# ELASDERMA®

Advanced Skin Molecule Technology©

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**ELASDERMA®** is a US Patented Elastin ingredient. This amazing molecule is the most stable protein of the extracellular matrix (ECM) which is composed of **collagen, glycoproteins, glycosaminoglycans and proteoglycans**. Elastin has been widely used as a skin booster by helping the skin maintain its elasticity and young age, though, this is not the only benefit of this powerful protein.[1-3]

Along with collagen, elastin is a vital component of the blood vessels and plays a significant role in the remodeling and elasticity of conduit arteries like the carotid and femoral. In terms of cardiovascular health, elastin protein is believed to provide a protective effect against cardiac rupture, to decrease the area of infarction and help lower the risk of cardiovascular disease by suppressing the formation of harmful blood clots. [2-3]

Elastin peptides have also shown protective effect as antioxidative having the advantage of being effective at low concentrations and safe. The ability of elastin peptides as radical scavenger may be due to their ability to chelate metal ions and their good affinity for oils, as well as the presence of hydrophobic amino acids.[4]

Among other benefits, soluble elastin shows antioxidative properties, and the presence or hydrophobic aminoacids (Val and Pro) could potentially contribute to the high antioxidant activity.[4-5]

In recent studies, it has been shown that consuming elastin or tropoelastin may positively impact the bone regenerative capacity by enhancing and accelerating osteogeonesis (the process by which new bone is made by the cells).[29]

**ELASDERMA®** is considered a skin conditioner, which is purported to help skin maintain its elasticity and young age. This protein has also been used as a skin booster. When taken regularly, it stimulates elastin biosynthesis. Elastin's renewing effect makes skin look younger, smoother and refreshed.

**ELASDERMA®** is obtained from Atlantic Cod Fish through a process involving several steps to refine elastin: from washing and defatting previously inspected and cleaned Atlantic Cod Skin to enzymatic hydrolysis using different proteases to remove non-elastin proteins, followed by various purification steps to deliver a fully water soluble, additive and high purity product.

Elastin is a critical skin protein which combines with microfibrils to form elastic fibers that provide stretch and recoil to the skin. Normal levels of elastic fiber production, organization, and integration with other cutaneous extracellular matrix proteins (ECM) are integral to maintaining healthy skin structure, function, and youthful appearance.[1] Also, elastin is present in several connective tissues and confers a unique physiological elasticity.[7-12]

Elastogenesis, the process of elastin formation, mainly occurs during the fetal and early neonatal development of organs such as blood vessels, lungs, and skin, principally in elastogenic cell types, such as fibroblasts,[11-12,] and containing high amounts of elastin to assure their correct function.[13] Elastin and elastic fibers are unique in that there is very low and slow turnover. In fact, in skin, the overall half-life of elastin is similar to the human lifespan.[14]

The benefits of elastin hydrolysate have been clinically proven. Among them are a better condition and greater elasticity of the skin.[15-17] Elastin hydrolysate activates human skin fibroblasts and has beneficial effects on skin conditions.[18] In a Japanese clinical study, ingestion of elastin hydrolysate enhanced the proliferation of fibroblasts and elastin synthesis, improving skin elasticity and blood flow and decreasing the number of wrinkles.[19]

Studies suggest that elastin increases the expression of long-chain base 1, dihydroceramide desaturase 1, elastin, hyaluronan synthase 2, and ceramide synthase 4 mRNA or protein as well as hyaluronic acid and sphingomyelin levels in UVB-irradiated HaCaT cells. Moreover, elastin regulated factors related to collagen production, wrinkles,

and melanin production in UVB-irradiated HS27 cells and IBMX-stimulated B16F10 cells. [28]

Elastin shows protective effects against UVA irradiation induced skin damage.[20-21] Other clinical studies on Elastin showed an improvement in blood flow providing a significant improvement in vascular health after 4 and 8 weeks.[22-23] Also, elastin showed a significant improvement in knee joint pain after 12 weeks.[24] After a injury, elastin mechanical properties are adapted to allow for proper work at higher pressures.[25]

The formation of Desmosine and Isodesmosine cross-links via allysine-allysine or allysine-lysine reactions also contribute to the biomechanical properties of elastic fibers, as these cross-links can resist elastolysis.[26-27]

**ELASDERMA®** is the only known elastin with a scientifically validated method to test, verify and quantify the presence of Desmosine (DES) and Isodesmosine (IDES), two amino acid isoforms uniquely found in elastin.

To measure the quantity of these biomarkers in products containing elastin, Nutraceuticals Group, in collaboration with Dr. Illya Gertsman, Ph.D (University of California-San Diego) and Vertex Analytical Labs an FDA registered and ISO 17025:2017 Accredited Laboratory, developed and validated a simple, accurate and precise HPLC-UV method to analyze elastin hydrolysates. The test method allows to detect each amino acid individually.

Lipids and small peptides are removed from elastin with ice cold ethanol. After that elastin is centrifuged and elastin hydrolysates was prepared by acid hydrolysis in 6 M HCl for 24 h at 110 °C under vacuum. The hydrolyzed elastin was neutralized with $NH_4OH$, evaporated and dried at 60 °C under stream nitrogen. The sample was resuspended in 10% MeOH and tested by ion-paring RP-HPLC.

HPLC analyses were carried out on a Shimadzu Prominence Series system (LC-20AT Pumps, SIL-20A Autosampler, CTO-20AC Column Oven, SPD-20A UV-Vis Detector). Data and chromatograms were processed with Shimadzu Lab Solutions HPLC Software. Samples (50 µL) were injected into a C18 HPLC Column (Nucleosil C18, 5µm, 150 mm x 4.6 mm, Sigma-Aldrich, cat# Z226173; St. Louis, MO) at 30 °C.

The separation mode of each amino acid was the ion-paired chromatographic technique because both DES and IDES amino acids contain pyridinium nucleus in their chemical structure. Ion pairs consisted of amino groups (positively [+] charged) and/or pyridinium nitrogen (positively [+] charged for DES and IDES), and the alkylsulfonate group (negatively [-] charged) as the other member of the ion pair. The carboxyl residues were suppressed by 0.1 M MSA (pH 2.0) containing 1.2 mM HSA like mobile phase A, and mobile phase B was used acetonitrile/0.2% FA with a flow rate to 1mL/min and 25°C column temperature. The optical density was monitored at 275 nm for the determination of DES and IDES amino acids.

Standard solution, a mix of IDES/DES (Sigma-Aldrich), was used to identify retention time and peak chromatographic parameters. A commercial sample (**ELASDERMA®**, Nutraceuticals Group USA; Lot. NIGELAS-2008V478067 and NIGELAS-2012V964125) were analyzed.

The retention time of IDES/DES standard solution (Sigma-Aldrich) were identified at 13.2 and 13.5 respectively (Figure 1).

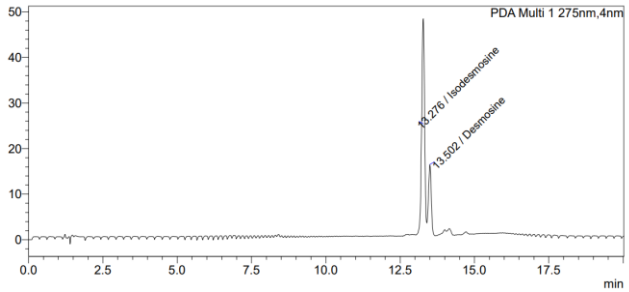


**Figure 1.** Stock standards solution chromatogram. Peak assignments and approximate retention times for IDES (13.27 min), and DES (13.50 min).

The presence of IDES/DES on elastin hydrolysate can be observed in Figure 2, with a similar retention time (RT ± 2.0%) compared with stock standards solutions.

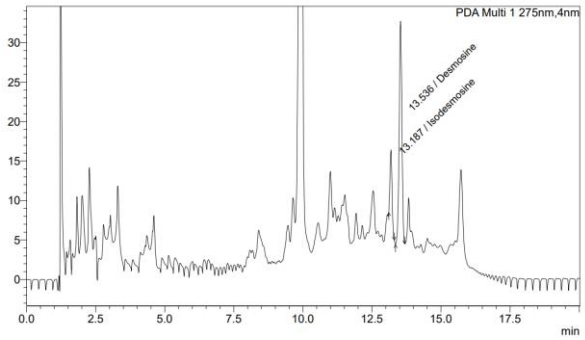


**Figure 2.** Hydrolyzed **ELASDERMA®** sample chromatogram. Peak assignments and approximate retention times for IDES (13.18 min), and DES (13.53 min).

Finally, Desmosine and Isodesmosine peaks were identified and integrated using Shimadzu LabSolutions and the amount of each amino acid in **ELASDERMA®** is calculated as µg/g using calibration curves prepared from DES/ISO reference materials (standards).

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