Oliver Brüstle

Personal Profile

Oliver Brüstle, MD, is Professor of Reconstructive Neurobiology at the University of Bonn. He is also Co-Founder and Scientific Director of LIFE & BRAIN GmbH, a biomedical enterprise serving as translational hub of the University of Bonn Medical Center. Trained as an M.D., Oliver Brüstle conducted research and clinical work in neuropathology and neurosurgery at the universities of Zurich and Erlangen, respectively. In 1993 he joined the laboratory of Ron McKay at the National Institutes of Neurological Disorders and Stroke in Bethesda, MD, USA to study neural stem cells. Upon his return to Germany in 1997, he started is own lab and, in 2002, became director of the newly founded Institute of Reconstructive Neurobiology. His field of interest is stem cell research with a particular focus stem cell-based disease modeling and nervous system repair.

In 2013, Brüstle was elected founding president of the German Stem Cell Network. He also serves as Chair of the Managing Board of the Stem Cell Network North Rhine Westphalia. Brüstle is a member of EMBO and the German National Academy of Sciences Leopoldina, where he also served in the Senate.

Having been the first researcher working on human embryonic stem cells in Germany, Oliver Brüstle was instrumental in shaping the public debate around this sensitive topic and became a fierce political advocate of stem cell research.

Contact details

Institute of Reconstructive Neurobiology
University Hospital Bonn
Venusberg-Campus 1
Building 76
D-53127 Bonn
Fon: +49 228 6885 500
Fax: +49 228 6885 501
r.neuro@uni-bonn.de
www.stemcells.uni-bonn.de

Major Scientific Achievements

Scientific key achievements of Oliver Brüstle include the development of stem cell-based interspecies neural chimera models (Brüstle et al., 1995, 1997; Zhang et al., 2001), which have since become instrumental for studying the developmental potential of rodent and human neural progenitor cells in the context of the developing mammalian brain and for assessing the ability of stem cell-derived neurons to undergo synaptic network integration in vivo (Wernig et al., 2004; Koch et al., 2009).

In 1999, Brüstle succeeded in generating purified glial precursors from mouse ES cells and using them for myelin repair in an animal model of Pelizaeus-Merzbacher disease. This represented the first demonstration of an ES cell-based therapy in an animal model of a human disease (Brüstle et al.,1999).

In 2001, in a collaboration with the Thomson lab, he published first data on human ES cell-derived neural precursors and their in vivo differentiation (Zhang et al., 2001).

In 2009, his lab generated a novel stable neural stem cell population from human pluripotent stem cells, which can be patterned to generate different regional and neurotransmitter phenotypes (Koch et al., 2009). This cell population has subsequently been exploited for iPSC-based disease modeling, e.g. for dissecting the pathogenesis of protein aggregation in polyglutamine disorders (Koch et al., 2011) as well as neurotransplantation (Doerr et al., 2017).

More recently, the Brüstle team refined the generation of transcription factor programmed neurons and their use in modeling psychiatric disease (Rhee et al. 2019; Meijer et al., 2019; Wen et al. 2023). The Brüstle lab further became active in the field of direct cell fate conversion, where they developed a highly efficient small molecule-based approach for the direct conversion of human fibroblasts and blood cells into functional neurons (Ladewig et al., 2012). His team also showed that adult human blood-derived induced neural stem cells (iNSCs) undergo epigenetic rejuvenation (Sheng et al., 2018) and are competent to integrate functionally into the mammalian brain (Berg et al., 2024).

Brüstle has contributed extensively to the field of translational stem cell research, including the identification of novel mechanisms for enhancing integration of grafted neural stem cells (Ladewig et al., 2014), the assessment of neural transplant integration (Doerr et al., 2017), the set-up of standardized neural cell production pipelines and implementation of the *StemCellFactory*, a fully automated platform for cell reprogramming and genome editing (Elenzew et al., 2020; Nießing et al., 2024; see also http://www.stemcellfactory.de/).

Selected Publications

Berg, L.J., Lee, C.K., Matsumura, H., Leinhaas, A., Konang, R., Shaib, A.H., Royero, P., Schlee, J., Sheng, C., Beck, H., Schwarz, M.K., Brose, N., Rhee, J.S., **Brüstle, O.** (2024) Human neural stem cells directly programmed from peripheral blood show functional integration into the adult mouse brain. ***Stem Cell Res. Ther.*** 15: 488. doi : 10.1186/s13287-024-04110-7

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