The International Conference on Tissue Science and Engineering 2012: News on Emerging Cell-Based Therapies?

Melanie L Hart, Jan K Maerz and Wilhelm K Aicher*

University of Tuebingen Hospital (UKT), Tuebingen Germany, Germany

In October 2012 the OMICS Group held an International Conference on Tissue Science and Engineering, and stem cells and biomaterials were or course among the hot topics. Here we review briefly current developments on emerging cellular therapies and point to some of the presentations of the OMICS conference related to stem cells.

The prototype of all stem cells is the pluripotent stem cell generated from the inner cell mass of a blastocyst. Such pluripotent cells are therefore called embryonic stem cells (ESC). Their artificial counterpart of ESC are the recombiantly induced pluripotent stem cells (iPSC) generated by overexpression of key factors required to maintain the transcriptome and epigenetics of a truly pluripotent cell: NANOG, OCT4 and SOX2 [1,2]. In addition, to increase the cloning efficacy, in some cases a growth-promoting factor such as MYC is employed, and to ensure sufficient telomer lengths for extended expansion of the cells the enzyme telomerase (TERT) is expressed as well. The pluripotent stem cells allow generation of all cell types and lineages of cells found in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells in an adult individual. They therefore inspired the field of regenerative medicine. Hope was high that iPSC will open new avenues to all cells

Another hot topic at the OMICS convention was of course biomaterials, and especially the modification of stiffness, elasticity, hydrophobicity, and structure of the scaffold. It has been shown that differentiation of stem cells not only depends on soluble signals such as growth factors, cytokines, hormones or low molecular weight components (e.g. nutrients, oxygen, radicals) [15], but also on the signals provided by the extracellular matrix or immediate pericellular environment [16, 17], and of course on the elasticity of the substratum [18] [19].

However, chronic inflammation confronts stem cells with an overdosis of cytokines, growth factors, and even nitric oxide radicals. This may contribute to malfunction of the stem cells and cause malignancies, as Dr. Mahin Khatabin (NIH, Bethesda, USA) explained at the OMICS conference. Unresolved chronic inflammation may tip the balance between tumoricidal or tumorigenic pathways, cell death (apoptosis) on one side, and wound healing or differentiation on the other side. Here controlling chronic inflammation seems the solution for the problem.

Biomaterials are important to maintain the phenotype of a cell, and keep the cells alive and in place for regeneration. Elastic, micro-porous and nano-surfaced hydrogels were instrumental for supporting microglia cells in neuronal repair in a spinal cord injury model, as Dr. Eugen P. Goldberg (Univ. of Florida, USA) pointed out. These nano-structured surfaces allowed cell-matrix binding, and the porous scaffold acted as reservoir for growth factors. Therefore, all players are in place: the cell and the fuel it needs to do the job.

Overall the OMICS meeting covered very interesting topics. It
offered great opportunities to contact experts from all over the globe. It was a success!

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