

Nanotechnology in Skin, Soft Tissue, and Bone Infections

Mahendra Rai
Editor

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 Springer

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Mahendra Rai
Nanobiotechnology Laboratory
Department of Biotechnology
Amravati, Maharashtra, India

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Preface

Skin, soft tissue, and bone infections are increasing due to the invasion of a wide variety of microorganisms, including bacteria, fungi, viruses, and protozoa. Usually, these infections are mild but they are sometimes fatal to human beings. Such infections can be cutaneous, subcutaneous, or deep-seated in tissues. Among these, bacterial infections occur commonly throughout the world and have created the problem of resistance to drugs. There are alarming reports of methicillin-resistant *Staphylococcus aureus* (MRSA), which accounts for the major part of community-acquired skin infections. Streptococci are also responsible for such infections. These infections are more common in immunocompromised patients. Unfortunately, the rate of development of antibiotics is very slow, and the problem of multidrug-resistance is quickly increasing. These infections are booming in hospitals and mostly community-acquired. Considering these facts, there is a greater need to search for newer antibiotics or potential alternatives to tackle the problem.

In this context, nanotechnology is emerging as a potential tool to fight against multidrug-resistant microbes. It has demonstrated huge potential for the treatment of bone infections through the application of antibacterial nanomaterials. Many nanobiomaterials have been studied for scaffold reinforcement to improve their micro-mechanical and biocompatible properties. For example, calcium phosphate (CaP) bioceramics are commonly used as local delivery agents (nanocarriers) for the treatment of bone infections and can be substituted with antibacterial nanoparticles that possess broad-spectrum activity even against multidrug-resistant bacteria. Metal nanoparticles such as silver nanoparticles and other antimicrobial nanomaterials can be used for coating of implants. This self-assembly at the nanolevel at body temperature may, in the future, be used by way of side chains to direct bone growth or possibly to combat osteomyelitis. Silver nanoparticles are yet another nanostructured material that is attracting increasing attention as an effective antimicrobial agent. Wound dressings impregnated with silver nanoparticles have already proven their remarkable potential against Gram-positive and Gram-negative bacteria.

The present book covers the role of nanotechnology in skin infections such as atopic dermatitis and acne vulgaris, as well as the role of metal nanoparticles as antibacterial and antifungal. It additionally elaborates on the management of wound

and bone infections using different nanoparticles. Finally, this book discusses toxicity issues concerning the use of nanoparticles.

This book will be useful for master and postgraduate students, researchers, and teachers dealing with medical microbiology, dermatology, osteology, nanotechnology, nanobiotechnology, pharmacology, microbiology, and biotechnology.

Amravati, Maharashtra, India

Mahendra Rai

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Contributors

Mehran Alavi Laboratory of Nanobiotechnology, Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran

Venâncio Alves Amaral Laboratory of Biomaterials and Nanotechnology, University of Sorocaba, Sorocaba, São Paulo, Brazil

Farnoush Asghari-Paskiabi Department of Mycology, Pasteur Institute of Iran, Tehran, Iran

Fernando Batain Laboratory of Biomaterials and Nanotechnology, University of Sorocaba, Sorocaba, São Paulo, Brazil

Debalina Bhattacharya Department of Microbiology, Maulana Azad College, Kolkata, West Bengal, India

Marco Vinicius Chaud Laboratory of Biomaterials and Nanotechnology, University of Sorocaba, Sorocaba, São Paulo, Brazil

Kessi Marie Moura Crescencio Laboratory of Biomaterials and Nanotechnology, University of Sorocaba, Sorocaba, São Paulo, Brazil

Hanna Dahm Department of Microbiology, Nicolaus Copernicus University, Torun, Poland

Larissa Ciappina de Camargo Department of Microbiology, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Parneet Kaur Deol Department of Pharmaceutics, G.H.G. Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana, Punjab, India

Carolina Alves dos Santos College of Pharmacy, University of Sorocaba, Sorocaba, São Paulo, Brazil

Amoljit Singh Gill Department of Mechanical Engineering, Punjab Technical University, Kapurthala, Punjab, India

Marcelly Chue Gonçalves Department of Microbiology, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Avinash P. Ingle Department of Biotechnology, Engineering School of Lorena, University of Sao Paulo, Lorena, SP, Brazil

Zahra Jahanshiri Department of Mycology, Pasteur Institute of Iran, Tehran, Iran

Aswathy Jayakumar School of Biosciences, Mahatma Gandhi University, Kottayam, Kerala, India

Vandita Kakkar Department of Pharmaceutical Sciences, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, India

Indu Pal Kaur Department of Pharmaceutics, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, India

Renata Katsuko Takayama Kobayashi Department of Microbiology, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Parina Kumari Department of Pharmaceutical Sciences, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, India

Audrey Alesandra Stingenhen Garcia Lonni Department of Pharmaceutical Sciences, Health Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Milena Menegazzo Miranda-Sapla Department of Pathological Sciences, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Fabio Franceschini Mitri Department of Human Anatomy, Biomedical Sciences Institute, Federal University of Uberlandia, Uberlandia, MG, Brazil

Mainak Mukhopadhyay Department of Biotechnology, JIS University, Kolkata, West Bengal, India

Gerson Nakazato Department of Microbiology, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Priyanka Narula Department of Pharmaceutical Sciences, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, India

Luciano Aparecido Panagio Department of Microbiology, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Anita K. Patlolla CSET, Department of Biology, Jackson State University, Jackson, MS, USA

Joana C. Pieretti Center for Natural and Human Sciences (CCNH), Federal University of ABC (UFABC), Santo André, SP, Brazil

Sushant Prajapati Department of Biotechnology and Medical Engineering, NIT, Rourkela, India

E. K. Radhakrishnan School of Biosciences, Mahatma Gandhi University, Kottayam, Kerala, India

Mahendra Rai Nanobiotechnology Laboratory, Department of Biotechnology, Amravati, Maharashtra, India

Thais Cruz Ramalho Laboratory of Pharmaceutical Nanosystems—NANOSFAR, Postgraduate Program in Pharmaceutical Sciences, Federal University of Piauí, Teresina, Piauí, Brazil

Mehdi Razzaghi-Abyaneh Department of Mycology, Pasteur Institute of Iran, Tehran, Iran

Márcia Araújo Rebelo College of Pharmacy, Max Planck University Center, Indaiatuba, São Paulo, Brazil

Guilherme Fonseca Reis Department of Microbiology, Biological Sciences Center, Universidade Estadual de Londrina, Londrina, Paraná, Brazil

Hercília Maria Lins Rolim Laboratory of Pharmaceutical Nanosystems—NANOSFAR, Postgraduate Program in Pharmaceutical Sciences, Federal University of Piauí, Teresina, Piauí, Brazil

Rituparna Saha Department of Biotechnology, JIS University, Kolkata, West Bengal, India

Amaresh Kumar Sahoo Department of Applied Sciences, Indian Institute of Information Technology, Allahabad, India

Amedea B. Seabra Center for Natural and Human Sciences (CCNH), Federal University of ABC (UFABC), Santo André, SP, Brazil

Masoomeh Shams-Ghahfarokhi Department of Mycology, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

Vishal Singh Department of Applied Sciences, Indian Institute of Information Technology, Allahabad, India

Victória Soares Soeiro Laboratory of Biomaterials and Nanotechnology, University of Sorocaba, Sorocaba, São Paulo, Brazil

Paul B. Tchounwou CSET, Department of Biology, Jackson State University, Jackson, MS, USA

Fernanda Tomiotto-Pellissier Carlos Chagas Institute (ICC), Fiocruz, Curitiba, Paraná, Brazil

Arushi Verma Department of Applied Sciences, Indian Institute of Information Technology, Allahabad, India

Alka Yadav Department of Biotechnology, Sant Gadge Baba Amravati University, Amravati, Maharashtra, India

Mohd Yaseen Department of Pharmaceutical Sciences, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, India