

Meeting report – 'Tissue Engineering in the Auditory System', June 2<sup>nd</sup> 2011, The Royal Society, London.

It is not often that one is presented with the opportunity of seeing the stars in one's research area gathered together for a single day's conference. It is yet more unusual for participants to circumnavigate the globe to give a half-hour presentation, but such was the draw and the prestige of 'Tissue Engineering in the Auditory System' that the great and the good of auditory research assembled at the Royal Society on a summer's day in London to share ideas at the cutting edge of the research field.

As it stands currently, there are various options for prosthetic devices available to those with certain types of hearing loss, broadly being hearing aids and cochlear implants. However, it remains a great conceptual and technical challenge to build a 'biological' cochlea replacement and many of the day's participants work on different aspects of this conundrum. The first speaker of the day, Robin Ali, brought insights from his own sensory experimental model, the retina, to demonstrate how the dream of regenerative therapy using stem cells may be several steps closer to becoming a reality, with chastening and informative lessons about picking your cell stage for transplantation very carefully.

Before we can attempt to build a cochlea *de novo*, we must first understand what it looks like and how it behaves in 'real life' situations. Helge Rask-Andersen provided us with some marvellous images of the structure of the human cochlea, a rare treat for those of us more accustomed to seeing the ear in our experimental animals. He gave us some tantalising hints regarding inter-species differences between humans and other mammals, giving those of us who work on auditory neuropathy serious food for thought.

Meanwhile, Andrew Forge took us through his work on the potential for regeneration in the damaged 'hearing organ', the organ of Corti, in the cochlea. Alas, the complex nature of epithelial remodelling and the varied responses to injury in different inbred strains of mouse (imagine how this would extrapolate to an outbred human population!) suggest that this could be a very difficult task to undertake. Consequently, it might be an easier approach to support and regrow the damaged cochlear nerve, with the concomitant benefit of widening the patient population for whom a cochlear implant is of therapeutic use – at the moment, the technology behind the 'bionic ear' relies on a functioning connection between the ear and the brain, which is often lacking following long-term degeneration or might be absent from birth. Robert Shepherd's pioneering work on mammalian models for cochlear implantation is well-known, so it was a pleasure to hear him speak on the use of an implantable supply of neurotrophic factors, proteins which 'feed' the spiral ganglion neurons, to help prevent neural degeneration. Juichi Ito's presentation took this idea a step further, with his work showing exciting clinical trial data on the potential protective effects of providing the trophic factor IGF-1 to patients with sudden hearing loss. The nanoparticles being used in both Robert Shepherd's work and that of Alessandro Martini confirm the idea that nanotechnology is no longer in the realms of science fiction and is likely to be a critical next-stage in *in vivo*, long-term drug delivery to the inner ear, circumventing the risks associated with an implantable pump/cannula system.

But what of the auditory nerve itself? Marcelo Rivolta's data provoked an involuntary gasp from the audience when he showed the restoration of hearing in deafened gerbils by

the transplantation of human auditory neural progenitors, truly evidence of how far the stem cell field has come and how stem cell technology may fulfil its much-vaunted promise. Finally, Andrej Kral's presentation gave some interesting observations on the question of 'what happens next?' His work on the modulation of central pathways after early deafening gave some startling insights into the developmental remodelling of the auditory cortex and how this may impinge on the acoustic stimuli perceived in patients with cochlear implants.

I would like to take this opportunity to thank the ESF for their generous financial support which enabled me to attend this meeting. I would also like to extend my thanks to the organisers, Marcelo Rivolta and Gerard O'Donoghue for their work in organising such a distinguished programme of talks and thought-provoking discussion.