

Pharmaceutical Applications of Fishery Byproducts – An Overview

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[DOI:10.5281/ScienceWorld.15819253](https://doi.org/10.5281/ScienceWorld.15819253)

Introduction

The global fishery industry is a significant contributor to food security and nutrition for populations around the world. While fish is primarily consumed as a food source, a substantial number of by-products generated during fish processing presents opportunities for creating valuable pharmaceutical products. These by-products, which include fish proteins, oils, and derivatives such as gelatin and chitin, can be transformed into high-quality ingredients used in various applications, particularly in health and wellness sectors. This document aims to provide an in-depth analysis of key fishery by-products and their roles in pharmaceutical applications.

Key Fishery By-Products and Their Pharmaceutical Applications

1. Gelatin

Gelatin is primarily extracted from fish skins and bones, recognized for its unique gelling properties. In the food industry, it is used extensively in confectioneries and desserts; however, its pharmaceutical applications are increasingly significant. Fish gelatin is favored in capsule and tablet coatings due to its excellent film-forming abilities and biodegradability. Research indicates that fish gelatin can effectively replace mammalian gelatin in tissue engineering, thereby helping to mitigate ethical concerns associated with animal-derived products,

In addition to traditional uses, innovative applications of fish gelatin include the development of hydrogels for drug delivery systems. For instance, cross-linked fish gelatin hydrogels can harbor drugs and provide controlled release, making them highly suitable for localized therapeutic delivery. The biocompatibility of fish gelatin enhances its usability in various

biomedical applications, including wound dressings and scaffolds for tissue regeneration.

2. Insulin

Insulin, a critical hormone for regulating blood glucose levels, has been sourced from fish pancreas, particularly from species like tuna and cod, which contain a higher concentration of insulin than mammalian sources. Fish insulin has shown greater stability and reduced susceptibility to enzymatic degradation, which could lead to new paradigms in diabetes management. Japan has pioneered production facilities that extract insulin from fish, and ongoing research in India explores the potential of utilizing the large tuna catch expected in upcoming fisheries expansions.

The drive for fish-derived insulin aligns with broader trends in biotechnology, which are shifting away from traditional mammalian insulin production towards more sustainable methods. The ability to generate insulin from fish not only provides a sustainable resource but also reduces reliance on conventional animal sources, presenting a significant advancement in terms of both ethics and health benefits.

3. Fish Albumin

Fish albumin, akin to egg albumin in terms of its attributes, is primarily derived from the residual protein left after fish processing. It occurs in two grades: a technical grade suited for food production and a pharmaceutical grade formulated for medical applications. Its emulsifying and foaming properties make fish albumin an excellent addition to various food products, enhancing texture and stability. In pharmaceuticals, it is used as a stabilizing agent and a carrier for drugs, supporting better absorption and efficacy of medications.

4. Fish Protein Concentrate

Fish protein concentrate (FPC) offers a concentrated source of protein, achieved by removing non-protein components such as water and oil from fish. This product is gaining popularity in the food and dietary supplement industries due to its high nutritional value, being rich in essential amino acids and minerals. FPC can help address protein deficiencies in various population segments and is utilized in formulating protein-rich foods and functional supplements that cater to the growing demand for health-enhancing products. The development of FPC has made it easier to incorporate underutilized fish species into human diets, thereby contributing to more sustainable fishing practices while ensuring nutritional quality.

5. Chitin and Chitosan

Chitin, derived from crustacean shells, is a biopolymer with numerous applications in medicine and industry. Chitosan, produced through the deacetylation of chitin, has garnered interest due to its biocompatibility and biodegradable nature. It exhibits antimicrobial properties and is used as a drug delivery system agent, enhancing the stability and bioavailability of various pharmaceutical formulations.

Chitosan is also finding its place in wound healing and tissue engineering, serving as a scaffold for cell attachment and growth. Its role as a dietary supplement for weight management and cholesterol reduction is under exploration, showcasing its potential as a multifunctional ingredient in health products.

Conclusion

Pharmaceutical fish products represent a diverse and growing market that capitalizes on the nutritional value and functional properties of fishery by-products. Innovations in extraction and formulation techniques have opened new avenues for utilizing these resources, ensuring that the fish processing industry can contribute to dietary requirements and health care solutions. The versatility and effectiveness of fish-derived ingredients demonstrate their potential to enhance various products, ranging from pharmaceuticals to functional foods, while promoting sustainability and waste reduction within the fishing industry. As research continues to evolve, the full potential of pharmaceutical fishery products will likely be realized, offering transformative benefits across health sectors and contributing to global health initiatives, especially in addressing protein malnutrition and chronic diseases.

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