

TECH OFFER

Amphibian Collagen: A Sustainable-Derived Biomaterial with Multi-functional Capabilities



KEY INFORMATION

TECHNOLOGY CATEGORY:

Healthcare - Medical Devices

Personal Care - Cosmetics & Hair

Waste Management & Recycling - Food & Agriculture

Waste Management

Healthcare - Pharmaceuticals & Therapeutics

TECHNOLOGY READINESS LEVEL (TRL): **TRL7**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO175063**

OVERVIEW

Collagen is a structural protein prevalent in the connective tissues of all organisms, and is the building block of biomaterial that is essential in wound healing and tissue regeneration. Through a patented extraction method, a novel Type I Amphibian collagen has been valorised from discarded skins, an agrifood waste stream and processed into a medical grade collagen biomaterial. The extracted pristine native amphibian collagen possesses unique properties, combining attributes associated with aquatic and land-based collagen sources, giving the extracted collagen more versatility than conventional sources of collagen.

The Type I Amphibian collagen possesses a higher biocompatibility and water solubility as compared to mammalian sources of collagen, with a better thermostability profile, than marine sources of collagen. The technology provider has demonstrated the medical application of this extracted collagen by developing a range of specialised wound dressings, specifically designed for the

management of chronic wounds. These dressing will significantly improve clinical outcomes and increase the rate of chronic wound closure.

The technology provider is looking for partnerships or collaborations to transform this pristine collagen into medical products. Additionally, with a pristine collagen extract, hydrolysing them into smaller fragments (collagen peptides) that can be customised to the needs of the partnership or collaboration, for the medical/cosmeceutical/nutraceutical industry.

TECHNOLOGY FEATURES & SPECIFICATIONS

- A unique pristine Type 1 collagen of amphibian origin, in its native triple helix form.
- Relatively high denaturation temperature of $\sim 43^{\circ}\text{C}$, to withstand the average human body temperature of 37°C , thus retaining its functionality better in human body as compared to marine collagen.
- Can serve as a matrix or carrier for bioactives such as anti-microbials or anti-inflammatory drugs or compounds that confer additional specific therapeutic benefits.
- Reduced risk of adverse reactions or rejection compared to traditional biomolecules, thereby increasing clinical safety.
- Can be easily chemically cross-linked to form a microporous scaffold that facilitates tissue regeneration and accelerates the rate of re-epithelialization.
- Proven to inhibit/deactivate matrix metalloproteinase (MMPs), producing an optimal healing environment for the wound. Exists as Nano Fibres that are 20–25 nm in diameter with a length of 200–400 nm, enhancing cell-material interactions and better supporting fundamental cellular processes.
- Highly absorbable and thus able to remove wound exudate, allowing for a reduction in inflammation and oedema at the wound site.

POTENTIAL APPLICATIONS

Amphibian collagen can be used widely for biomedical applications, nutraceutical products, as well as cosmetics. Well known for its biocompatibility in human tissue, collagen is widely used in clinical practice for accelerated wound healing, post debridement. The main clinical usage of this technology allows collagen to act as support matrices for the repair of matrix-rich tissues that have been damaged and replacing scaffolds for tissue filling.

In the cosmetic front, collagen is extremely suitable for the care of dry, UV-exposed, and environmentally stressed skin as well as ageing skin. It is one of the main constituents of cosmetic formulations due to its moisturising, regenerating, and film-forming properties.

However, the technology provider is also keen to collaborate with partners to explore beyond the applications stated above.

MARKET TRENDS & OPPORTUNITIES

With increasing consumer awareness of skincare and beauty products, the collagen market is expected to have a continued upward trend. Due to a greater emphasis being placed on developing products that are environmentally friendly and sustainable, the approach of upcycling amphibian skins that would otherwise be discarded as waste, will be embraced by the consumer fraternity.

The global collagen market was valued at USD 9.66 billion in 2022 and is expected to expand to USD 19.98 billion in 2030 at a CAGR of 9.36 % during the forecast period of 2023-2030.

Though intense competition, with many established brands and new entrants in the extraction of collagen, this technology is unique in the resources used – amphibians. There is no commercial available amphibian collagen in the market and the technology provider is the first to have demonstrated the use of this in wound dressing and cosmetics. Amphibian collagen is expected to be widely embraced as there are no religious restrictions, unlike other traditional sources of collagen.

UNIQUE VALUE PROPOSITION

- A medical grade collagen with intact native triple helix structure.
- A special mechano-chemical method of extraction that form a sustainable waste valorisation process.
- Maintains unique properties of both aquatic and land-based collagen, unlike current sources of collagen.
- Nano-collagen fibres that are of 175-187% thinner than those of mammalian collagen.
- Is easily processed into gelatin and easily hydrolysed to form collagen peptides.
- Collaborations can be medical or cosmetic related.
- White labeling options available.
- All products conform to ISO10993 and can be ETO sterilized.