

Update on the Tom Walker PhD Studentship in Acute Myeloid Leukaemia

The scientist appointed to the Tom Walker PhD studentship is Theo Morin, who is 25 and comes from a small city near the west coast of France called La Roche-sur-Yon. After completing his MSc in Life Sciences in Canada, Theo moved to Wales and took a research assistant role in Professor Andrew Sewell's T-cell modulation group in the Division of Infection and Immunity at Cardiff University. Professor Sewell's group undertakes projects on infection, transplant tolerance, vaccination, cancer immunotherapy and autoimmune disease (more details can be found at <http://www.tcells.org/>). Cancer Research Wales ran the competition for the studentship and in 2020 awarded this group the grant that will enable Theo to undertake three years of research that will lead to a PhD.

Theo's research will look at how the immune system can be trained to attack the cancerous myeloid white blood cells that cause acute myeloid leukaemia (AML). During the lockdown in 2020, before his PhD officially started, Theo spent the summer getting to grips with the science and how this may be applied to form the basis of a future treatment.

The human immune system is made up of many types of cells each with its own particular role. Theo's research will focus on a type of immune cell called *killer T-cells*, which travel around the body in the blood stream and attack cells they encounter that appear to be infected with a virus, bacteria or fungi or that look significantly different from normal cells – which some cancerous cells do. In doing so, killer T-cells help keep the body healthy and free from disease. In order to do this, T-cells have on their surface groups of proteins called *T-cell receptors* that match features found on the surface of infected and cancerous cells.

Unfortunately, regular killer T-cells often don't recognise cancerous cells because they don't have T-cell receptors that match with any of the cancerous cells' surface features. However regular T-cells can be taken from a patient, and genetically engineered so that they do have the required receptors to attach to particular cancerous cells, and then re-infused into the patient. The first challenge is to work out what T-cell receptors are needed to attack a specific type of cancerous cells. To do this, Theo and his colleagues will use white blood cells taken from patients that have undergone successful immunotherapy and try to find killer T-cells that already have the ability to identify and attack AML cells. Following this Theo will aim to identify the specific T-cell receptors that are involved in attacking AML cells, and then engineer regular T-cells so that they also have these T-cell receptors. He will test these engineered T-cells on cancerous cells taken from people suffering with AML, to find what is the optimal set of T-cell receptors to attack AML cells. This could provide a route to new treatments for AML, as well as helping create new tests for it.

Similar research has already been carried out by Professor Sewell's group on other types of cancer, and so Theo will have the experience of the other members of the group to draw on. As this type of therapy draws on the power of the immune system that occurs naturally in the body, it is hoped any eventual treatment that is developed using this approach will have limited side effects.

Theo, who provided a lot of the information we used to write this update, has promised to keep us posted as the research develops, and we hope you agree that it is a very exciting project. It was only made possible by all the endeavours and kind generosity of the thousands of people who have raised and donated funds in memory of Tom, including the community associated with the Haberdashers' Monmouth Schools. We think it is a fine legacy for Tom.

Debbie, Tim, Holly and Emily Walker

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