

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Acquired genes and epigenetic mechanisms creating mammalian features

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1. Background of research

Genome is a blueprint of information processing for an organism. Elucidation of specific features of some organism from its own genomic information is the ultimate goal of modern genome science. Recent explosive increase in genomic information of varieties of organisms including human beings and several mammalian species as well as other vertebrate and non-vertebrate animals makes it possible to identify mammalian-specific genes during evolution.

2. Research objectives

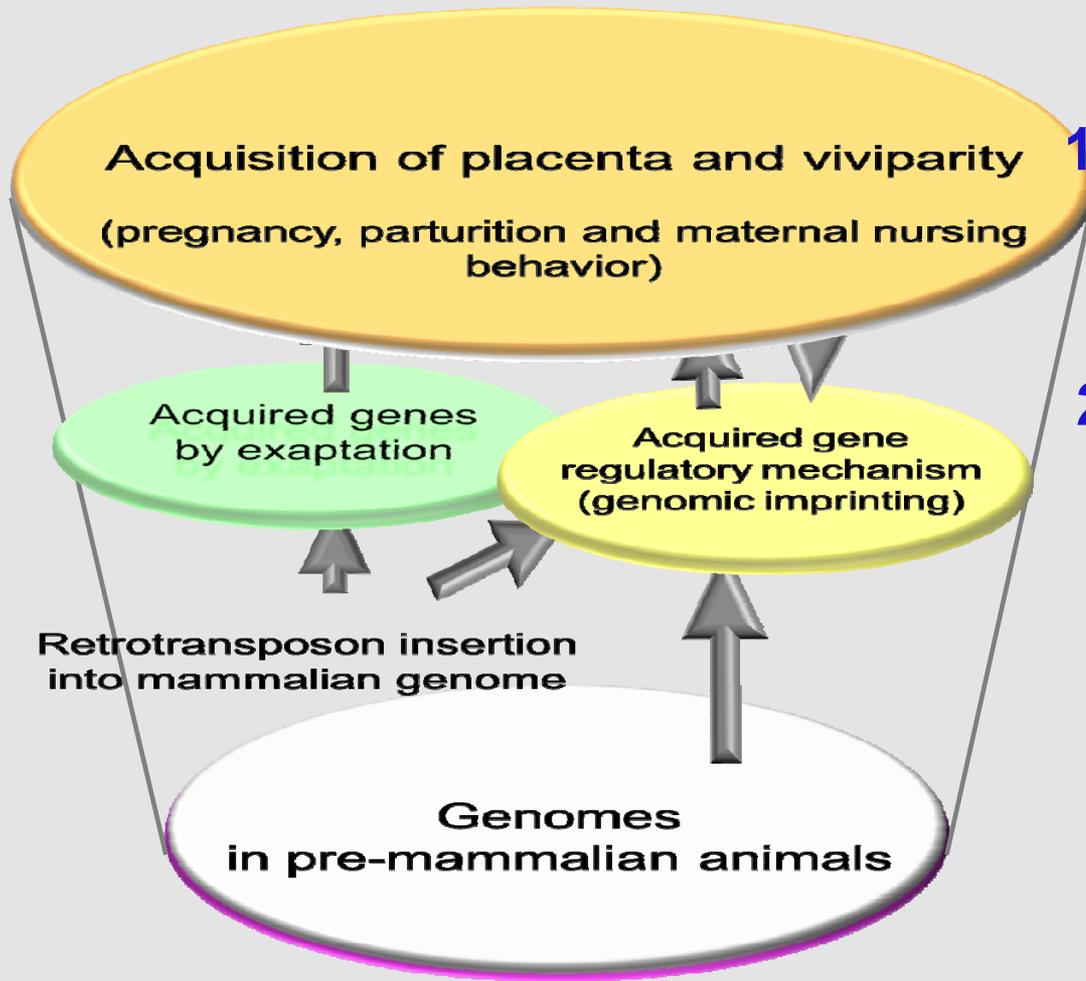
Viviparity and placentation are the most famous features in therian mammals, eutherians and marsupials: fetuses are supplied with nutrients and oxygen from placenta during pregnancy and mothers give birth to live young. What kinds of changes occurred in their genomes made it possible these therian-specific features? From the viewpoint of mammalian-specific genes and mammalian-specific epigenetic mechanisms, I will address this interesting and challenging theme.

3. Research characteristics (incl. originality and creativity)

I have recently demonstrated the biological functions of two mammalian -specific genes, *Peg10* and *Peg11/Rtl1*. These are responsible genes for early embryonic lethality and late fetal/neonatal lethality caused by genomic imprinting defects of maternal duplication of proximal chromosome 6 and distal chromosome 12 in mice, respectively. These are also the first and second demonstrations that the genes derived from retrotransposons play essential roles in mammalian development via placenta formation. In this project, I focus on the contribution of retrotransposon-derived genes and genomic imprinting, one of mammalian-specific epigenetic mechanisms, in establishing the current mammalian developmental systems.

4. Anticipated effects and future applications of research

This project gives us the basic knowledge on fetal and placental growth during pregnancy, hormonal regulation in parturition and maternal behavior in mammals, thus, contributes to health and welfare of mother and child through development of gynecology and reproductive medicine.



1. Mammalian-specific genes

* Biological functions of *Sirh3*, 7 and 11.

2. Mammalian-specific gene regulation mechanism (genomic imprinting)

* Origin of DMRs (making artificial DMRs)

* Reprogramming of parental memories by DNA demethylation

Changes in mammalian genomic functions during evolution

New medicine and biology provided by the project on “Acquired genes and epigenetic mechanisms creating mammalian features”

**Health and Welfare
of mother and child
through gynecology
and reproductive
medicine**

**Mammalian-
specific genes**

**Regenerative
medicine using
iPS, ES and somatic
stem cells.**

**Mammalian-
specific epigenetic
mechanisms**

**Biology on fetal and placental
development, pregnancy,
parturition and lactation.**

**Biology on reprogramming
of epigenetic memories
during development**