

Press Release, September 6, 2016

How Single Cells Build Complex Organs

Ernst Schering Foundation awards Friedmund Neumann Prize 2016 to junior scientist Barbara Treutlein for her outstanding work on single cell transcriptomics analysis

During human development, stem cells differentiate into many different cell types that build and determine the function of complex organs. Previous studies have provided only limited insights into the genetic programs that control organ development. By adapting the methodology of single cell transcriptomics analysis, junior scientist Prof. Dr. Barbara Treutlein from the Max Planck Institute for Evolutionary Anthropology in Leipzig for the first time made it possible to perform genome-wide measurements of genetic expression in unprecedented resolution on the single cell level. In her research, she applies this method to understand the genetic foundations of organogenesis, i.e. the process by which cells differentiate into organs, and to make possible their in-vitro recreation under controlled conditions. In her lab, Dr. Treutlein grows hepatic and cerebral organoids and compares them with real organ tissue.



Photo: Ronny Barr, MPI-EVA

For her outstanding work on single cell transcriptomics analysis, the Ernst Schering Foundation awards the Friedmund Neumann Prize 2016 to Prof. Dr. Barbara Treutlein. The festive award ceremony will take place on **September 26, 2016, at the Meistersaal in Berlin.**

The Ernst Schering Foundation awards the 10,000-euro **Friedmund Neumann Prize** to young scientists who have done outstanding basic research in human biology, organic chemistry or human medicine and who have already developed a distinctive scientific profile after their dissertation. The award aims to make visible excellent scientific achievement and help young scientists establish themselves in their field of research. Barbara Treutlein was nominated for the Friedmund Neumann Prize 2016 by Prof. Dr. Svante Pääbo, director of the Department of Evolutionary Genetics at the Max Planck Institute for Evolutionary Anthropology: *“Barbara Treutlein uses new techniques in a brilliant and creative way to find answers to fundamental questions of developmental and neuro-biology. Thanks to her, we have gained several new insights into how a fertilized egg cell develops into an individual with functioning tissues and a brain.”*

Award Ceremony

September 26, 2016, 6:30 p.m.

Meistersaal at Potsdamer Platz (Köthener Straße 38 | 10963 Berlin)

Registration until September 15, 2016, at: anmeldung@scheringstiftung.de

The prize will be awarded together with the 2016 Ernst Schering Prize of the Ernst Schering Foundation.

On the occasion of the award presentation, Prof. Dr. Barbara Treutlein will present and discuss her research with students of the Lise Meitner School in Berlin on September 27.

More Information

More information and images are available for download on our website www.scheringstiftung.de | section press.

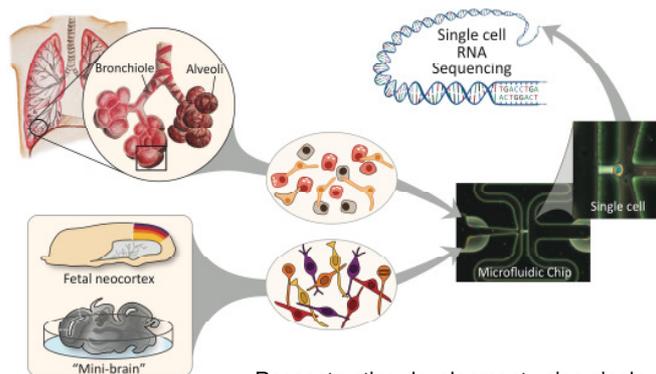
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Background information

Research

During development, stem cells differentiate into many different mature cell types that build and determine the function of complex organs. These developmental processes are controlled by the genes that are being expressed in each cell at a given time point. Previous studies of organ development have provided only limited insights into the genetic programs that control organ development, since genome-wide measurements of gene expression lacked the required cellular resolution. Furthermore, limited access to human tissues complicates studies of human development.

Barbara Treutlein developed a novel method based on DNA sequencing to detect the expression of thousands of genes in individual cells that are captured on microfluidic chips. Using this method, she characterized in unprecedented resolution the individual cells that compose the developing and mature lung including stem cells, developmental intermediates and mature differentiated cells. She discovered a novel type of stem cells and was able to reconstruct the precise paths these stem cells take to develop into the major cell types constituting the lung epithelium.



Reconstructing development using single-cell genomics, © G. Camp & B. Treutlein

Since this initial study, Barbara Treutlein has used the method to analyze the developing human cortex leading to a highly resolved description of the path of neuronal stem cells to cortical neurons and the identification of the gene networks controlling this path. She also showed that in vitro self-organizing tissues that are derived from induced pluripotent stem cells (iPSC) are able to mimic these genetic programs as well as the cellular composition of the developing cortex.

In the future, Barbara Treutlein will combine single cell transcriptomics analysis with iPSC-derived in vitro tissues, in particular brain tissues, to understand how human organs develop, what are the features unique to humans compared to those of our closest living relatives, the great apes, and what goes wrong on a mechanistic level when mutations in the genome lead to developmental disorders.

Vita

Barbara Treutlein (*1982) studied chemistry at the Universities of Tübingen and Mainz and at UC Berkeley in 2001-2007. From 2007-2012, she performed her doctoral research with Jens Michaelis at LMU Munich. She used single molecule fluorescence techniques and probabilistic data analysis to study molecular mechanisms of eukaryotic transcription and ATP-dependent chromatin remodeling. During her postdoctoral research from 2012-2014 in the lab of Stephen Quake at Stanford University, she pioneered the use of microfluidic based single cell transcriptomics to dissect the cellular composition of complex tissues such as lung and brain, as well as to elucidate differentiation pathways during organ development and transdifferentiation. Since 2015, she is a Max Planck Research group leader at the MPI for Evolutionary Anthropology in Leipzig with a co-affiliation at the MPI for Molecular Cell Biology and Genetics in Dresden. Her group uses and develops single cell genomics approaches in combination with stem cell based 2- and 3-dimensional culture systems to study human organogenesis. In 2016, Barbara Treutlein was appointed as a tenure-track assistant professor at TU Munich, jointly with her Max Planck Research group leader position.