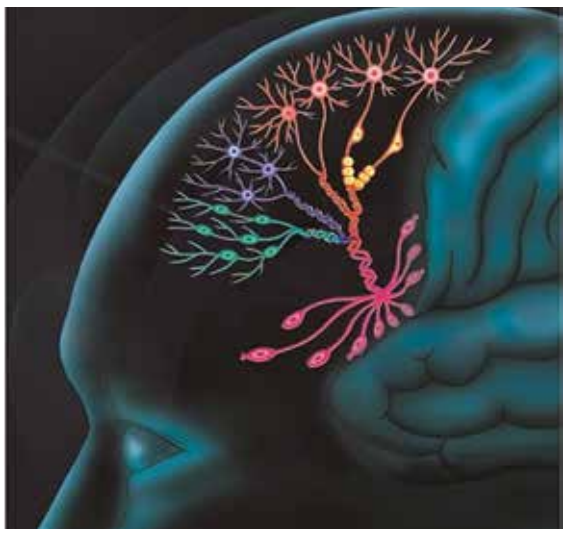
Drawing the Developmental Landscape of the Human Prefrontal Cortex by Single-cell RNAseq

The prefrontal cortex (PFC) is the cerebral cortex which covers the front part of the frontal lobe in mammalian brain anatomy and in the case of humankind, it has increased six-fold throughout this species' evolution. This brain region has been implicated in planning complex cognitive behavior, decision-making and regulating social behavior. There is a need for detailed knowledge of the development of the PFC since disturbance or failure of PFC development may contribute to several cognitive deficits seen in patients with neurodevelopmental disorders, such as intellectual disability, autism spectrum disorders and schizophrenia.

To investigate the development of PFC, a team led by Prof. WANG Xiaoqun at the Institute of Biophysics (IBP), identified cell types in the developing human PFC and distinguished their developmental features via single-cell transcriptional profiling, in cooperation with Prof. TANG Fuchou and Prof. QIAO Jie at Peking University, and Prof. ZHANG Jun at the Capital University of Medical Sciences and colleagues. Entitled "A single-cell RNA-seq survey of the developmental landscape of the human prefrontal cortex," their work was published online in the journal *Nature* on Mar 14, 2018.

In their research, the molecular features of cells in the PFC during human brain development at gestational weeks 8 to 26 were described. The data showed heterogeneity of neural progenitor cells that have the potential of proliferation and differentiation to neurons or to glial cells. Intermediate progenitor (IP) cells, acting as transit amplifying progenitor cells, play a critical role in mammalian cerebral cortex development, allowing neurons to be generated at a tremendous speed in a short period. They found new markers of IP cells and revealed the developmental features of these cells. They also illustrated the critical periods of the proliferation, migration and maturation of excitatory neurons. In addition, the data also indicate that there exist a few interneuron progenitor cells in the early period of PFC while they are inactively progressing through the cell



cycle, implying interneurons may be generated locally in the developing human PFC. This screening and characterization approach provides a blueprint for understanding human PFC development in the early and mid-gestational stages, which might facilitate systematical dissection of the cellular basis and molecular regulation of PFC function in humans. It could also serve as a powerful tool for investigating the mechanisms underlying neurological diseases related to abnormal structure or dysfunction of the PFC and exploring potential therapies.

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Contact:

WANG Xiaoqun
Institute of Biophysics, Chinese Academy of Sciences
Beijing 100101, China
Phone: 86-10-64887377
Email: xiaoqunwang@ibp.ac.cn