Stem Cells and Skyscrapers: Gordon Research Conference in Hong Kong

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As a stem cell researcher at an aging institute, my interest is in the contribution of adult stem cells to age-related diseases and functional decline. At the 10th anniversary of Shinya Yamanaka's seminal paper on iPS cells, we now have a myriad of protocols to use iPS cells and differentiate them into different cell types and even tissue-like structures. However, most tissues already have resident stem cells that act continuously to provide a tissue with new cells, theoretically providing an eternal supply of young, healthy differentiated cells. Unfortunately, adult stem cell function declines steadily during aging. This not only leads to gradual organ dysfunction, but also to cancer: there is ample evidence that most solid tumors arise from adult stem cell lineages. Understanding tissue-resident stem cells, their niche and their function are therefore critical in understanding aging and age-related diseases such as cancer.

The Gordon Research Conference 'Tissue Niches and Resident Stem Cells in Adult Epithelia' focused exactly on this topic and combined data from different tissues and model organisms to create a diverse and exciting program. The Gordon Research Conferences organization decided to host this event in the bustling metropole of Hong Kong. The organizers Rongwen Xi (NIBS, Bejing, China) and Doina Tumbar (Cornell) really used this opportunity to create a very diverse portfolio of speakers and attendees from all over the globe.

The sessions were organized according to the different tissues in which adult stem cells are studied: from well-established fields, such as the skin and intestine, to more emerging fields such as stem cells in the ovary, salivary glands and oesophagus. There was also a strong delegation of people working on my tissue of choice: the Drosophila intestine. This adult stem cell model is genetically very amenable and is a great model in which to study the external signaling pathways as well as the intrinsic factors that control stem cell division and differentiation. Bruce Edgar (Huntsman Cancer Institute, Utah) presented a recent story on the role of the EGFR-pathway regulator Capicua in regulating the transcriptional program downstream of EGFR in the fly intestine. Co-organizer Rongwen Xi showed new and exciting data about lineage specification and lineage plasticity in the Drosophila intestinal stem cell lineage. Talks by Lucy O'Brien (Stanford) and Nozomi Nishimura (Cornell) demonstrated the possibilities of using live-imaging resident adult intestinal stem cells in mouse and Drosophila to answer fundamental questions on the stem cell niche and stem cell motility.

There were also numerous talks that translated basic research findings from adult stem cells into the clinic. As our basic understanding of the signals that control stem cell maintenance and proliferation increases, the community is getting better at growing these adult stem cells *in vitro* for regrafting into damaged tissues such as the skin and the retina. Prof. Michele de Luca (CMR Modena, Italy) highlighted advances in the use of potential of skin cell replacement therapies. Furthermore, Joana Neves (Jasper lab/Buck Institute)

and Jeff Mumm (Johns Hopkins) demonstrated that work in genetic model organisms such as Drosophila and zebrafish can quickly translate into cell therapies in mammalian species. In particular, Drosophila MANF was identified in a retinal damage screen in Drosophila and subsequently it was demonstrated that the immune modulation role of MANF is conserved in mice : manipulating MANF increases the success of functional engraftment of retinal cells in blind mice.

One of the overarching themes at this meeting and in the field of adult stem cells in general is the realisation that adult stem cell fate is not irreversibly committed in many tissues with adult stem cells. Tissues have quite flexible strategies for replacing dead and damaged cells upon damage or injury and these strategies might depend on different cell types than the stem cells that regulate normal tissue turnover. For instance, upon damage, differentiated cell types might adapt a stem-progenitor like fate and show multi-lineage potential again. This was also addressed by talks from Barry Stripp (Cedars Sinai) and Brigid Hogan (Duke University) and others on epithelial regeneration in the lung, a tissue that shows a remarkable diversity of stem cells and lineage commitment flexibility.

Apart from the scientific content, the Hong Kong University of Science and Technology (HKUST) provided an excellent location for doing science. The conference venue was a comfortable 50 meters away from the conference hotel (which was quite convenient during the monsoon season in southern China) and the GRC support staff and volunteers (mostly HKUST students) were very helpful. The free-time excursions to The Peak (the hill overlooking Hong Kong) and the boat-trip to the surrounding islands provided ample opportunity for networking and socializing. All in all: a highly productive meeting about stem cells between the skyscapers!