Journal Home: www.bioticainternational.com

Popular Article

Article: RT712

Biotica Research Today

Vol 3:9 2021 728 / 729

Aquaculture Waste Derived Biomaterial in Innovative Bone Repair

Mahadevi*, Cheryl Antony, V. Ezhilarasi, K. Ravaneswaran and B. Ahilan

Dept. of Aquaculture, Dr. MGR Fisheries College and Research Institute, Ponneri, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Tamil Nadu (601 204), India

Open Access

Corresponding Author

Mahadevi

e-mail: mahadevi@tnfu.ac.in

Keywords

Aquaculture, Biomaterial, Tissue repair, Waste utilization

Article History

Received in 30th August 2021

Received in revised form 05th September 2021

Accepted in final form 06th September 2021

E-mail: bioticapublications@gmail.com

How to cite this article?

Mahadevi *et al.*, 2021. Aquaculture Waste Derived Biomaterial in Innovative Bone Repair. Biotica Research Today 3(9): 728-729.

Abstract

As the title denotes, the innovative biomaterial has been developed using the aquaculture waste by a team of scientists at Nanyang Technological University, Singapore. Majority of the aquaculture industry side-streams are currently used for low-value purposes such as animal feed or composting material, with low economical returns. To maximize resource reuse and minimize waste generation, valorisation efforts should be augmented with the aim to produce high-value products. The Nanyang Technological University, Singapore has come up with the best remedy of waste utilization. The article discusses the technology and procedure in brief.

Introduction

In Singapore, the combined annual consumption of frog flesh and fish is estimated to be around 100 million kilograms, making bullfrog skin and fish scales two of Singapore's largest aquaculture waste side streams. More than 20 million tonnes of fishery by-products, such as fins, scales, and skins, are discarded every year. Hence, to utilize the waste of these aquaculture industry side-streams, the Nanyang Technological University, Singapore designed the project to develop biomaterial for tissue repair from the bullfrog skin and fish scales.

Figure 1: Aquaculture Waste Derived Biomaterial (Source: Wang JK *et al.*, 2021)

Innovation and Application

1. Collection of Waste

The skin of American bullfrog was collected from the Local Jurong Frog Farm and the fishery waste was collected from Khai Seng Fish Farm.

2. Process

- The scientists removed all impurities from the bullfrog skin, then blended it to form a thick collagenous paste that is diluted with water. Collagen was then extracted from this mix.

• Hydroxyapatite (a calcium-phosphate compound) was harvested from discarded fish scales of snakehead fish, commonly known as the Toman fish through calcination, which is purification process that requires high heat to remove the organic matter and then the purified matter is air-dried.

• The biomaterial was synthesised by adding hydroxyapatite powder to the extracted collagen, then cast into a mould to produce a 3D porous scaffold.

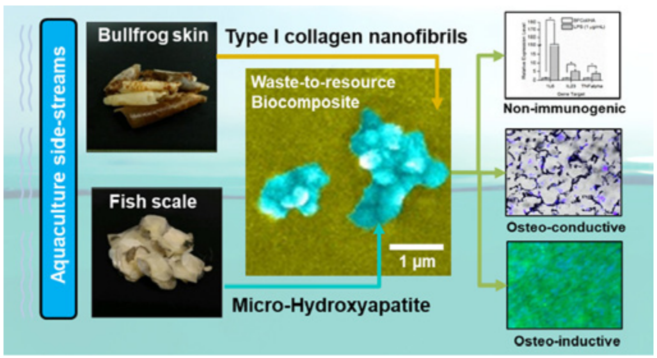

Figure 2: Collagen used in Biomaterial synthesis process (Source: Wang JK *et al*., 2021)

Applications

• Human bone-forming cells seeded onto the biomaterial scaffold successfully attached themselves and start multiplying which is a sign of growth. Hence, scaffold could be used to help with the regeneration of bone tissue lost to disease or injury or jaw defects from trauma or cancer surgery.

• Many potential dental applications ranging from the regeneration of gum tissues in periodontal disease, to bone for placement of dental implants, to jawbone following tumour surgery.

Conclusion

Biomaterial is a promising alternative to the current standard practice of using a patient's own tissues, which requires additional surgery for bone extraction. At the same time, the production of this biomaterial tackles the problem of aquaculture waste. India also should take up such studies which would help in aquaculture and fish processing industry waste management.

Reference

Wang, J.K., Nicole, C.C., XiaoHu, M.J., Tay, C.Y., 2021. Sustainable aquaculture side-streams derived hybrid biocomposite for bone tissue engineering. *Materials Science and Engineering: C* 126, 112104. https://doi.org/10.1016/j.msec.2021.112104.