Hanin Bashir, J Biotechnol Biomater 2019, Volume 9
DOI: 10.4172/2155-952X-C1-113

4th Annual Conference and Expo on **Biomaterials**

February 25-26, 2019 | London, UK

Antimicrobial nano-fiber structures development to rejuvenate injured dura mater in brain surgery

Hanin Bashir
Nottingham Trent University, UK

Statement of the Problem: Nosocomial pathogens such as Staphylococcus epidermidis, Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa have been linked to surgical site infections. Inefficiency of surgical technique of the brain or spinal cord could greatly damage the duramater layer of the meninges. Hence, with it being non-regenerative in nature and with continued unsuccessful attempts to produce a well-maintained substitute, biomaterials incorporated with antimicrobials are the novel focus now. Silver salts have shown no harm when inserted in vitro and are emerging in many medical antimicrobial applications. Despite few scaffolds being proposed, a biomaterial with smooth integration and optimal properties has not yet been confirmed.

Aim: The purpose of this project is to attempt to close this gap by synthesizing polyacrylonitrile nanofibers, using the electrospinning technique and dip-coating them in polyethylene glycole solutions with dissolved silver acetate, behenate or citrate in hopes of inducing antimicrobial properties and creating optimal structures for such applications.

Methodology & Theoretical Orientation: Nanofibers were synthesized and tested using scanning electron microscopy. Also, antimicrobial efficacy assays, well diffusion assays and time kill assays were done to test the minimal concentration of each of the silver salts required to inhibit the 5 nosocomial pathogens S. aureus, S. epidermidis, E. coli K10, E. coli 10418 and P. aeruginosa.

Findings: The optimum minimum inhibitory concentration for the three silvers was found to be 0.8%. Both silver acetate and citrate at 0.8% showed potent antimicrobial activity; however, silver acetate coated nanofibers were the most potent amongst the three salts. Of the pathogens tested, gram-positive bacteria were proved, using CFU/ml viable count, to be most resistant to both silver salts despite efficient antimicrobial activity against them at 0.8%.

Conclusion & Significance: Based on these initial, yet interesting findings, future directions would be finding most appropriate scaffold sizes and diameters through varying flow rates and asking surgeons about biocompatibility, size of an optimum scaffold and easiness or best way of surgical insertion. Lastly, non-medical aseptic applications could be considered for testing on other microorganisms thus furthering experimentation with scaffolds.

Recent Publications:

1. Alamri A, El Newehy M and Al Deyab S (2012) Biocidal polymers: synthesis and antimicrobial properties of benzaldehyde derivatives immobilized onto amine-terminated polyacrylonitrile. Chemistry Central Journal 6(1):111.
2. Călina D et al. (2016) Antimicrobial resistance development following surgical site infections. Molecular Medicine Reports 15(2):681-688.
3. Dolina J, Jiříček T and Lederer T (2013) Membrane modification with nanofiber structures containing silver. Industrial & Engineering Chemistry Research 52(39):13971-13978.
4. Gopiraman M et al. (2016) Silver coated anionic cellulose nanofiber composites for an efficient antimicrobial activity. Carbohydrate Polymers 149:51-59.

Biography

Eunjin An received her bachelor's degree in Department of Chemistry. Also, she received her Master´s degree in Department of Pharmacy from Duksung Women's University, Republic of Korea.

haninmb@outlook.com