Universität Basel

Research Project

Mouse and human stern cells: Control of self-renewal and neural differentiation (Sinergia)

Third-party funded project

Project title Mouse and human stern cells: Control of self-renewal and neural differentiation (Sinergia)
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Departement Biozentrum / Pharmacology/Neurobiology (Barde)
Department
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Mouse and human stem cells: Control of self-renewal and neural differentiation

Summary of the research plan

The 4 participating groups in this Sinergia project are Yves-Alain Barde, Coordinator (Biozentrum, University of Basel), Lukas Sommer, Deputy coordinator (University of Zurich),
Austin Smith (Cambridge, U.K.) and Dirk Schübeler (Friedrich Miescher Institut, Basel). These 4 groups have complementary expertise in stem cell biology and neuronal
differentiation, in the epigenetics of developmental restriction and in the development of the mouse nervous system. They have defined the following common objectives. First, they propose to characterize the pluripotent status of human embryonic stem cells. This is a prerequisite for the establishment of a tissue culture system allowing reproducible neuronal differentiation. Second, the extent of reprogramming of human somatic cells will be explored and compared with what has been achieved and defined with human embryonic stem cells. Third, they will perform molecular analyses of the pathways followed by embryonic and reprogrammed cells leading to the neural lineage. Fourth, neural stem cells will be studied in the mouse with regard to their ability to contribute to neurogenesis and the epigenetics of their developmental program analysed. Neurogenesis will be analysed in vivo in the mouse and in vitro with human neural progenitors as a minimal system reflecting aspects of human brain development.
The cornerstone of the strategy is the exploitation of recent knowledge gathered by the 4 participating groups with mouse stem cells, both in culture and in vivo during the
development of the nervous system. Indeed, the mouse currently represents the only mammalian organism allowing the validation of results obtained with cultured cells,
including embryonic and reprogrammed stem cells, as well as neural progenitors derived from stem cells. Our objectives could not be reached by groups working in isolation as
detailed knowledge and expertise in several different areas are needed for the common objectives to be reached. The availability of techniques allowing the reprogramming of
human somatic cells has, in principle, opened new ways of studying the function and dysfunction of human neurons in vitro. As human neurons can be generated in unlimited
numbers, such tissue culture systems also drugs to be screen for their ability to correct functional defects. While these objectives are ambitious, they are more realistic than claims of repair of the nervous system. The research proposed in this joint effort would greatly benefit the training of young scientists in Switzerland and the stem cell and medical community at large would benefit from the pursuit of achievable goals.

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