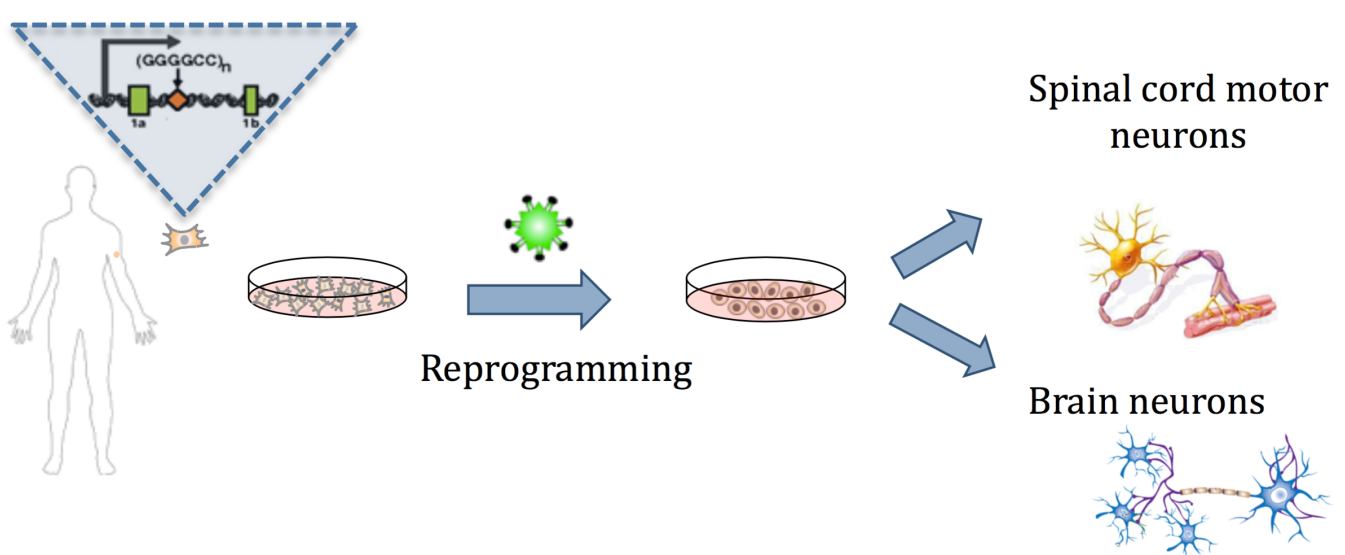


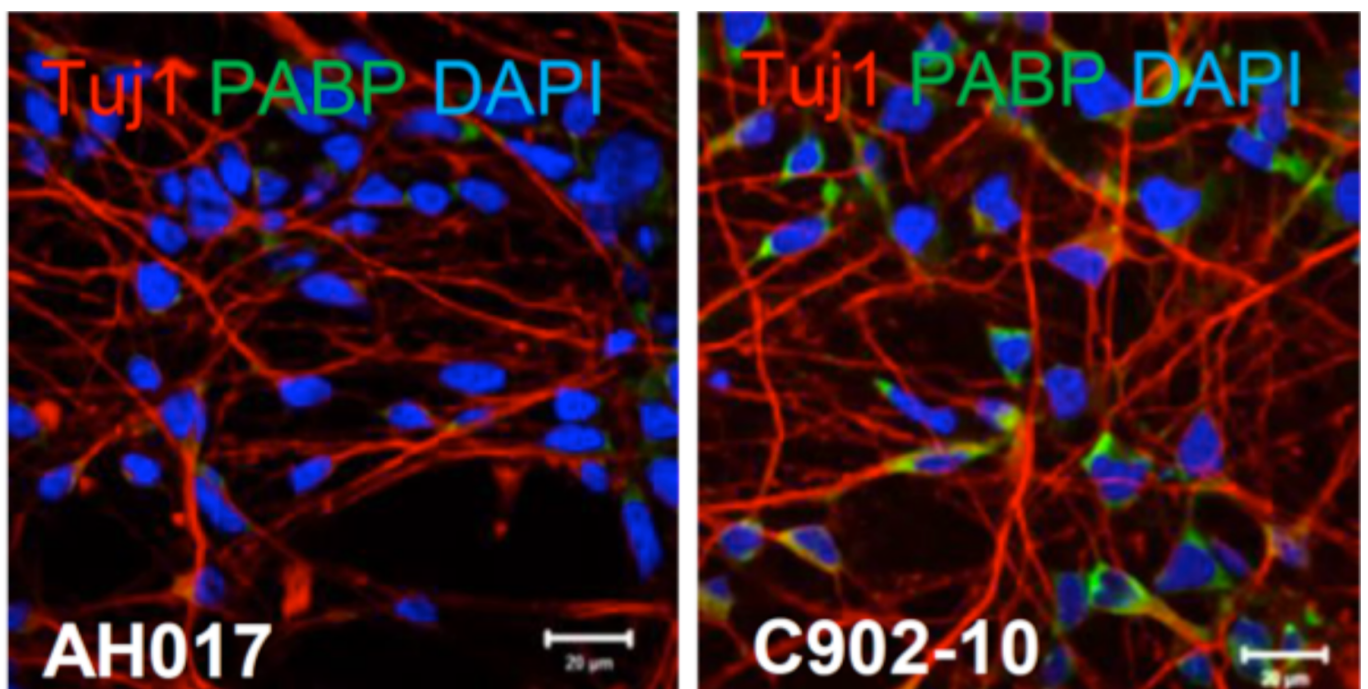
STEM CELL RESEARCH AT OXFORD UNIVERSITY TO IDENTIFY NEW TREATMENTS FOR MOTOR NEURON DISEASE

Motor neuron disease (also known as amyotrophic lateral sclerosis, ALS) occurs when the cells in the brain and spinal cord that control our movements undergo degeneration. This causes progressive and incurable weakness leading to problems with mobility, speech and swallowing and breathing. Although there is a lot of individual variation in how the disease behaves, this means that most people die of MND within 5 years of onset. The causes of MND are very complex, but one of the many reasons MND is difficult to cure is that it has been very difficult to make realistic models to use in the laboratory to understand what is going wrong in the motor neurons, the cells which are directly affected. Advances in stem cell research have enabled us to make new models which we believe will greatly improve our ability to find new treatments.

Stem cells have the capacity to self-renew and produce new cells. We can take a tiny piece of skin from a patient with MND and feed it chemicals which turn the skin cells into stem cells which are pluripotent, meaning that they have the capacity to become any tissue in the body. So if we use the right chemical messages a skin cell can become an induced pluripotent stem cell (iPSC) which can become a motor neuron.



Over the last 3 years we have used these techniques to successfully model MND in the laboratory. Cells directly derived from patients from our clinic show the key features of the disease.



Motor neurons growing in the laboratory. The green fluorescent staining in the right hand panel is a sign that motor neurons from a patient with MND are under stress compared with cells from a person without the disease.

Remarkably, we have also been able to use a new technique called **genome editing** to remove the genetic mutation responsible for MND in this particular case, to correct the cellular stress and prevent the cells from dying.

In our **current research**, we now want to use these cells to:

- 1) Screen for drugs which improve the health of the cells and might therefore be treatments for MND.
- 2) Experiment with ways to remove genetic mutations using genome editing to explore the possibility that these techniques can be used to treat people with MND.
- 3) Compare the cells in great detail to look for the earliest changes in the cells which offer the best targets for treatment.

Stem cell research is extremely expensive and requires special facilities as the cells are very fragile. Due to the generosity of our supporters we have been able to develop an internationally competitive program of research in Oxford. We urgently need more resources to continue this important work.