Assunta Borzacchiello

National Research Council of Italy
Italy

Polysaccharide-Based Biomaterials: From molecular design to therapeutic translation

Abstract:

Polysaccharides represent one of nature's most versatile classes of biopolymers, combining structural complexity, biofunctionality, and chemical tunability. Their intrinsic biocompatibility, hydration capacity, and receptor-mediated bioactivity make them ideal candidates for the design of advanced biomaterials and targeted delivery systems. This lecture will explore the path "from molecular design to therapeutic translation," focusing on natural polysaccharides such as hyaluronan, chitosan, and alginate as functional building blocks for biomedical technologies. Through chemical modification and physical structuring—ranging from hydrogels to nanoparticles—these polymers can be engineered to achieve precise control over viscoelasticity, degradation, and bio-interactivity. Integrating rheological and microfluidic analyses, our research elucidates how polysaccharide organization governs cell–matrix crosstalk and drug transport within complex biological environments. By exploiting receptor-specific interactions (e.g., CD44 for HA-based systems) and multiscale material design, we aim to bridge the gap between fundamental polymer science and precision therapeutics. This keynote highlights recent advances in the development of polysaccharide-based platforms for regenerative medicine and nanomedicine, emphasizing how molecular insights and materials engineering converge to enable the next generation of bioinspired therapeutic systems.

Biography

Assunta Borzacchiello earned her M.S. degree in Chemical Engineering cum laude and the PhD degree in Material Technologies (1998) at University of Naples "Federico II." She was a Research Scientist at QMWC University of London (1996) and at University of Connecticut, USA (1997). She was Professor of Biomaterials at the University of Naples "Federico II" from 2002 to 2011. She was a visiting professor at McGill University, Canada (2018-2019). She is currently the Research Director at IPCB-National Research Council of Italy. She is the author of about 120 peer-reviewed papers (H-index 40). The Borzacchiello research activities focus on Biomimetic materials and natural polymers for biomedical applications and nanomedicine, microfluidic techniques, rheology and microrheology of complex fluids.