

Advanced bactericidal coatings for long-term effective and safe uses in Health

Diego Mantovani, FBSE, FASM

Director, Lab Biomaterials and Bioengineering; Holder, Canada Research Chair Tier I; Full Professor of Biomaterials; School of Min-Met-Materials Eng.; Regenerative Medicine Division, CHU de Quebec Research Center; Laval University, Quebec city, Canada

Abstract

Over the last 50 years, biomaterials, prostheses and implants saved and prolonged the life of millions of humans around the globe. Today, nano-biotechnology, nanomaterials and surface modifications provides a new insight to the current problem of biomaterial complications, and even allows us to envisage strategies for the organ shortage. In this talk, creative strategies for designing advanced bactericidal coatings for health will be discussed. Based on plasma surface modification, a platform was developed for antibacterial coatings showing stable bactericidal properties over repeated cycles of cleaning, use or sterilization. However, a critical step for controlling Ag release depends on the mechanism in which it is oxidized to produce Ag⁺. In this presentation, we physically and chemically assess the differences between Ag and Ag_xO_y in a diamond-like carbon (DLC) matrix produced by low-vacuum plasma. Moreover, in order to effectively translate the proposed coating to a hospital setting, it must be proven that the coating is active against bacteria while remaining safe towards human cells. Thus, additionally to release kinetics study using MP-AES, we also present the biological characterization performed on human dermal fibroblasts by Alamar Blue Viability Assay and Immunofluorescence staining.

Biography

Holder of the Canada Research Chair in Biomaterials and Bioengineering for the Innovation in Surgery, professor at the Department of Materials Engineering at Laval University, senior scientist at the Division of Regenerative Medicine of the Research Center of the CHU de Québec, Diego Mantovani is a recognised specialist in biomaterials. At the frontier between engineering, medicine and biology, within his team, their works aim to improve the clinical performances of medical devices for functional replacement, and to envisage the next generations of



biomaterials to develop artificial organs enhancing the quality of the life of patients. He has authored more than 250 original articles, holds 4 patents, and presented more than 170 keynotes, invited and seminar lectures worldwide in the field of advanced materials for biomedical applications. In 2012, he was nominated Fellow of the International Union of Societies for Biomaterials Science & Engineering (FBSE), and in 2019 Fellow of the American Society for Materials Intl, (FASM) for his leadership and contribution to biomaterials for medical devices. He was Executive Co-Chair of the 10th World Biomaterials Congress 2016. He is advisor of three medical devices consortium in the Americas, Asia and Europe.