CDB SEMINAR

Kei Miyamoto

Wellcome Trust/Cancer Research UK Gurdon Institute,
University of Cambridge, UK

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16:00~17:00 A7F Seminar Room

Mechanisms of nuclear reprogramming by eggs and oocytes

Summary

Nuclear reprogramming is a phenomenon in which differentiated adult cells revert to undifferentiated embryonic ones. This holds great promise for regenerative medicine. A complete reprogramming of differentiated cells can be achieved by nuclear transfer to eggs and oocytes. Nuclear transfer remains the most effective method to reprogram differentiated cells to totipotency. However, the egg/oocyte factors and mechanisms involved in reprogramming are not well understood. To identify natural reprogramming factors and mechanisms that eggs and oocytes intrinsically possess, we took advantage of cell-free extracts from oocytes. This extract approach enabled us to identify two oocyte factors that are important for reprogramming. One is maternally stored protein DJ-1, which is necessary for development of pig nuclear transfer embryos by modulating P53 activity. The other is nuclear actin, which is abundantly present in the giant oocyte nucleus referred to as the germinal vesicle (GV) in *Xenopus*. This unexpected role of nuclear actin in reprogramming further led us to explore the functions of nuclear actin-binding proteins in the context of reprogramming. Recently, we found that WAVE1, an actin-binding protein, is localized in the oocyte nucleus and required for transcriptional reprogramming. Nuclear WAVE1 is also important for normal development. Furthermore, nuclear WAVE1 plays a key role in transcriptional activation in embryos by regulating the histone methyltransferase and RNA polymerase II activity. These studies provide novel mechanistic insights into nuclear reprogramming and reveal a new type of maternal protein required for development.

Host:
Shigeo Hayashi
Morphogenetic Signaling, CDB
shayashi@cdb.riken.jp
Tel:078-306-3185 (ext:1523)