WWIEM SUMMER RESEARCH PROGRAMME 2023

MBRU جامعة محمد بن راشد للطب و العلوم الصحية MOHAMMED BIN RASHID UNIVERSITY OF MEDICINE AND HEALTH SCIENCES

QUEEN'S UNIVERSITY BELFAST | WELLCOME-WOLFSON INSTITUTE FOR EXPERIMENTAL MEDICINE

Programme Coordinator: Dr. Derek Brazil

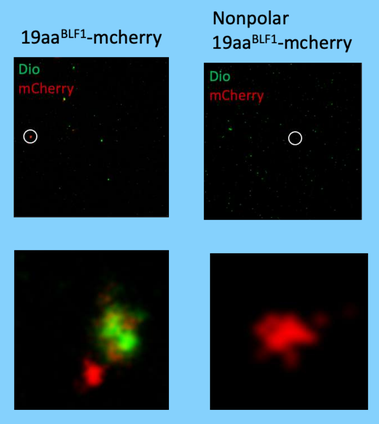
MICROBIOLOGY AND INFECTIOUS DISEASES

Shahad Alshamsi- Supervisors: Prof. Miguel A. Valvano, Dr. Julia V. Monjarás Feria

Research Question: Is the amphipathic property of the α-helix DNA, part of bacterial toxin BLF1, required for its secretory mechanisms?

- My research focused on the mechanism of secretion of the bacterial toxin Burkholderia Lethal Factor 1 through Outer Membrane Vesicles (OMVs).
- I constructed a non-polar mutant of the toxin through PCR-based mutagenesis and compared its ability to interact with the membrane to a wild-type BLF1
- I subsequently conducted a series of experiments to compare this mutant and the wild-type BLF1, particularly assessing their membrane interaction and secretion capabilities. Results of the experiments such as Western blotting and Confocal microscopy confirm that the amphipathic property is required for the interaction of the α-helix to the membrane and the secretion of the toxin.

Other laboratory contributions: Galleria mellonella infection model (to observe the activity of the toxin in an in-vivo model), Electron Microscopy (to visualize the outer membrane vesicles)



Confocal microscopy shows fluorescence of the vesicle membrane protein DiO(green) and the toxin protein mCherry (red). In the case of the wild type α-helix, colocalization is observed; however, with the mutant non-polar α-helix, we can see the toxin as an individual entity.

TGF-B: TRIGGERING FACTOR OF FIBROSIS

Mira Alredha- Supervisors: Prof. David Grieve, Dr Chris Watson

This study aimed to investigate the role of TGF-β in human cardiac fibroblasts and its potential connection to cardiac fibrosis.

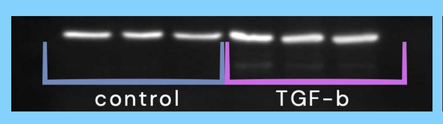
Human cardiac fibroblasts were cultured and then divided into two groups: a control group and a group treated with TGF-β. The cells were placed in separate 6-well plates to compare the effects of TGF-β on α-SMA expression. Both gene expression analysis and Western blotting were conducted to assess these effects.

The results showed that the group treated with TGF-β exhibited significant overexpression of the α-SMA gene in comparison to the control group. This elevated gene expression supports the notion that TGF-β contributes to fibrosis by stimulating the production of α-SMA.

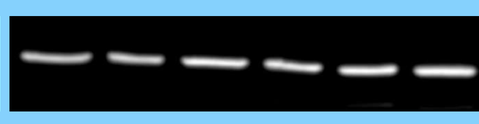
The findings from the Western blot analysis aligned with the gene expression results. The α-SMA protein bands in the cells treated with TGF-β were visibly denser and thicker than those in the control group. This observation strengthens the hypothesis that TGF-β drives the expression of α-SMA, thereby intensifying the fibrotic response.

In conclusion, this study suggests that TGF-β exacerbates the fibrotic process in human cardiac fibroblasts by enhancing the expression of α-SMA. This indicates that TGF-β is associated with cardiomyopathies.

Western blot results:

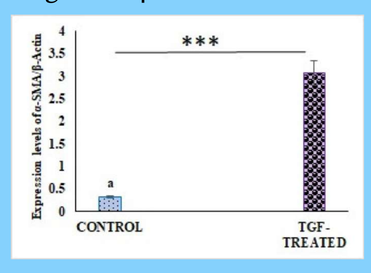


α-SMA



α-Tubulin (normalizing antibody)

gene expression results:



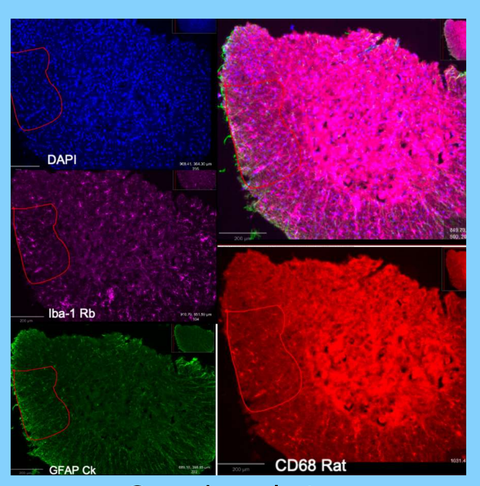
IMMUNOLOGY AND MICROBES

Hafeeza Jummakhan- Supervisors: Dr Yvonne Dombrowski

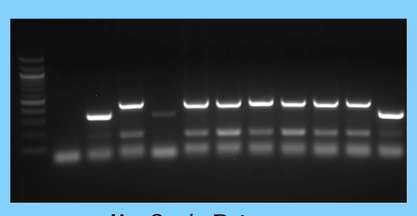
Research Question: Role of AIM2 inflammasomes and their products on Multiple Sclerosis

- Our research aimed to identify the role of AIM2 inflammasome & its' product cytokines, IL18 & IL1B on the initiation & progression of Multiple Sclerosis. I particularly analysed the impact of the IL-18 cytokine.
- We utilized healthy spinal cord tissue from wild-type mice pups & performed indirect immunohistochemistry staining for GFAP indicative of astrocytes, CD-68 for activated macrophages, Iba-1 indicative of microglial surface marker and DAPI for all nucleated cells.
- After capturing the stains using a DM5500 microscope, using the QuPath software I analysed the cell counts of the stained cells and plotted them to be able to provide a baseline to compare and contrast with counts of cells in experiments incooperating lesion pups in the future.

Other laboratory contributions: Mycoplasma testing to identify any contamination of our mice tissue using PCR techniques and gel electrophoresis & Genotyping to confirm the genotypes of the mice.



Qupath analysis



IL18 -/- Primers

OUR EXPERIENCE

The opportunity to engage in lab research at Queen's University, Belfast, this summer was truly an unforgettable experience!

Along with our research projects, we were fortunate to be placed within the neonatal and geriatric units of two Belfast hospitals. This experience provided us with hands-on patient interaction and a valuable opportunity to witness the workings of the NHS.

Extra-curricular activities:

Royal Victoria and Mater Hospital visits, Titanic Museum Trip,
and a trip to the Causeway Coast!