

Hyaluronic Acid: The Ultimate Skin Hydrating Agent

Hyaluronic acid (HA), or also called hyaluronan, is a naturally occurring glycosaminoglycan (large sugar molecule; polysaccharide) that consists of subunits of 2 sugars (glucosamine and glucuronic acid). It is present as "filling material" in most human and animal connective tissues especially the skin where it has a protective, structure-stabilizing and shock-absorbing function.

Besides its major role in cosmetics as humectant, HA is also used in a number of other clinical applications due to the unique viscoelastic nature of HA along with its biocompatibility and non-immunogenicity. HA has been used as a supplementation of joint fluid in arthritis, as a surgical aid in eye surgery, as an injectable gel that acts as a filler to remove wrinkles, and as compound to facilitate the healing and regeneration of surgical wounds. More recently, HA has been investigated as a drug delivery agent for various routes of administration, including ophthalmic, nasal, pulmonary, parenteral and topical. In fact, regulatory approval in the USA, Canada and Europe was granted for several drugs.

HA in the Skin

HA is found in almost all vertebrate organs, but most abundantly in the soft connective tissues of the skin. The estimated total amount of HA in human skin has been found to be 5g, about a third of the total amount of HA believed to be present within the entire human body. Interestingly, HA is not only found in the deeper layers of the skin where connective tissue is predominant, but also in the top layers of the skin (epidermis) around the horny cells (keratinocytes). In the skin, HA is bound to proteins (aggrecans) together with other glycosaminoglycans, such as dermatan sulphate, chondroitin sulphate and keratin sulphate. As its name implies, aggrecan is composed of very large proteoglycan aggregates.

The most important property of these molecules is their strong ability to bind to water. Consequently, HA becomes hydrated to such an extent that a gel-like system is formed. Hence, the main function of HA is to aid in the body's water maintenance providing essential moisture for body processes and molecular transport. However, as we age, the HA levels in the skin decrease, contributing to skin aging and formation of wrinkles. For example, fifty year olds are estimated to have less than half the amount of HA in the skin than they had in the youth.

HA Production

HA is not only present in vertebrates but occurs ubiquitous. It is, for example, also present as a component of the cell coat of many strains of bacteria. Commercially produced HA is therefore not only isolated from animal sources, including the synovial fluid, umbilical cord, skin, and rooster comb, but also from bacteria through a process of fermentation or direct isolation. In the future, HA may be commercially produced also from the vitreous humor of fish.

HA in Cosmetics

HA is being extensively utilized in cosmetic products because of its ability to penetrate the skin and its unique moisturizing and viscoelastic properties and excellent biocompatibility. As a consequence, the most popular indications of cosmetic HA products are to combat signs of aging such as wrinkles. Typical cosmetic products supplemented with HA include serums, moisturizers, creams, shampoos, conditioners and bath oils. However, HA can also be orally administered as capsules. It has been shown that application of HA containing cosmetic products moisturizes and softens the skin and restores the elasticity thereby achieving a significant antiwrinkle effect. In addition, HA has been suggested to promote hair growth and restore hair color. HA-based cosmetic formulations or sunscreens may also be able of protecting the skin against UV irradiation due to the free radical scavenging properties of HA. Since HA is a water-soluble compound it can be easily incorporated into cosmetic formulas. Typically applied concentrations of HA in cosmetic products are 0.01 to 0.05 %. There are also products on the market with concentrations of up to 0.3 % (Please be aware that some commercial products claim to contain >1% HA. However, since HA is typically added to cosmetics as 1% solution, the final concentration is actually 100 times less!)

HA Injections as Wrinkle Fillers

HA, either in a stabilized form or in combination with other polymers, is used as a component of commercial dermal wrinkle fillers (e.g. Hylaform®, Restylane® and Dermalive®) in cosmetic surgery. Clinical studies have shown that injection of such products into the dermis, can reduce facial lines and wrinkles in the long term with fewer side-effects and better tolerability compared with the use of collagen. Based on an on-line report (www.e-hyaluronicacid.com) facial injections are becoming increasingly popular among both American women and men. As opposed to just 9'635 in 2003, 882'469 Americans have received HA facial injections in 2004. Reasons for this extreme growth in the number of HA facial injection procedures could include the safety and effectiveness of the injections. For example, the HA product Restylane® containing biosynthetically produced HA is the only FDA approved filler with clinical data supporting its efficacy for as long as six months. Restylane® does not require any allergy or skin test prior to injection, and the reported HA side effects have been limited to temporary redness and swelling at the injection site.

The main side-effect may be an allergic reaction possibly due to impurities present in HA and redness and/or pain at the site of injection. It has also been investigated the feasibility of using HA as an alternative implant filler material to silicone gel in plastic surgery. It was found that when using HA, the implanted organ structure was visually better than that obtained using silicone gel and saline implants. Moreover, there were no reported side-effects one year after the implantation.

Hyaluronic Acid is available at our store:

www.makingcosmetics.com

Benefits of Hyaluronic Acid

- Replenishes levels of skin HA
- Hydrates dry skin
- Makes skins soft & smooth
- Reduces fine lines & wrinkles
- Promotes hair growth
- Restores hair color
- Reconstructs connective tissue

Sources:

Brown, MB et al. Hyaluronic acid: a unique topical vehicle for the localized delivery of drugs to the skin. *JEADV* 2005; 19: 308

Kazuaki Kakehi et al. Hyaluronic acid: separation and biological implications. *Journal of Chromatography* 2003; 797: 347

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