'Bionic' nerve to bring damanged limbs and organs back to life

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University of Manchester researchers have transformed fat tissue stem cells into nerve cells — and now plan to develop an artificial nerve that will bring damaged limbs and organs back to life.

In a study published in October's *Experimental Neurology*, Dr Paul Kingham and his team at the UK Centre for Tissue Regeneration (UKCTR) isolated the stem cells from the fat tissue of adult animals and differentiated them into nerve cells to be used for repair and regeneration of injured nerves. They are now about to start a trial extracting stem cells from fat tissue of volunteer adult patients, in order to compare in the laboratory human and animal stem cells.

Following that, they will develop an artificial nerve constructed from a biodegradable polymer to transplant the differentiated stem cells. The biomaterial will be rolled up into a tube-like structure and inserted between the two ends of the cut nerve so that the regrowing nerve fibre can go through it from one end to the other.

This 'bionic' nerve could also be used in people who have suffered trauma injuries to their limbs or organs, cancer patients whose tumour surgery has affected a nearby nerve trunk and people who have had organ transplants.

With a clinical trial on the biomaterial about to be completed, the researchers hope the treatment could be ready for use in four or five years.

Dr Kingham said: "The differentiated stem cells have great potential for future clinical use, initially for treatment of patients with traumatic injuries of nerves in the arms and legs.

"This work will also help to develop a similar surgical approach for organ transplant, to give full functional recuperation to the transplanted tissue.

"Furthermore, the technique of artificial nerve grafting could also be applicable when tumour mass has involved a nearby nerve trunk, which consequently has to be excised together with the tumour, such as the removal of a prostate tumour where damage to the nerve leads to male impotence."

Director of the UKCTR, Professor Giorgio Terenghi said: "This new research is a very exciting development with many future clinical applications that will improve the lives of many different types of patients and therefore many, many people.

"The frequency of nerve injury is one in every 1,000 of the population — or 50,000 cases in the UK — every year.

"The current repair method — a patient donating their own nerve graft to span the gap at the injury site — is far from optimal because of the poor functional outcome, the extra damage and the possibility of forming scars and tumours at the donor site. Tissue engineering using a combination of biomaterials and cell-based therapies, while at an early stage, promises a great improvement on that. Artificial nerve guides provide mechanical support, protect the re-growing nerve and contain growth factor and molecules favourable to regeneration. The patient will not be able to tell that they had ever 'lost' their limb and will be able carry on exactly as they did before."

He added: "The facilities available at the UKCTR have been developed jointly by the University of Manchester and the North West Development Agency, with exactly this aim — to provide the transition from experimental research to new clinical treatment."

Source: University of Manchester