Collagen and Naticol®

As a glycoprotein, collagen is a fibrous macromolecule which is widely distributed in the animal organisms and which represents 25–30% of the total protein in the human body. Collagen is present in tendons and ligaments, cartilages, various membranes as those which are at the base of superficial tissues or epithelium, or those which ensure the filtration of blood in the kidneys. Collagen can also be found in special tissues which must be resistant and present particular properties like the cornea. Thus, collagen is one of the most abundant proteins in our organism. It takes part in the vital functions of almost all tissue systems and organs. Consequently, particular attention has to be paid to collagen.

There are several types of collagen that differ in their structure, their composition and their distribution in the tissues and organs. However, the most frequent collagen occurring in the human body is type 1 collagen. It is composed of three polypeptide chains which wind around each other and are held together by hydrogen bonds. The arrangement of type 1 collagen is the following: two chains are the same (designated as α1-chains), while the third chain differs (α2-chain).

Naticol®, a natural ingredient produced by Weishardt, a French company with more than 170 years of experience in the field of collagen, is composed of a unique collagen peptide profile (including di and tripeptides), resulting from the hydrolysis of α1 and α2 chains of type 1 collagen. Indeed, Naticol® is obtained from a rigorous selection of the fish skins and a specific white biotechnology process (enzymatic proteolysis), resulting from Weishardt’s know-how. This biotechnology or enzymatic proteolysis allows a unique collagen peptide distribution and amino acid sequences. The uniqueness and specificity of the peptides contribute to the biological functionalities which are validated by “in vitro/in vivo models” and by human pre-clinical studies.

Scientific studies conducted by the faculty of pharmacy of Toulouse and the INSA/CRITT Bioindustries also showed that Naticol® is highly assimilated. Naticol® presents excellent organoleptical properties (its neutral taste does not alter the formulation of functional food products such as beverages). Naticol® dissolves easily in aqueous phases and emulsions water-oil. It is a stable health ingredient which can be included into all formulations.

Innovative fish collagen peptide products – directed to functional food and beverage applications, cosmetofoods and nutraceutical products

Dr Christelle Bonnet
Collagen

Skin beauty
Collagen is a substance organized into fibrils which can be found in dermal connective tissues (skin 70%). It contributes to skin firmness and smoothness. Collagen plays the role of a frame for the skin. Type 1 collagen is the most frequent collagen occurring in the skin. It is co-distributed with type 3 collagen. However, due to intrinsic (hormones, genetics) and extrinsic factors (bad dietary habits, smoking, UV pollution), collagen structure can be (quantitatively and qualitatively) disorganized and destroyed. Indeed, all of these factors generate oxidative stress through the production of reactive oxygen species (ROS). This oxidative stress leads to a cascade of events including inflammation, and to qualitative and quantitative loss of collagen (collagen fibres are fewer and depleted). Dermoclinical studies carried out by the Clinical Center of Pharmacology Applied to the Dermatology (CPCAD), Hospital of the Archet in Nice (France), showed the benefits of the ingestion of Naticol® at 5 and 10 g/day for 2 and 3 months respectively. Hydration, elasticity and relief of the skin, at various sites (face, belly and forearm), were assessed. Skin biomechanics indicated a significant improvement of skin firmness for Naticol® compared to Placebo. An increase of overall skin elasticity for Naticol® on the abdomen was also observed. This was corroborated by the significant decrease of the crow’s-feet wrinkle score at week 8.

Joint health
Osteoporosis and sarcopenia are the most frequent musculoskeletal disorders affecting elderly people. Osteoporosis is characterized by reduced bone mass and microarchitectural deterioration of bone tissue, with a consequent increase in the risk of fracture. Sarcopenia is considered to be one of the major factors responsible for functional limitation and motor dependency in elderly people. Due to the demand on the collagen-containing structures (movement and weight bearing) and the slower joint ability to repair, it is vital to optimize the conditions that contribute to the maintenance of joint mobility.

(Note: tissues such as bones, tendons and ligaments are rich in type 1 collagen.)

Muscular mass and force
With its scientific Research partner, INSERM Toulouse (National institute for Health and medical Research), Weishardt has evaluated the effects of its fish collagen peptides, Naticol® (> 99% protein, dry matter), on muscle and bone condition. In this study, ovariectomized female mice having developed a model of osteoporosis were used.
The mice received a normal daily diet containing 2.5% Naticol® for 14 weeks. The results of this study demonstrated the positive effects of ingestion of Naticol® on the force and muscular mass, which were increased. The results of this study also showed that the mineral bone density tended to increase. In addition, it seems useful to point out the following health claims which are allowed by EFSA:

Article 13.1:
- Proteins contribute to the growth of the muscular mass (if 12% of the energy value comes from proteins).
- Proteins contribute to the maintenance of the muscular mass (if 12% of the energy value comes from proteins).
- Proteins contribute to the maintenance of the bone mass (if 12% of the energy value come from proteins).

Article 14.1
- Proteins contribute to the growth and the normal development of the bones in the child (if 12% of the energy value comes from proteins).

Anti-inflammatory/Antioxidant activities

The ageing process is associated with a decrease in the autophagic ability which deteriorates cellular cleaning. That leads to the protein aggregation and the dysfunctional mitochondrias accumulation, causing production of reactive oxygen species (ROS) and oxidative stress. Consequently, human ageing and in particular the inflammation at low grade which refers to ageing, is called “Inflammageing”. “Inflammageing” is the ageing phenomenon induced by chronic and persistent inflammation. Most people are familiar with the visible inflammation that can be seen on the surface of the skin, with redness representing a sign of infection, irritation or discomfort. However, inflammation can also be invisible. All skin – and particularly weakened or aged skin – is subject to inflammation, even at low intensity. It is this underlying inflammation that ultimately exhausts the body’s defence system, dismantling key youth-sustaining skin structures, and resulting in collagen and elastin degradation, as well as a breakdown of the skin’s barrier function. Inflammageing can be prevented – and even reversed – by using ingredients with anti-inflammatory and antioxidant activities.

The results of in vitro studies conducted with the University Paul Sabatier of Toulouse, France, (Faculty of Pharmacy) showed anti-inflammatory and antioxidant activities of Naticol® on human monocytes. In vivo studies about anti-inflammatory effects of Naticol® on mice models are presently in progress.

Weight management

Modern lifestyle, characterized by permanent lack of time, results in the consumption of a highly processed foods diet rich in fat, salt and/or sugar, which does not have any beneficial effects on our health: overweight, hyperglycemia, insulin-resistance, hypercholesterolemia.

In vivo studies were conducted by INSERM Toulouse (National institute for Health and medical Research, France) and carried out on male mice (9 weeks old) for 9 and 18 weeks. The objective was to evaluate the effects of an oral intake of Naticol® fish collagen peptides (daily diet containing 2.5% of Naticol®) on body weight composition, serum insulin, glycemia and cholesterol of mice fed with a high-lipid diet.

The mice groups treated with Naticol® showed a significant lower weight gain than the control group (p < 0,05). Additionally, this weight loss was explained by a decrease of fat mass.

Glycemia was also improved after Naticol® ingestion vs. control group. Total cholesterol and particularly LDL were lower in mice groups treated with Naticol® than in the control group (p < 0,05).

Weishardt continues to work in this research area and other innovative health applications to offer to its customers new and biofunctional approaches in the future.

For more information, please contact

Weishardt international
Dr Christelle Bonnet, scientific director
christelle.bonnet@weishardt.com
welcome@weishardt.com
Tel: +33 (0)5 6342 14 41, Fax: +33 (0)5 6342 3518
Yannick Auffret, general manager/Innovation
yannick.auffret@weishardt.com
www.weishardt.com