

Anti-infective biology

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Major Scientific Interests of the Group

For aiming to control viral diseases, we conduct basic research for chronically-infected human tumor viruses and pathogenic viruses with pandemic potential, including zoonotic viruses, arthropod-borne viruses, and hemorrhagic fever viruses. We also study about drug modalities that are useful for the development of antiviral agents. Not only conducting basic research, we translate scientific evidences to the productivity of anti-infectives through collaboration with counterparts including research institutes, universities, and pharmaceutical industries.

Projects for Regular Students in Doctoral or Master's Programs

- 1) Molecular mechanism underlying virus-host interaction during infection and replication
- 2) Live cell analysis for the virus/receptor complex and the virus replication complex
- 3) Characterization of drug targets and their regulation for antiviral seed discovery
- 4) Drug modality science for antiviral strategy

Study Programs for Short Stay Students (one week – one semester)

- 1) Analysis on cell cultures
- 2) Virus infection assays
- 3) Evaluation of antiviral agents
- 4) Analysis on mode of action of antiviral agents

Selected Publications

- 1) Kobayashi C, Ekimoto T, Ooka K, Mifune J, Matsuzawa K, Que L, Li Y, Kusunoki A, Morita T, Shionoya K, Nagano M, Wakae K, Isogawa M, Muramatsu M, Ohto U, Nomura N, Park SY, Sureau C, Arai M, Ikeguchi M, ***Watashi K**. Multistep receptor binding of the hepatitis B virus preS1 domain. *Nat Commun* 17: 102 (2026)
- 2) Matsuzawa K, Ekimoto T, Kobayashi C, Shionoya K, Mifune J, Morita T, Takeuchi JS, Park SY, Ikeguchi M, Sureau C, Kawaguchi A, ***Watashi K**. Structural mapping of NTCP distinguishes its dual functionality as a hepatitis B virus receptor and bile acid transporter. *PLoS Pathog* 22: e1013824 (2026)
- 3) *Akazawa D, Shimojima M, Park ES, Okutani A, Virhuez-Mendoza M, Inoue Y, Hishiki T, Maeda K, Ebihara H, Takahashi Y, ***Watashi K**. Bivalent single-domain antibodies show potent mpox virus neutralization through M1R antigen. *Commun Biol* 8: 1073 (2025)
- 4) Sasaki S, Nakajima S, Nohara R, Endo H, Takeuchi N, Oyama T, Iwano N, Tsukakoshi K, Ikebukuro K, Shiraishi A, Nagasawa K, ***Watashi K**, *Tera M. Targeting G-Quadruplex with Bis-thiourea Compounds Inhibits SARS-CoV-2 Replication. *ACS Infect Dis* 11: 2131-2144 (2025)
- 5) Asami J, Park JH, Nomura Y, Kobayashi C, Mifune J, Ishimoto N, Uemura T, Liu K, Sato Y, Zhang Z, Muramatsu M, Wakita T, Drew D, Iwata S, Shimizu T, ***Watashi K**, *Park SY, *Nomura N, *Ohto U. Structural basis of hepatitis B virus receptor binding. *Nat Struct Mol Biol* 31(3): 447-454 (2024)