ID No.	K3003	
Project Title	Impact of human endogenous retroviruses on virus infections,	
	human diseases, and evolution	
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Project Members		
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Report		

This proposal was based on the collaboration of the principal investigator of this proposal, <u>Dr. Robert Gifford</u> (MRC-University of Glasgow Centre for Virus Research, UK), and IMSUT host researcher, <u>Dr. Kei Sato</u>. The IMSUT host researcher (<u>Dr. Sato</u>) constructed the core of excellence for the interdisciplinary research on virology and bioinformatics as the "hub" of this proposal. <u>Drs. Gifford and Sato</u> collaboratively proceed **Project 1: co-expression network analysis of ERVs and human genes**, which was mainly based on bioinformatics analysis. The findings and knowledge brought from **Project 1** was applied to the applicative objects such as **Project 2: co-expression network analysis of HIV** and **ERVs**, which was proceeded by collaboration with <u>Dr. Daniel Sauter (Ulm University, Germany)</u>, and **Project 3: evolutionary analysis of ERVs and human diseases**, which was proceeded by collaboration with <u>Dr. Kotaro Sasaki (University of Pennsylvania, USA)</u>.

The collaboration of <u>Drs. Gifford and Sato</u> (**Project 1**) has been launched. In this project, we performed bioinformatics analysis using the genome sequences of 160

mammalian species including human, we described the co-evolutionary history of ERVs and mammals. This study was published in *PNAS* (<u>paper 3</u>: Ito, Gifford, Sato, *PNAS*, 2020).

Because of the emergence of SARS-CoV-2 at the beginning of 2020, we started the international collaboration on SARS-CoV-2 as well. By the collaboration of Drs. Gifford, Sato and Sauter (the framework of **Project 2**), we revealed a role of SARS-CoV-2-encoding protein on antiviral immunity. This study was published in *Cell Reports* (paper 2: Konno et al, *Cell Rep*, 2020).

Additionally, the collaboration of <u>Dr. Sasaki and Sato</u> (**Project 3**) has been also launched. In FY2020 and FY2021, we performed bioinformatics analysis on the human embryonic cells and primordial germ cells and showed the evidence suggesting that human ERVs play crucial roles in human spermatogenesis. This study has been recently accepted in *Nature Communications* (paper 1: Hwang et al, *Nat Commun*, 2020).