Title of Project : Molecular mechanisms underlying reconstruction of 3D structures during regeneration

Term of Project : FY2010-2014

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【Purpose of the Research Project】

Recent research has greatly increased our understanding of embryonic stem cells and developed technical advances to establish induced pluripotent stem cells. Such accomplishments have brought the possibility of stem cell-mediated regenerative medicine much closer to becoming an applicable reality for curing diseases and injuries. To further our insight into regenerative medicine, we aim to develop strategies to induce regenerative response in humans for replenishing missing tissues and organs by understanding the molecular basis of endogenous regenerative abilities in many regeneration animal models.

Japan has a long history in regenerative biology. In the past decade, great advances in regeneration studies have revealed many of the molecular mechanisms that regulate regeneration. We will use genetic manipulations to provide factors that regulate the regenerative activities from regeneration-competent animals into regeneration-incompetent animals, such as mice, in order to induce a regenerative response.

【Content of the Research Project】

We aim to: **(1)** Understand a common molecular basis for morphological regeneration by using animals models with high regenerative abilities such as planarians, crickets and newts. **(2)** Understand the specific changes in *Xenopus* tadpole limb regeneration potential that arise in transition from a regeneration-competent stage to a regeneration-incompetent stage, and provide this information to regeneration-incompetent animals through genetic manipulations, in order to induce a regenerative response. **(3)** Establish novel clinical applications for replenishing missing tissues and organs by inducing regenerative response.

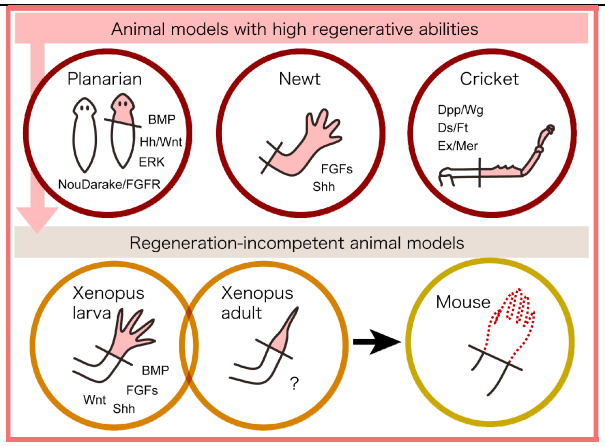

Figure 1 Identification of regeneration factors

【Expected Research Achievements】

"Why regeneration-competent animals can restore their missing body parts, but mice and humans can not?" Our approach of investigating why the ability to regenerate varies greatly among animals will answer this question at the molecular level. As a result, the knowledge obtained from our research will open a door to establish novel clinical applications for curing missing fingers and arms in humans.

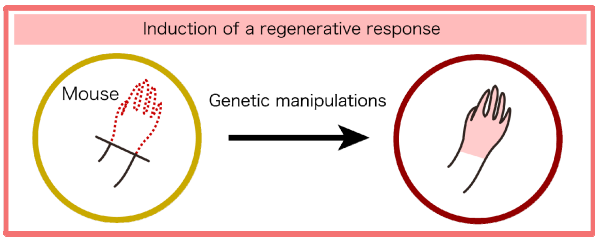

Figure 2 Novel clinical applications

【Key Words】

Intercalation: a mechanism in which, when body regions encoding different positional values are juxtaposed, regeneration takes place via the generation of new body regions between them to restore pattern continuity.

【Homepage Address】

http:// reg.biol.sci.kyoto-u.ac.jp