# "Crustaceutical": A Jargon Term Firstly Used for Scientific Paper

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***Abstract:*** *This scientific research paper introduces the term "crustaceuticals" to describe crustaceans with potential applications in nutraceuticals, marking the first usage of this terminology. The study aims to conduct a five-year synthesis review to support and validate the coined phrase. Utilizing a synthesis review methodology, the researchers analyze secondary resources from 2017-2022, focusing on two main themes: the nutraceutical potential of crustaceans such as shrimp, crabs, and lobsters, and the designation of these crustaceans as "crustaceuticals." The results reveal that these crustaceans not only possess traditional nutrients but also contain bioactive components with pharmaceutical potential. Astaxanthin, chitin, chitosan, and fatty acids found in crustaceans exhibit antioxidant, anti-inflammatory, immune-boosting, and health-enhancing effects. The conclusion affirms the appropriateness of the term "crustaceutical" and underscores the biochemical components present in crustaceans, emphasizing their potential value in food technology with medicinal applications. This original research contributes a novel concept to the scientific lexicon and lays the foundation for further exploration of crustaceans in the realm of nutraceuticals.*

## I. INTRODUCTION

Crustaceans are one of the most important commodities in the food industry. In fact, the crustacean industry produces high-value export goods that allow producers to purchase low-value goods on the global market, favorably affecting food security in both exporting and importing nations (Bondad-Reantso et al., 2012; Nguyen et al., 2019 & Abbott et al., 2021). Asian countries are among the largest producers of crustaceans such as shrimp, crabs, and lobsters (Uderbayev et al., 2017 & Venugopal et al., 2017). In the year 2022, Asian countries currently account for 69% crustacean landings (Boenish et al., 2022).

Among Asian countries, the Philippines is one of the countries with a greater number of fisherfolk involved in crustacean industries (Abduho & Madjos, 2018). The Philippines' production of 826,060 MT of fish, crustaceans, mollusks, etc., contributed 1.01% to the world's total production in aquaculture by principal producers (BFAR, 2020). In reality, the Philippines is one of the Association of Southeast Asian Nations (ASEAN) countries that exports crustaceans to Japan due to a particular interest in the effects of Acute Hepatopancreatic Necrosis Disease (AHPND). In Japan suggests that ASEAN exporters continue to increase efforts to combat AHPND so that exports to their major market (Japan) will not be affected (Lee, 2020).

The potential to address the economic aspects of other countries is not only one of the benefits of the Philippines' crustaceans; it also has a high nutraceutical potential, aside from the fact that they are a good source of protein-rich foods for human consumption (Li et al., 2021). Nutraceuticals are products that, other than being used for nutrition, are also used as medicine. A nutraceutical product may be defined as a substance that has a physiological benefit or provides protection against chronic disease (Baharlouei & Rahman, 2022). In the case of crustaceans such as shrimp and crabs, it contains chitin, a substance that inhibits the growth of human cancer cell lines, meaning it has an anti-cancer effect (Rameshthagam et al., 2018; Wang et al., 2020 & Shahbaz et al., 2023). Moreover, in addition to the aforesaid chemical substance found in shrimp and crabs, they also contain chitosan, just like another family of crustaceans, the lobsters. Chitosan is a fibrous substance that reduces cholesterol and fat, making crustaceans very useful in medicine and drug manufacturing (Zhou et al., 2021; Razak et al., 2018 & Dang et al., 2018).

This scientific research paper presents evidence that crustaceans have pharmaceutical potential, and terms linked to them are first used in this study and tagged as "crustaceuticals."

Specifically, this study aims to:

1. introduce the term "crustaceutical" as the first terminology for crustaceans with potential for usage in nutraceuticals.

2. conduct a five-year synthesis review to back up the aforesaid non-technical phrase

## II. METHODOLOGY

This study at hand uses "synthesis review" as a method. The researchers read secondary resources from 2017-2022 divided into two themes: the first is on the characteristics of crustaceans such as shrimp, crabs, and lobster, proving their nutraceutical potential. Second, consider how these specific crustaceans are tagged as "crustaceuticals."

## III. RESULTS AND DISCUSSION

**Prediction Inputs**

***A. Characteristics of Crustaceans***

*Shrimp*

In terms of overall length, shrimp have been observed to range in size from 8 to 23 cm. The cephalothorax and exoskeleton account for at least 40% of the entire shrimp body, whereas the shrimp muscles are consumed directly (Dang et al., 2018). Shrimp peelability and shell loosening can be improved using enzymatic procedures, microwaves, or ultrasonic treatments. The exoskeleton and head of shrimp are used as by-products to further extract bioactive substances and chitin (Mishyna et al., 2021).

However, accumulating shrimp shell debris causes environmental damage and wastes resources. Utilizing affordable and environmentally friendly methods to recycle shell trash into usable fractions is still difficult (Yang et al., 2019 & Sharma et al., 2021). To find a clean and effective enzymatic procedure to recover the majority of the components of shrimp shell waste, including protein, chitin, astaxanthin, and minerals. Recombinant chitinase, two recombinant aspartic proteases, and ethyl acetate were all employed in the procedure to hydrolyze proteins, hydrolyze chitin, and extract astaxanthin (Deng et al., 2020).

After the removal of the protein and chitin, astaxanthin was easily recovered from the shell remnant due to the fact that deproteinization made the shell chitin accessible to chitinase. High recovery rates of protein (91.4%) and chitin (88.9%) were achieved during the procedure, which was finished in a matter of hours. In contrast to conventional chemical or physical treatments, the N-acetyl group of chitin oligomers, astaxanthin, and amino acids in peptides were all retained in their original states in the final products. Potential uses for the goods include food additives, anti-inflammatory drugs, and antioxidants (Ko et al., 2021; Nirmal et al., 2020 & Kandylis et al., 2020). This enzymatic method improves the environment and the economy by implementing a circular economy in the processing of shrimp (Deng et al., 2020 & de la Caba et al., 2019).

Supplements made from shrimp oil can assist your health more than other fish oils since it contains polyunsaturated fatty acids and carotenoids. By reducing the need for excessive solvent usage and raising the extraction yield, the physical techniques employed for the extraction of oil from shrimp processing by-products (SPBP) have the potential to enhance the extraction procedure (Gulzar et al., 2020 & Du et al., 2022).

*Crab*

Long-chain omega-3 fatty acids, protein, vital amino acids, and long-chain vitamins and minerals are all abundant in crab meat. Crab meat's distinct flavor and pleasing flavor qualities are a result of its volatile and non-volatile scent and flavor components, which contributes to the high level of customer acceptability (Adetokunbo, 2021; Nanda et al., 2021 & Nadeeshani et al., 2020). To increase the quality, security, and shelf life of crab meat and crab-based value-added goods, various cutting-edge preservation techniques are offered. Crab manufacturing wastes also contain a number of highly valuable bioactive substances (Nanda et al., 2021 & Yadav et al., 2019).


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**Table 1**

***Presentation of Biochemical Components***

| Biochemical Components | Pharmaceutical Description and Used | Presence in the Crustacean Commodity | | |
|---|---|---|---|---|
| | | Shrimp | Crab | Lobster |
| Astaxanthin (AST) (Carotenoids) | A potent lipid-soluble keto-carotenoid with auspicious effects on human health. It has antioxidant and anti-inflammatory effects that protect against inflammatory diseases such as cancer, obesity, hypertriglyceridemia, and hypercholesterolemia, with excellent safety and tolerability (Fakhri et al., 2018; Raza et al., 2021 & Alugoju et al., 2022). | ✓ | ✓ | ✓ |
| Chitin/Chitosan | These biochemical components are commonly used as antitherapeutics for immune system suppression and host cell toxicity (Safarzadeh et al., 2021). It can exert immune-boosting effects (Chen et al., 2019). Chitosan can even deliver treatment for SARS-CoV-2 infection, while chitin is very useful for having an anti-cancer effect (Tan et al., 2022; Gulati et al., 2021 & Rasul et al., 2020). | ✓ | ✓ | |
| Fatty acids (polyunsaturated) | It controls how the nervous system, blood pressure, hemostatic clotting, glucose tolerance, and inflammatory processes operate. These functions may be helpful in treating all inflammatory disorders. Especially among people who engage in physical exercise, their potential anti-inflammatory and antioxidant actions may offer health benefits and performance enhancement (Gammone et al., 2019; Tobaldini et al., 2019 & Bautista et al., 2019). | ✓ | | |

The valorization of these bioactive substances—derivatives of chitin, protein hydrolysates and enzymes, lipids, carotenoids, etc.—that have numerous uses in the agricultural, environmental, food, textile, pharmaceutical, and other biomedical industries—is advised to be done using green extraction methods (Ozogul et al., 2021 & Suresh et al., 2018).

*Lobster*

Study on carotenoids present in carapace and abdominal tissue in 5 species of lobsters T. orientalis, P. homarus, P. versicolor, P. ornatus and P. polyphagus has been carried out. Each carotenoid found in each species was given a separate quantitative and qualitative (HPLC) estimation. Astaxanthin was found to be more prevalent among the carotenoids in the P. polyphagus carapace (65.68%). Since astaxanthin predominates, this product is likely a strong source of natural antioxidants, which may enhance users' health (Galasso et al., 2018; Stachowiak & Szulc, 2021). So, it follows that the waste could constitute a valuable source of natural carotenoid that could be recovered and used later as a pigment source in aquaculture diets.

### *B. Crustaceutical" Potentials*

Based on the literature reviews, aside from the facts that crustaceans such as shrimp, crabs, and lobsters are rich in proteins, minerals, vitamins, and carbohydrates, there are recently discovered biochemical composition that makes it important in the pharmaceutical areas (Nanda et al., 2021; Suresh et al., 2018 & Nag et al., 2022). The following were the bioactive components present in crustaceans such as crabs, shrimp, and lobster which are abundant in the Philippines. Based on the literature reviews, the following were the bioactive components present in crustaceans such as crabs, shrimp, and lobster, which are in the Philippines (Table 1).

The findings suggest that crustaceans such as shrimp, crabs, and lobsters are not only rich in traditional nutrients but also contain important bioactive components that have potential applications in the pharmaceutical industry. Astaxanthin, a carotenoid found in these crustaceans, has antioxidant and anti-inflammatory effects that may protect against inflammatory diseases such as cancer, obesity, hypertriglyceridemia, and hypercholesterolemia. Chitin and chitosan, which are commonly found in crustacean shells, have immune-boosting effects and can be used as antitherapeutic for immune system suppression and host cell toxicity. Fatty acids, particularly polyunsaturated fatty acids, found in crustaceans can potentially treat all inflammatory disorders, offer health benefits, and enhance performance among individuals who engage in physical exercise. Overall, these findings highlight the importance of crustaceans in human nutrition and health

## IV. CONCLUSION

In conclusion, this study introduces the term "crustaceutical" as a pioneering nomenclature for crustaceans, shedding light on their nutraceutical potential through a comprehensive five-year synthesis review. Employing a synthesis review methodology, the research thoroughly explores the characteristics of shrimp, crabs, and lobsters, uncovering innovative extraction methods for valuable components. The study emphasizes environmentally sustainable practices, such as circular economies in shrimp processing, and explores the diverse applications of by-products.

Additionally, the investigation reveals the abundant bioactive components in crab meat and highlights green extraction methods for various substances, including chitin and chitosan. The prevalence of astaxanthin in lobster waste further underscores its potential as a natural antioxidant source. The multifaceted discussion delves into the rich biochemical composition of crustaceans, with particular emphasis on the immune-boosting effects of chitin and chitosan.

Overall, the coined term "crustaceutical" encapsulates the layered significance of crustaceans in human nutrition, health, and pharmaceutical applications, urging continued exploration of their potential benefits and sustainable utilization.

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