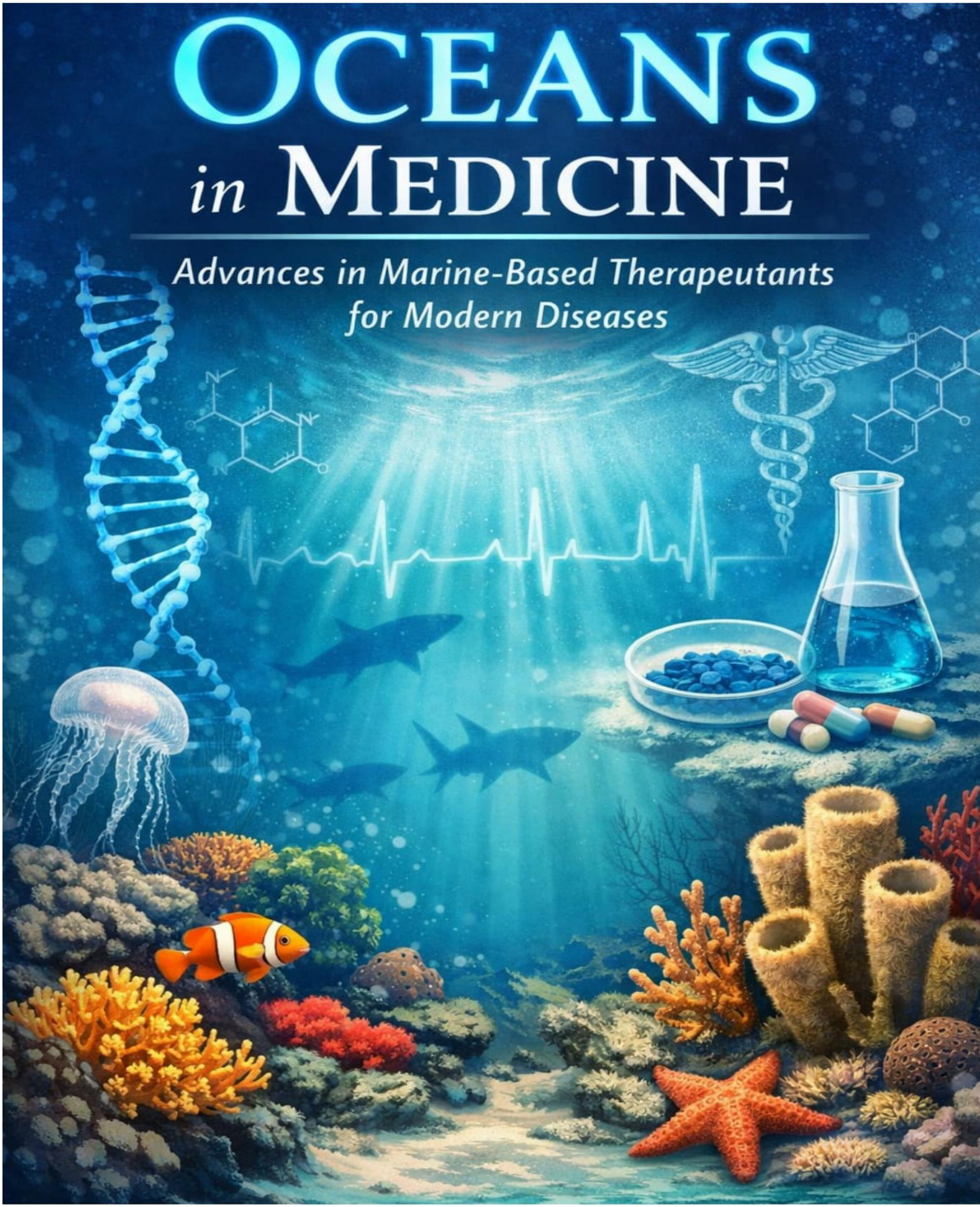
OCEANS in MEDICINE

Advances in Marine-Based Therapeutants for Modern Diseases



Mrs. Varaganti Sai Chitra Prathyusha
Dr. Narendra Kumar Nyola
Dr. Anil Kumar
Dr. Sanmati Kumar Jain

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Editors

1. Mrs. Varaganti Sai Chitra Prathyusha, Assistant Professor, Faculty of Pharmacy, Dr. M.G.R. Educational and Research Institute (Deemed to be University), Chennai, Tamil Nadu, India
2. Dr. Narendra Kumar Nyola, Principal, School of Pharmacy, Shridhar University, Pilani, Jhunjhunu, Rajasthan, India
3. Dr. Anil Kumar, Assistant Professor & Head, Department of Chemistry (PG), Sahibganj College Sahibganj, Jharkhand, India
4. Dr. Sanmati Kumar Jain, Professor, Department of Pharmacy, Guru Ghasidas Vishwavidyalaya (A Central University), Koni, Bilaspur, India

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Chapter 8: Marine Collagen Peptides: Regenerative Approaches in Wound Healing, Skin Aging, and Osteoarthritis

Aniket Kakkar[*1], Snehal Praful Shingade[2] , Ankita Vijay Thul[3], Anil Kumar[4], Chetana Sudhakar Selukar[5]

[1]*Assistant Professor, Sahu Onkar Saran School of Pharmacy, Faculty of Pharmacy, IFTM University, Moradabad, Uttar Pradesh, India*

[2]*Professor, School of Pharmacy, GH Raisoni Skill Tech University, Nagpur, Maharashtra, India*

[3,5]*Assistant Professor, School of Pharmacy, GH Raisoni Skill Tech University, Nagpur, Maharashtra, India*

[4]*Assistant Professor & Head, Department of Chemistry (PG), Sahibganj College Sahibganj, Jharkhand, India*

***Corresponding Author: Aniket Kakkar, Assistant Professor, Sahu Onkar Saran School of Pharmacy, Faculty of Pharmacy, IFTM University, Moradabad, Uttar Pradesh, India**

Abstract

Marine collagen peptides have emerged as promising bioactive compounds in regenerative medicine due to their high biocompatibility, bioavailability, and multifunctional biological activities. Derived primarily from marine by-products such as fish skin, scales, bones, and invertebrates, these peptides offer a sustainable and safe alternative to mammalian collagen sources. This chapter provides a comprehensive overview of marine collagen peptides with a focus on their regenerative applications in wound healing, skin aging, and osteoarthritis. The structural characteristics, extraction methods, and biological properties of marine collagen peptides are discussed in relation to their antioxidant, anti-inflammatory, and immunomodulatory effects. Particular emphasis is placed on their role in accelerating wound repair through enhanced fibroblast proliferation, angiogenesis, and extracellular matrix remodeling. Additionally, the anti-aging potential of marine collagen peptides in improving skin elasticity, hydration, and dermal collagen synthesis is critically evaluated. Their therapeutic relevance in osteoarthritis is also examined, highlighting chondroprotective mechanisms, cartilage regeneration, and symptomatic relief. Safety, bioavailability, and regulatory considerations are addressed, along with current challenges and future prospects. Overall, marine collagen peptides represent a versatile and innovative biomaterial with significant potential for regenerative and therapeutic applications.

Keywords

Marine collagen peptides; Regenerative medicine; Wound healing; Skin aging; Osteoarthritis; Biomaterials; Tissue regeneration

1. Introduction

Collagen is the most abundant structural protein in the extracellular matrix (ECM) of connective tissues, where it plays a fundamental role in maintaining tissue integrity, mechanical strength, and cellular signaling. It constitutes a major component of skin, cartilage, bone, tendons, and ligaments, and is therefore central to tissue repair and regeneration processes. In regenerative medicine, collagen-based biomaterials have long been