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 Senator of the German National Academy of Sciences Leopoldina.

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.

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Major Scientific Achievements

Scientific key achievements of Oliver Brüstle include the development of interspecies neural chimera models (Neuron 1995; PNAS 1997; Nature Biotech 1998), 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 (Nature Biotech 2001; J Neurosci 2004, PNAS 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 (Science 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 (Nature Biotech. 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 (PNAS 2009). He is currently exploiting this system for iPS cell-based disease modeling, e.g. for dissecting the pathogenesis of protein aggregation in polyglutamine disorders (Nature 2011) as well as neurotransplantation (Nature Comm. 2017).

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 (Nature Methods 2012). In 2018, his team showed that adult blood-derived induced neural stem cells (iNSCs) undergo an epigenetic rejuvenation (Nature Comm. 2018).

Brüstle has further contributed to the field of translational stem cell research, including the identification of novel mechanisms for enhancing integration of grafted neural stem cells (Nature Neurosci. 2014) and the initiation of the *StemCellFactory*, a fully automated platform for cell reprogramming and generation of human iPS cells (http://www.stemcellfactory.de/).

Selected Publications

Rhee, H.J.[#], Shaib, A.H.[#], Rehbach, K.[#], Lee, C.K., Seif, P., Thomas, C., Gideons, E., Guenther, A., Krutenko, T., Hebisch, M., Peitz, M., Brose, N., **Brüstle, O.***, Rhee, J.S.* (2019) An autaptic culture system for standardized analyses of iPSC-derived human neurons. ***Cell Rep.*** 27:2212-2228. doi: 10.1016/j.celrep.2019.04.059

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Meijer, M.[#], Rehbach, K.[#], Brunner, J.W., Classen, J.A., Lammertse, H.C.A., van Linge, L.A., Schut, D., Krutenko, T., Hebisch, M., Cornelisse, L.N., Sullivan, P.F., Peitz, M.*, Toonen, R.F., **Brüstle, O.***, Verhage, M.* (2019) A single-cell model for synaptic transmission and plasticity in human iPSC-derived neurons. ***Cell Rep.*** 27:2199-2211.doi: 10.1016/j.celrep.2019.04.058

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Ladewig, J., Koch, P., **Brüstle, O.** (2014) Auto-attraction of neural precursors and their neuronal progeny impairs neuronal migration. ***Nature Neuroscience*** 17:24–26

Ladewig, J., Mertens, J., Doerr, J., Poppe, D., Kesavan, J., Glaua, F., Koch, P., **Brüstle, O.** (2012) Small molecules enable highly efficient neuronal conversion of human fibroblasts. ***Nature Methods*** 9:575-578

Koch, P.*, Breuer, P*., Peitz, M.*, Jungverdorben, J.*, Kesavan, J., Poppe, D., Doerr, J., Ladewig, J., Mertens, J., Tüting, T., Hoffmann, P., Klockgether, T., Evert, B.O., Wüllner, U., **Brüstle, O.** (2011) Excitation-induced ataxin-3 aggregation in neurons from patients with Machado-Joseph disease. ***Nature*** 480:543-6

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