

IT Tralee Masters by Research Programme Details

Title of Project: Marine Polysaccharides for Skin Health (SkinCult)

Name of Principle Supervisor: Dr. Joanna Tierney

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Brief Biography of Principle Supervisor: Dr. Tierney has specific expertise in skin cell health research in the context of cosmetic product support. Her research experience encompasses the fields of cell biology, immunology, infection and disease with applications in biopharmaceutical, medicine and veterinary sciences and she has completed a number of postdoctoral positions both in academia and industry. She is a Principal Investigator with Shannon Applied Biotechnology Centre on several applied research projects for industry, has a wide ranging funding portfolio (Enterprise Ireland, European Union, and Science Foundation Ireland) and currently supervises students to Masters and PhD level. Relevant to this project, her wide ranging experience in mammalian cell culture applications for SMEs including current projects on skin cell analysis of skincare formulations for cosmetic companies.

Recent Publications:

- Islam N, Whitehouse M, Mehendale S, Hall M, Tierney J, O'Connell E, Blom A, Bannister G, Hinde J, Ceredig R, Bradley BA (2014). Post-traumatic immunosuppression is reversed by anti-coagulated salvaged blood transfusion: deductions from studying immune status after knee arthroplasty. Clin Exp Immunol. Aug;177(2):509-20.
- Islam N, Whitehouse M, Tierney JB, Mehendale S, Hall M, Blom A, Bannister G, Ceredig R & Bradley B (2012). Biomarkers for post-traumatic immunosuppression. Network for the Advancement of Transfusion Alternatives, Copenhagen, Denmark.
- Islam N, Whitehouse M, Tierney JB, Mehendale S, Hall M, Blom, A, Bannister G, Ceredig R & Bradley B (2011). Post-traumatic immunosuppression syndrome and its reversal by salvaged blood transfusion. British Society for Immunology, Liverpool, UK.
- McCarron C & Tierney JB (2011). Metabolic characterisation of macrophage activation by phenotype microarrays. Irish Society for Immunology Galway, Ireland
- Keating P, O'Sullivan D, Tierney JB, Kenwright D, Miromoeini S, Mawasse L, Brombacher F & La Flamme AC (2009). Protection from EAE by IL-4Ralpha (-/-) macrophages depends upon T regulatory cell involvement. Immunol Cell Biol. 87 (7) : 534-45

Research Project Abstract

Skin is the largest organ in the body and is covered by a dynamic group of beneficial bacteria which can change over time under the influence of host and environmental factors such as the use of cosmetics, soaps and hygienic products. Upset to this bacteria population is apparent in skin disorders as clinical improvement is most often seen with antimicrobial treatment. This project aims to evaluate the role of marine derived extracts to support commensal skin microbiota and enhance skin inherent defence.

Research Context (Technical Merit & Impact)

Over the last decade attention has turned to the role of microbiota found on skin and how this relationship influences host health. The skin is the body's largest organ, colonised by a diverse population of microorganisms which is mainly commensal to the host unless disruptions in this balance occur which can result in skin disorders or infections. The structure of skin lends itself to inhabitation by multiple microorganisms in distinct habitats determined by skin thickness, folds, hair follicle and gland density. Skin is composed of three primary layers, the epidermis, dermis, and hypodermis. Within each layer are mixtures of unique cells that provide skin with structure and function. The skin also acts as an immunological barrier with immune response vital in wounds and infection and there is constant interplay between skin cells, immune cells and the skins' microbiota. Cosmetics, soaps, hygienic products and moisturisers are potential factors contributing to the variation of skin microbiota. These products alter the conditions of the skin barrier but their effects on skin microbiota remain unclear. Biologicals that possess the capacity to maintain and restore the microbiota of the skin in different ways as topical applications of beneficial bacteria have been shown to have a direct effect at the site of application by enhancing skin natural defence barriers. This project seeks to evaluate the role of marine derived extracts to support commensal skin bacteria which can benefit cutaneous immune responses.

Research Methodology

Research Location:

The research programme will be based in IT Tralee.

Research objectives:

- Evaluate whether marine derived extracts can support beneficial skin microorganisms and deter overpopulation of pathogenic microorganisms.
- Investigate whether marine extracts can influence the skin immune response through interplay between skin microbiota and skin cells.
- Determine if marine extracts can influence and support the skin barrier whose dysfunction is apparent in most skin ailments.

Discipline-specific training:

- Knowledge of cellular biology and cellular processes in skin cell types which underlie health care.
- Understanding of cell interactions within skin and the different cell modelling used in cosmetic testing methods.
- Knowledge of the factors which influence bacterial metabolic process.

- Sourcing naturally derived biological agents that can modulate infection and inflammation processes.
- Factors that envelope skin barrier dysregulation.
- Regulatory network separating skin care health and cosmetic products.

Other Core training benefits:

- Good Laboratory Practice in class II laboratory environment with health and biosafety regulations set to international best practice.
- Cell culture: Skin cell culture, cryopreservation and cell proliferation assays.
- Biochemical analysis: enzyme assays, protein assays, protein purification, spectrophotometry, ELISA, Flow cytometry, DNA, RNA extraction, cDNA synthesis, PCR, real time PCR.

