A New DNA Vaccine for Prostate Cancer

The use of a novel technology platform to create a DNA vaccine for Prostate Cancer

This project will fund a PhD student to work for three years on research that focuses on the treatment of advanced prostate cancer. This kind of prostate cancer is very difficult to treat and new treatment options are needed. The researchers aim to develop a DNA vaccine that can be applied as a patch onto the skin and will stimulate the body’s own immune response to fight the cancer.

Cancerous prostate tissue expresses specific protein markers on the cell surface that can be targeted for therapy. The PhD project proposed by Dr McCarthy will develop a vaccine to deliver specific sequences of DNA, which produce protein sequences mimicking these prostate cancer specific markers. This stimulates the body to generate an immune response against the ‘foreign’ proteins, synthesised from the DNA vaccine. Since the immune cells cannot tell the difference between the ‘foreign’ protein, and the protein expressed by the cancer cells, the immune system also attacks the cancerous tissue.

Other DNA vaccines have not been as effective as expected because the DNA can become damaged or not reach the correct part of the cell. This proposed project offers advantages over other DNA vaccine therapies, because it uses short protein sequences called peptides to protect the DNA and improve delivery into the cell. Additionally, the vaccine will be given using micro-needles applied as a patch onto the skin so delivery of the vaccine will be rapid and painless for the patient.

The scientists will develop the vaccine in a series of steps: first, they will insert the DNA, wrapped in the protective peptide into the micro-needles and make sure that it is stable. Next, the researchers will use cell lines grown in the lab to confirm that the DNA can enter the right part of the cell and activate the immune system. After this, the researchers will use a model system to find out what dose of vaccine stimulates the strongest immune response, and measure what effect the vaccine has on tumour size.

As well as providing a new way to treat advanced prostate cancer, it is possible that this DNA vaccine could prevent the development of cancer in the first place. The scientists will also test this important idea in this project.