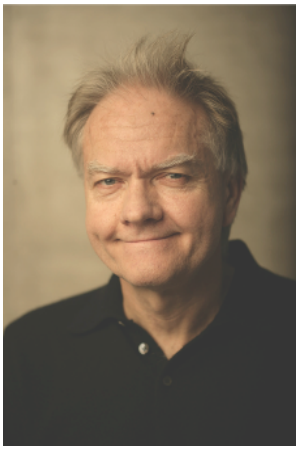
Manitoba Neuroscience Network Seminar Series

Friday, February 22nd, 2013 | 12:00 noon



Dr. Derek van der Kooy

Professor
Department of Molecular Genetics
University of Toronto

Topic: Where Brains Come From

Location: Regenerative Medicine Lecture Theatre (626 BMSB)

Derek van der Kooy served as Professor in the Department of Anatomy and Cell Biology at the University of Toronto from 1991 until 2002, when he became a Professor in the Department of Molecular Genetics. Derek received a M.Sc. in Psychology at the University of British Columbia, and a Ph.D in Anatomy, first at Erasmus University in the Netherlands, and finishing in the Department of Anatomy at the University of Toronto. Dr. van der Kooy gained postdoctoral research experience at Cambridge University in England and at the Salk Institute in California.

The van der Kooy lab works on various stem cell biology and developmental biology research projects; specifically, stem cells in organisms from Drosophila to humans. We produced the first report of stem cells in the adult mammalian eye, published in 2000 in Science. We also have isolated a rare stem cell from the adult mouse and human pancreas that can show extensive proliferation under defined conditions in vitro. Of interest to the lab is the lineage of neural stem cells from pluripotent embryonic stem cells, with relevance to the origin of the earliest neural stem cell in the developing embryo.

ABSTRACT: One of the few neurobiological facts not anticipated by Cajal is the existence of neural stem cells in the embryonic and adult mammalian brain that can produce new neurons in the adult brain (new neurons first shown by Altman). The earliest mammalian neural stem cells differentiate from pluripotent embryonic stem cells. These primitive neural stem cells emerge in response to LIF and have a wider non-neural phenotypic potential than later neural stem cells. By embryonic day 8.5 in mouse, true FGF2 dependent neural stem cells emerge and by embryonic day 14 they have given rise to copies of themselves and to EGF dependent neural stem cells. The separate FGF2 and EGF dependent neural stem cells increase greatly in numbers later in neurogenesis, but by E14 appear identical to adult neural stem cells. The adult mammalian neural stem cells are mostly quiescent, dividing asymmetrically only once every few weeks. Mouse embryonic stem (ES) cells cultured in low cell density, completely defined media adopt a neural identity. Using a clonal colony-forming assay, we identify the novel primitive neural stem cell stage as a component of neural lineage specification (this cell is similar to the one we isolate from the early embryo), which is negatively regulated by TGFb-related signaling. These results are consistent with a default mechanism for neural fate specification. Primitive neural stem cells are formed directly from single ES cells in a LIF-dependent manner, express multiple neural precursor markers and give rise to neurons and glia. Moreover, in vivo mouse chimera experiments reveal that these primitive ES-derived neural stem cells have a broad range of neural and non-neural lineage potential. These results support a model whereby definitive neural stem cell formation is preceded by a primitive neural stem cell stage during neural lineage commitment. Most recently, we have found that the LIF-dependent, primitive neural stem cells persist in adult organisms and can repopulate a depleted definitive neural stem cell pool in the adult.

For more information, contact the MNN Office at
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Presented in co-operation with University of Manitoba Clinical Neuroscience Rounds

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