CYTOPLASMIC ROADBLOCKS IN CELL FATE REPROGRAMMING: FROM PLAYERS TO MOLECULAR MECHANISMS

There is a special relationship between germ cells, oocytes and sperm, and pluripotency. For example, germ cells can give rise to different type of pluripotent cell lines, and oocyte cytoplasm has the capacity to reprogram somatic nuclei. Moreover, in disease, both male and female germ cells can differentiate into many types of somatic cells, forming tumors called teratomas. However, during normal development, the ability to differentiate into any type of cell is restricted to the cells of an early embryo. Combined, these observations suggest that, until after fertilization, the reprogramming potential of germ cells is kept at bay by putative repressive mechanisms. Our goal is to identify and dissect these mechanisms. To achieve this, we employ a genetically tractable, rapid invertebrate model – the nematode *C. elegans* – to study pluripotency. Through an unbiased genetic approach, we identified several RNA-binding proteins as novel regulators of pluriptency in the oocytes. Our findings suggest that, by inhibiting the oocyte reprogramming capacity, these proteins ensure a successful transition between generations. Importantly, the majority of molecular "roadblocks" to reprograming that have been identified so far are transcriptional regulators. However, we propose that, at least in germ cells, RNA-binding proteins fulfill an analogous role in the cytoplasm. Following the identification of individual players controlling pluripotency, our goal is to understand their reciprocal relation and the precise molecular mechanism, by which these factors control reprogramming. Cell fate determination and reprogramming are fundamental for development and tissue homeostasis, and hence their errors can cause numerous diseases. Thus, by dissecting the underlying mechanisms, we not only contribute to the understanding of a fundamental problem in developmental biology, but also fuel ideas with potential implications for biomedial research, including efficient generation of human pluripotent stem cells and regenerative medicine.