The Power of Bio-imaging Rat!

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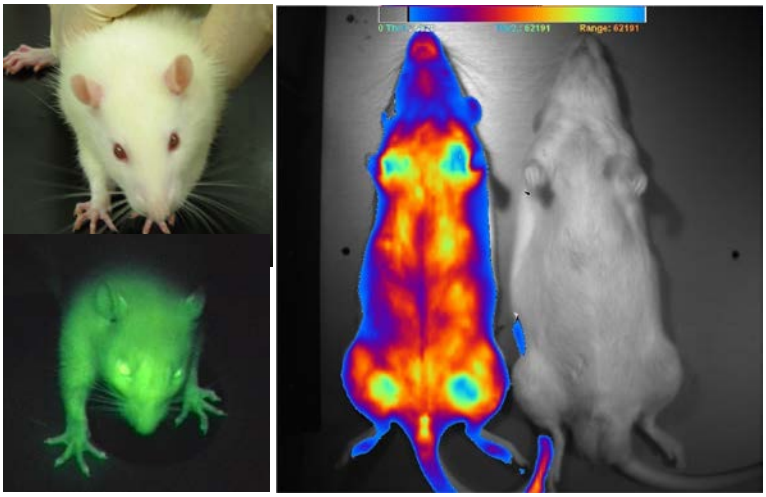
Mice as one of the experimental animals have been widely used as a superb model. On the contrary, due to the physical body size of rats; 10 times bigger than mice, despite the fact that they are more suitable research tool for regenerative medicine, the establishment of experimental rats has been affected by the delay in genetic manipulation technology and cost factors. The author pushed forward the world-first research on genetic modification in the early 2000s by establishing bioimaging rats through the optimization of inbred rat species. In this lecture, I would like to introduce this historical background and show the recent research results.

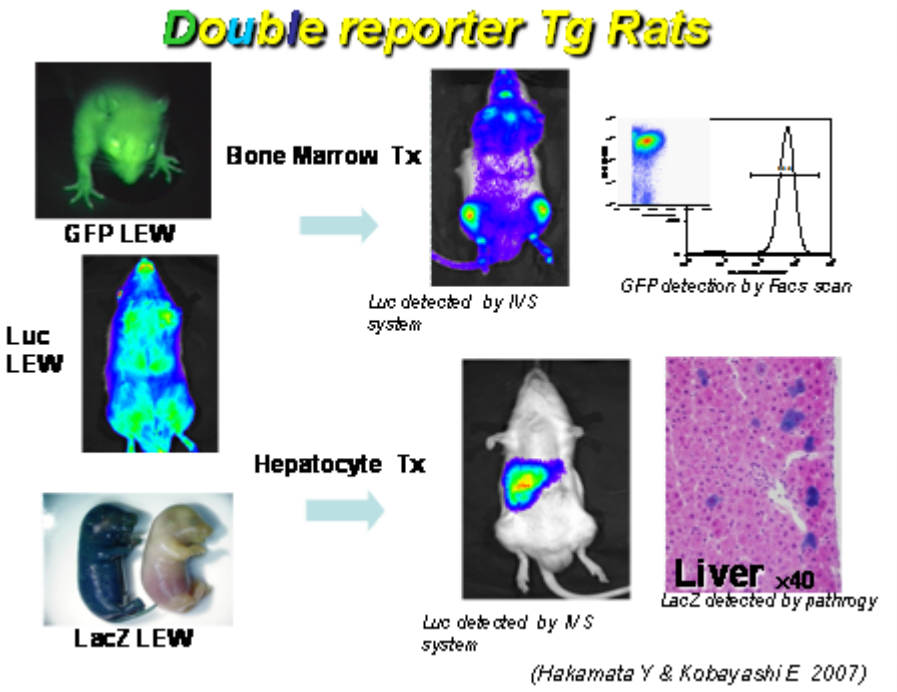
In vivo luminescent method is the optimization of luminescent protein “Luciferase” which merges into the light-emitting substrate “Luciferin” which ends up with acquiring light-emitting function by itself. On the other hand, the florescence imaging method is to observe the long-wave visible light on live tissues as a reflected light by emitting a visible short-wave excitement light.



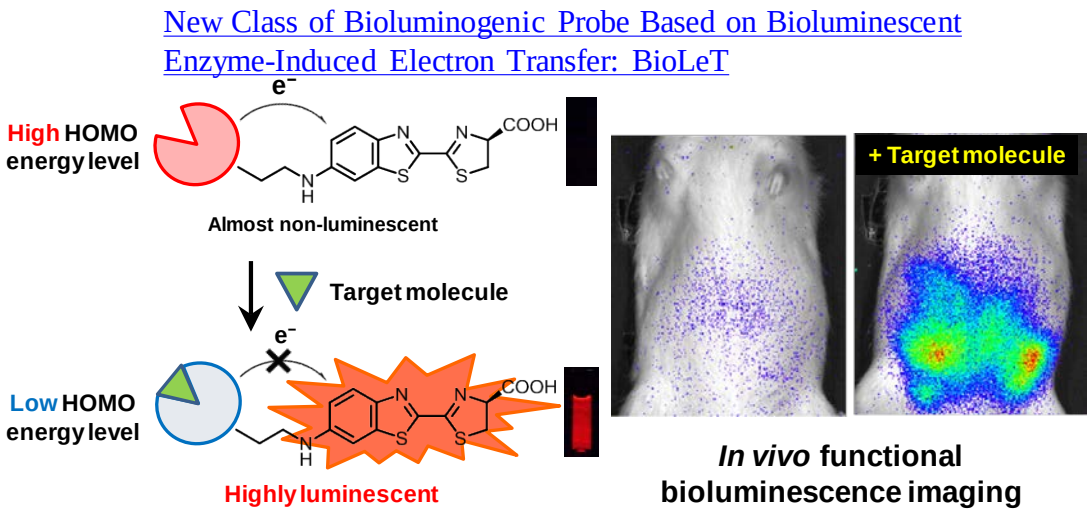
GFP Tg rat **Luciferase Tg rat**

We had been created GFP Tg (2001) and Luciferase Tg rat (2006) and worked for organ transplantation /stem cell research. There are pros and cons that it emits sharp light and has no energy consumption, on the contrary, it requires decrease in the signal sensitivity to avoid halation and auto-fluorescence because it creates the light intake halation inside the tissue.

We have a focus on inbred rat line, LEW(MHC haplotype;RT1[l]). When we will mate each Tg rat and another maker Tg rat, double reporter Tg rats can create as a F1 hybrid.



Luminescent and florescent molecules emit light when the electron in molecules in active status called “excitation state” returns to inactive status called “ground state”. Prof Urano group has found out the fact that the transfer of electron can logically control ON/OFF of florescent molecule (it emits photon from excitation state or not) through electron transfer from the binding electron donor around florescent molecule to luminophore (electron acceptor) in excitation state (See the below figure).



(Takakura H, et al.J Am Chem Soc. 2015)

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