



WHITE PAPER

HOW HYDRO-P PREMIUM SUPPORTS LONG-TERM MOBILITY IN CATS AND DOGS



BIO-FUNCTIONAL
HYDRO-P PREMIUM



Natural Ingredients. Smart Solutions.

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DARLING
INGREDIENTS



COLLAGEN IS NECESSARY FOR MOBILE JOINTS, STRONG LIGAMENTS AND TENDONS, AND HEALTHY BONES AND MUSCLES



WHAT IS COLLAGEN?

Collagen is a major component of an animal's body. It makes up about 30% of an animal's total body protein. Collagen is necessary for mobile joints, strong ligaments and tendons, and healthy bones and muscles. It is one of the primary structural proteins of connective tissues, while also being abundant in blood vessels, intervertebral discs, the blood-brain barrier, the cornea, dentin, and the intestinal wall. A vital component of the whole body (Figure 1), collagen is strong and flexible. It is the 'glue' that keeps the animal tissues together and provides the integrity of skin. In the animal body, 80 - 90% of collagens are type I, II or III (with the majority being type I). Type I collagen fibrils are characterized by an enormous tensile strength.

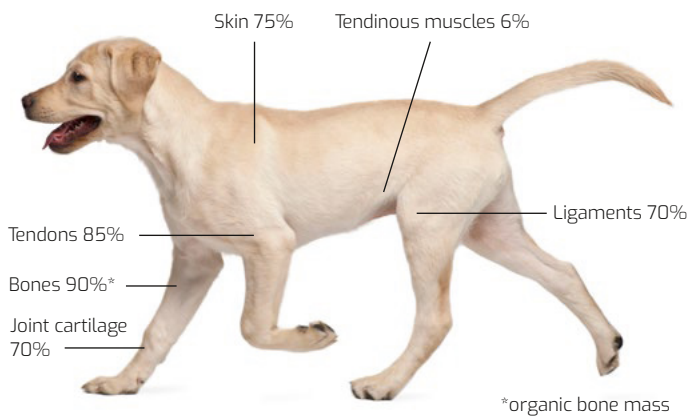


Figure 1: Distribution of collagen by weight ratio of dry mass in the animal body

COLLAGEN IS CRUCIAL FOR HEALTHY JOINTS

Joints provide the connection for bones. They are the functional links for the whole skeleton, allowing it to move effectively (Figure 2). Joints consist of cartilage, ligaments, tendons and synovial fluid. Each of these is necessary in order for the joint to function properly. Cartilage is a resilient, elastic and smooth tissue. It resembles a rubber-like padding that covers and protects the ends of bones in the joints. It acts as a cushion to prevent bone trauma or friction. Ligaments and tendons give structure, strength and flexibility to the joints. The synovial fluid provides proper lubrication. There are many joints in the animal body, and the proper functioning of each joint is necessary for normal activity. Dogs and cats tend to run, jump and play, thereby constantly putting pressure on their joints. When animals age, their natural synthesis of collagen decreases. The limited amount of collagen in cartilage can lead to damage and discomfort in movement, which is often observed in large breeds of dogs and cats and in aging or overweight animals.

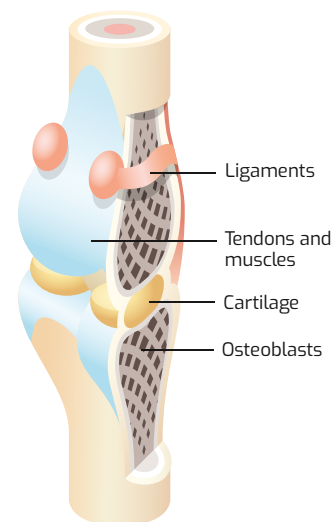


Figure 2: Structure of a synovial joint

COLLAGEN SYNTHESIS & AGING




During the aging process, the natural synthesis of collagen in the animal body declines. This leads to reduced comfort in mobility (affecting bones, joints and, muscles) and also affects the animal's appearance (skin and coat). Bone regeneration slows down, and loss of bone mass starts exceeding bone formation. As they grow older, dogs' and cats' bones can become more fragile and breakable. In joints, the decrease in collagen as well as other matrix elements can cause a loss of cartilage, initial joint discomfort or further joint disfunction. The progressive loss of muscle mass and strength that occurs with aging can affect balance, movement and overall mobility in dogs and cats. When the synthesis of collagen decreases, the skin collagen network that gives firmness and structure slowly breaks down. Skin becomes dehydrated and thinner, which makes it less resistant to injuries and pathogens. A reduction in collagen may also affect the condition of the coat and nails.

WHAT ARE THE FUNCTIONAL DIFFERENCES BETWEEN COLLAGEN, GELATIN AND COLLAGEN HYDROLYSATE?

Collagen is built of long, triple-helix amino acid chains. It strengthens and supports the structure of the animal body. Native collagen is not soluble. It is commonly used to make medical materials, sponges, and bandages for burns/wounds. It is a natural and safe ingredient popular in the meat industry in the form of collagen casings (Table 1).

Gelatin is made by partial hydrolysis of collagen. During the hydrolysis process, the collagen triple helices are pulled out into individual chains. Gelatin dissolves in hot water and then jellifies when the solution is cooled. Due to its comprehensive functionalities (gelling, foaming, emulsifying and binding), it can be found in bone broth or gelatin-based desserts. Gelatin is used in a variety of pet food and snacks formulations. Further hydrolysis of gelatin reduces the length of individual chains into small peptides (collagen hydrolysate). Studies show that collagen peptides are highly digestible and absorbable by the intestinal wall: over 90% is absorbed within several hours after consumption. This ensures an effective supply of the bioactive peptides to their site of action in the animal body. Hydro-P Premium is an example of a high-quality and bioactive collagen hydrolysate.

Table 1: Different grades of collagen provide different functionalities

Grade	Form	Solubility	Application examples
Native collagen		Insoluble	Collagen casings, medical materials
Gelatine		Medium	Snacks & treats, dental care snacks, dry pet food
Collagen hydrolysate		High	Functional pet food, skin, joint and mobility health supplements

WHAT IS HYDRO-P PREMIUM?

Hydro-P Premium is a bioactive protein with high bioavailability. It assists in the renewing process of connective tissue. Scientific investigations show that collagen peptides may act as a messenger to the cells that produce collagen in the animal body and stimulate the synthesis and reorganization of new collagen fibers. This explains how Hydro-P Premium can help with supporting tissue structure in animals. Scientific research in both animals and humans demonstrates that supplementing the diet with collagen hydrolysate can help to support health and maintain long-term mobility and well-being. Hydro-P Premium is easy to apply to a multitude of pet food recipes. It is also palatable to dogs and cats. Hydro-P Premium is a bioactive peptide concentrate extracted by controlled enzymatic hydrolysis of collagen. During this process, the molecular bonds between individual collagen strands are broken down. The hydrolysis reduces the size of collagen fibrils from approx. 300–400kDa into small, bioactive pieces with a molecular weight of approx. 2000–5000Da. These are called collagen hydrolysate or collagen peptides.

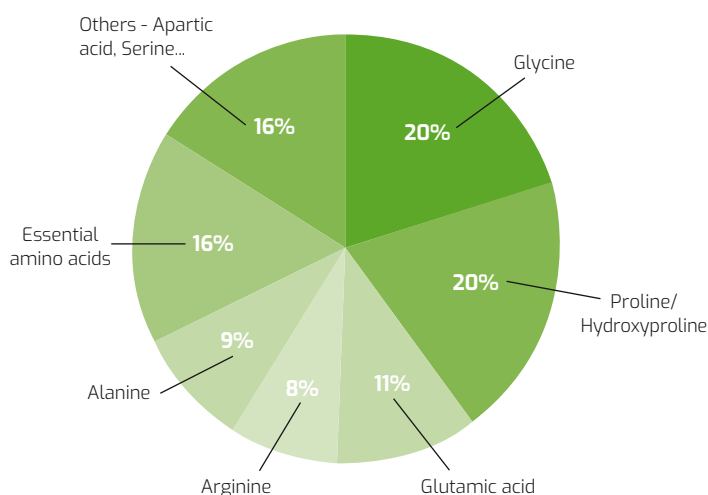


Figure 3: Amino acid composition of Hydro-P Premium

Hydro-P Premium contains particularly high levels of glycine, alanine, proline and hydroxyproline, arginine and glutamic acid (Figure 3).

- Glycine makes the collagen amino acids chains that form the specific helical structure. It also has some anti-inflammatory properties. It supports the proper functioning of the nervous system and cellular health.
- Alanine is the rate-limiting precursor in carnosine synthesis that plays a significant role in muscle pH regulation. Alanine can help enhance physical performance, stamina, or recovery.
- Proline is a precursor of hydroxyproline. Hydroxyproline is essential for collagen production and the stability of the collagen in connective tissue.
- Arginine is an antioxidant. It regulates hormone secretion, supports the immune function and is important for proper nutrient metabolism, vascular health and wound healing.
- Glutamic acid is the precursor of glutamine. Glutamine is involved in the regulation of the immune function. It is a major fuel for rapidly proliferating cells and inhibits the apoptosis of cells.



FACTS & FIGURES

- Natural collagen hydrolysate (type 1)
- Helps to maintain long-term mobility
- Supports joints and bones
- Stimulates healthy skin and fur
- Hypoallergenic
- Suitable for all kinds of pet food formulations
- Appearance: powder (80 mesh)

REFERENCES

- 1 Asserin, J. et al., 2015, The effect of oral collagen peptide supplementation on skin moisture and the dermal collagen network: evidence from an ex vivo model and randomized, placebo-controlled clinical trials. *Journal of Cosmetic Dermatology*, 14:291-301.
- 2 Cermak, N.M. et al., 2012, Protein supplementation augments the adaptive response of skeletal muscle to resistance type exercise training: a meta-analysis. *American Journal of Clinical Nutrition*, 96(6):1454-1464.
- 3 Guillerminet, F. et al., 2010, Hydrolyzed collagen improves bone metabolism and biomechanical parameters in ovariectomized mice: An in vitro and in vivo study. *Bone*, 46:827-834.
- 4 Guillerminet, F. et al., 2012, Hydrolyzed collagen improves bone status and prevents bone loss in ovariectomized C3H/HeN mice. *Osteoporosis International*, 23(7):1909-1919.
- 5 Dar, Q.A. et al., 2016, Oral hydrolyzed type 1 collagen induces chondroregeneration and inhibits synovial inflammation in murine posttraumatic osteoarthritis. *Osteoarthritis and Cartilage*, 24:5532-5533.
- 7 Moskowitz R., 2000, Role of collagen hydrolysate in bone and joint disease. *Seminars Arthrit. Rheumat.*, 30: 87-99.
- 8 Oesser S. et al., 1999, Oral administration of ¹⁴C labelled gelatine hydrolysate leads to an accumulation of radioactivity in cartilage of mice (C57/BL). *J. Nutr.*, 129: 1891-1895.
- 9 Paddon-Jones, D. et al., 2004, Potential ergogenic effects of arginine and creatine supplementation. *The Journal of Nutrition*, 134(10):28885-28945.
- 10 Watanabe-Kamiyama, M. et al., 2010, Absorption and effectiveness of orally administered low molecular weight collagen hydrolysate in rats. *Journal of Agricultural and Food Chemistry*, 58:835-841.
- 11 Wu, G. et al., 2009, Amino acids: metabolism, functions, and nutrition. *Amino Acids* 37:1-17.
- 12 Wu, G. et al., 2014, Amino Acid Nutrition in Animals: Protein Synthesis and Beyond, *Annu. Rev. Anim. Biosci.* 2:387-417.

The communication to the end user is the responsibility of the pet food producer.

BRINGING TOGETHER PRODUCTS, PEOPLE AND PETS

Operating on a unique residuals-to-resources concept, Sonac develops bio-functional, techno-functional and nutritional ingredients that benefit the pet food industry, pet owners and pets. We operate at the intersection of these three different stakeholders' worlds.

We are a leading producer of reliable, sustainable ingredients worldwide, with representation on 4 continents and activities in 60 different locations. As a dependable one-stop shop for smart, volume-driven, ingredient solutions, our constant aim is to help manufacturers improve recipes and reach the highest levels of quality and environmental performance.

Sonac is part of Darling Ingredients.



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