

## Department of Molecular Virology

Professor: Yoshio Koyanagi,

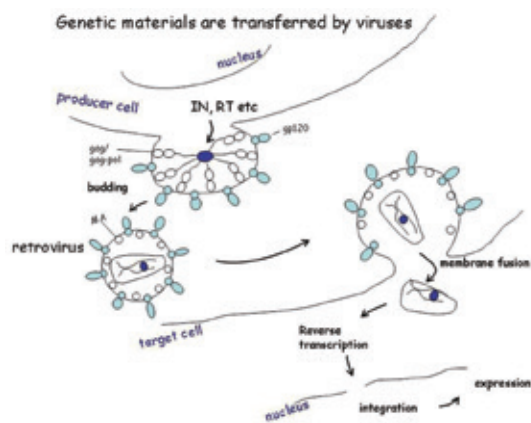
Assistant Professor: Yusuke Nakano, Yuki Furuse



### Research Projects:

It is clear that virus researches have provided strong advances to Cell Biology. Therefore, we believe that our efforts will contribute to Medical and Pharmaceutical Sciences. Our research themes have been arranged below.

**1) How virus infects cell and replicates?** Viral genome moves from virion-produced cell to adjacent naive cells (See figure below). This is a most significant characteristic of virus. Elucidation of the mechanism of this infection event is a primary theme.

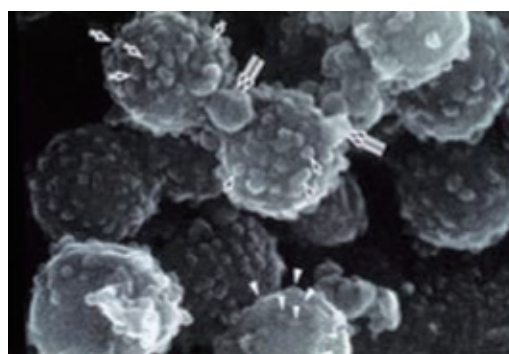


### 2) How cellular factors influence viral replication?

Virus cannot replicate without cells. Since it has been found that many cellular factors promote or suppress human immunodeficiency virus (HIV) replication, we wish to learn the mechanisms from aspect of Immunology and Virology (See right figure).

### 3) Why HIV causes immunodeficiency in human?

The mechanism of the immunodeficiency remains unclear. We have been analyzing how the immunodeficiency occurs using *in vitro*-cell culture models and *in vivo*-animal models. We developed a mouse system that human immune system is transplanted in SCID mouse and in this human-chimera mouse, abundant CD4 cell killing can be reproduced with HIV infection.



### 4) Why do we need novel anti-viral therapy?

Although development of anti-HIV therapies has been accelerating, treatment for HIV cure has not yet been established. Therefore, we have tried to develop novel strategy for HIV proviral DNA from genome editing technology.

### Recent publications

- Sato K, Takeuchi SJ, Misawa N, Izumi T, Kobayashi T, Kimura Y, Iwami S, Takaori-Kondo A, Hu WS, Aihara K, Ito M, An DS, Pathak VK, and Koyanagi Y. APOBEC2 and APOBEC3F potently promote HIV-1 diversification and evolution in humanized mice. *PLoS Pathog*, 10:e1004453, 2014.
- Ebina H, Misawa, Kanemura Y, and Koyanagi Y. Harnessing the CRISPR/Cas9 system to disrupt latent HIV-1 provirus. *Sci. Rep.* 3 : 2510, 2013.
- Sato, K, Misawa N, Iwami S, Satou Y, Matsuoka M, Ishizaka Y, Ito M, Aihara K, An DS, and Koyanagi Y. HIV-1 Vpr accelerates viral replication during acute infection by exploitation of proliferating CD4<sup>+</sup> T cells *in vivo*. *PLoS Pathog*, 9:e1003812. 2013.

Lab URL : <http://www.virus.kyoto-u.ac.jp/Lab/KoyanagiHP/saito/TOP.html>