlwraith, 2009). Oral viscosupplementation is preferential to injectable products because it eliminates the risk of adverse reactions, is more convenient, and more cost effective (Spirito, 2011).

Oral hyaluronan has been shown to be absorbed and effective (Ma, 2008). Recent clinical studies are consistent with these laboratory findings (Lukens, 2005; Kiburz, 2006). Studies with (99m)-technetium-labeled, high-molecular-weight hyaluronan administered orally show distribution to the joints in as little as four hours post-administration (Balough, 2008).

Clearly, there is the potential for therapeutic benefit from hyaluronan treatment as exogenous hyaluronan administration and supplementation has been shown to be safe and effective. Dietary hyaluronan can successfully be incorporated into consumer lifestyle as a means of promoting overall health.

To be compared to the CSG family of products, any oral hyaluronan supplement must be bioavailable, absorbed, and effective. Hyaluronan must be completely hydrated in order to be bioavailable and absorbed. Once absorbed it must have the appropriate molecular characteristics to be effective.

CSG oral hyaluronan supplements have been developed in liquid formulations because of the very nature of hyaluronan itself. Hyaluronan is among nature's most water-loving molecules. When dry and exposed to moisture, hyaluronan slowly absorbs up to 1000 times its weight in water, creating a thick, viscous fluid. If consumed dry as a tablet, the transit time from ingestion to excretion does not provide the necessary time for hydration of this incredibly hydrophilic molecule. Research indicates that little of the high molecular weight dry forms are absorbed before excretion. While some low molecular weight dry forms may be hydrated and absorbed during ingestion and digestion, they are not effective and may actually be detrimental to joint health. A study performed with CSG's patented, liquid MHB3® Hyaluronan shows it significantly outperformed a dry, tableted dosage form of HA (Hefner, 2012).