บรรณาธิการปริทัศน์/Editorial Corner

กระบวนการผลิตและการประยุกต์ใช้คอลลาเจนจากปลิงทะเลสู่ผลิตภัณฑ์เสริมอาหาร
Collagen Processing and Application from Sea Cucumber to Food Supplement Products

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Collagen protein is composed of polymeric chains of amino acids that form a triple helix. The human body contains around 30% collagen and 90% of the collagen is the type 1 collagen. Types of collagens are differentiated by how molecules are assembled and where the components are deposited. There are 28 types of collagens including 5 main types [1]. Collagen type 1 supports for structures of bones, blood vessel walls, tendons, ligaments, corneas, skins, and connective tissues [2]. It helps to prevent tissues from tearing, healing wounds on the skin, preventing wrinkles, and promoting skin elasticity. Collagen type 2 is mostly found in components of ears, nose, pharynx, and ribs [3]. It functions to stimulate cells to reduce the degradations of cartilage, bones, and joints. Collagen type 3 is found alongside collagen type 1 in blood vessels but is found in less than 10% [4]. Collagen type 4 has unique characteristics that is mostly found in extracellular basement membranes and body fat. It supports function of the nervous system and blood vessel. Collagen type 5 is a component of the cell membrane. It is found in the eye cornea, cell surface, hairs, and placenta of an expecting mother.

However, collagen can be degraded by lifestyle, environment, and age. Smoking and eating too much sugar promote the damage of collagen

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in the body. Nicotine from cigarettes makes blood vessels shrink and prevents blood oxygen delivery [5]. Sugar uptake cause collagen loss because it forms glycation end products by adding sugar moiety on collagen molecules [6]. Moreover, sunlight can break down collagen and disrupt collagen production [7]. Moreover, collagen is less produced when ages after 30 years old.

To increase the amount of collagen in the body, consuming rich collagen foods is suggested. Supplemented collagen source is mostly found in some parts of animals, especially skin and joints, and also beef bone broth, fish, skin-on chicken, etc [8]. Moreover, some vitamins and minerals can promote collagen production, which are vitamins C, E, zinc, and copper.

Various sources contain different types of collagens. Collagen type 1 predominates in marine animals and chicken skin, whereas collagen type 2 is abundant in the cartilage of chicken, beef, and lamb. Collagen type 3 is present in bone broth derived from chicken and beef cartilage, as well as in egg white. Collagen type 4 is typically extracted from eggshell membranes, while collagen type 5 is sourced from both chicken and bovine origins.

Under various restrictions in human diets, such as allergy, religion, tradition, alternative sources of collagen, such as sea cucumber, have been selected. Sea cucumbers offer significant potential as a collagen source due to their abundance of collagen, unique composition, and bioactive properties. Collagen derived from sea cucumbers may have specific benefits for skin health, wound healing, and overall wellness. Additionally, utilizing sea cucumbers for collagen extraction promotes sustainability by efficiently utilizing byproducts from the seafood industry. Ongoing research and innovation in this area may uncover new applications and benefits of sea cucumber collagen in biomedical, cosmetic, and food industries.

Most sea cucumbers have a soft and cylindrical body, lengthened, rounded off and occasionally fat in the extremities, and generally without solid appendages. It is typically 10 to 30 cm in length, although the smallest known species are just 3 mm long, and the largest can reach 3 meters [9]. Sea cucumber contains high collagen in the body wall which is an edible part. Most collagen contained in sea cucumber is type 1 collagen. It contains high collagen about 70% of the total body wall protein in the form of highly insoluble collagen fiber [10]. The body walls of sea cucumber 100 grams of wet weight, the collagen can be extracted from 4 to 11 grams of dry weight. About 58-67% of pepsin-solubilized collagen (PSC) can be extracted from crude collagen. Mostly, collagen is composed of 33% glycine, 11% proline, 12% hydroxyproline, 9% alanine, 9% glutamic acid, 8% arginine and other amino acids.

Several methods can be employed to extract collagen from sea cucumbers. Enzymatic extraction involves using enzymes, such as pepsin, papain or trypsin to break down the protein matrix within the sea cucumber tissues, releasing collagen molecules. Alternatively, chemical extraction utilizes acidic or alkaline solutions to solubilize collagen from the tissues. Mechanical extraction methods, including grinding or homogenization, can also be used to disrupt the tissues and facilitate collagen release. In practice, extraction protocols often utilize a

combination of these techniques to maximize collagen yield and purity. The choice of extraction method depends on various factors such as the desired quality of collagen, yield requirements, and intended applications. Each extraction method has its advantages and limitations, and careful consideration is essential to select the most suitable approach for extracting collagen from sea cucumbers.

The market for collagen has experienced remarkable growth due to increased consumer awareness of its health benefits and the demand for functional ingredients in food products. Collagen acts as a functional protein, enhancing the nutritional value of products like protein bars and snacks. Collagen also improves texture in candies, desserts, and meat products, providing chewiness and juiciness. Additionally, it serves as a gelling agent in jellies and puddings and stabilizes emulsions in sauces and dressings. Moreover, collagen's association with joint health, skin elasticity, and muscle recovery has led to its incorporation into various health-focused food and beverage products, catering to consumers seeking wellness-oriented options. As the food industry continues to innovate to meet evolving consumer preferences, collagen's versatile applications and health-promoting properties are expected to drive further growth and development in functional foods and beverages.

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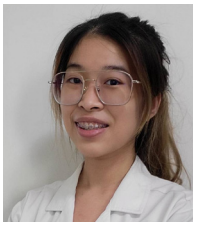

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