Fabrication and evaluation of nanofibrous biomaterials for biomedical applications

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Bacterial nanocellulose (BC), a natural three-dimensional nano-biomaterial fabricated via microbial fermentation with a primary fiber diameter of ~14nm, distinguishes itself from cellulose derived from other sources mainly by its purity, crystallinity, mechanical strength, three dimensionalities, high water holding capacity, and good biocompatibility. BC has found many biomedical applications such as bioscaffolds in the repair and regeneration of skin, blood vessel, cornea, heart valve prosthesis, urethra, nerve, bone, cartilage and knee menisci, as well as for the delivery of drugs, hormones and proteins. A combined method to control the thickness of the BC film was a part of my research. BC was biosynthesized by gluconacetobacter xylinus (ATCC53582) and modified by chitosan. The nano-composites of BC and chitosan form a cohesive gel structure, and the cell toxicity of the composite is excellent. A novel strain could reduce the cost of BC production and accelerate the manufacturing process of wound dressings and antimicrobial wound healing products from this novel strain. With different oxygen availability and different biofabrication parameters, microbes can produce BC in forms of hydrogel and that can be processed to different forms as film, tube, sphere and nanocrystal. Incorporation of reactive functional groups and nanosilver particles into the polymer backbone via heterogeneous surface reactions can be used as delivery platforms from biosynthesized nanofibers using microbes to synthesize nanofibers using electrospinning. My focuses aim to heal damaged skin tissues and can also applied in other fields in tissue engineering and nanomedicine.

Speaker Biography

Lina Fu received her Ph.D. degree in Microbiology from Department of Biomedical Engineering, Huazhong University of Science and Technology, China. Upon the completion of MITACS Accelerate Internships and Postdoctoral Fellow in Western University and Axcelon Biopolymer Corporation, Canada, she started doing the postdoctoral research in Mary & Dick Holland Regenerative Medicine Program, University of Nebraska Medical Center, USA. Her work resulted in 5 peer-reviewed publications, 2 book chapters and 1 issued innovation patent and has been cited over 300 times since 2012. She was awarded the MITACS Accelerate Awards from 2014 to 2016. She serves as the reviewers for Advanced Functional Materials, Journal of Materials Chemistry A, Nanoscale, Chemical Communications, Acta Biomaterialia, Biofabrication, Oncotarget and Carbohydrate Polymers. She is also a member of professional scientific organizations including BMES, CBS, ACS and RSC. Fu has had more than ten years' experience in biomaterials and polymers, in terms of hydrogel, electrospun fibers, film, sponge, 3D printed materials, elastomer, microspheres and nanoparticles, etc. Her research is focused on engineering bacterial nanocellulose based materials and the use of a combination of cells/tissues, as well as suitable biochemical and physical cues to restore, maintain, or improve biological functions of damaged/diseased tissues or organs.

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