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Development and characterization of novel lyophilized wound dressings for the treatment of hard to heal wounds

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Wound healing is a highly regulated and complex process that is critical for maintenance of the barrier function of skin. Many mediators, disease statuses and exogenous factors can affect the cascade of events involved in wound healing, resulting in chronic non- healing wounds that not only causes discomfort to patients but drains the medical system of an enormous amount of resources. In past years various dressings have been developed using natural or synthetic materials to re-establish skins native properties and structure. Despite the enormous number of dressings, none of them has accomplished this objective. Taking this into account, this project aimed to develop characterise and optimise lyophilised novel wound dressing based on fish skin components for the treatment of hard to heal wounds. Wafers were prepared from gels containing collagen combined with hyaluronic acid and pluronic combined with hyaluronic acid in different ratios (1-3% total polymer weight). Gels were freeze dried using an optimised cycle incorporating an annealing step that was acquired by differential scanning calorimetry. Wafers were characterised for surface morphology (scanning electron microscopy - SEM), mechanical strength and adhesion (texture analysis), exudate handling properties; (porosity, swelling, water absorption, equilibrium water content, evaporative water loss and water vapour transmission). SEM investigations revealed that the annealed wafers were highly porous with large uniform and circular shaped pores. Further, pore size affected morphologies and functional characteristics such as hardness, adhesion, and exudate handling properties. In general as the concentration of collagen increased the wafers became very brittle which made it hard to handle. Blend formation with non-degradable hydrophilic polymers or crosslinking with potentially toxic compounds can help overcome these limitations. Although crosslinking may enhance the mechanical stability, the bio-functionality can be irreversibly altered. For this reason, development of collagen-pluronic127-hyaluronic acid was attempted.

Speaker Biography

Meena Afzali is a MPhil/PhD student at the University of Greenwich. She completed her Bachelor of Science with a First Class Honours following an approved Honours programme in Pharmaceutical Sciences at the University of Greenwich in 2015. She was awarded the EDE & Ravenscroft prize for Best Project Performance as well as Nguyen prize.

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