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## CURRENT POSITION

Director (W3), Institute of Cardiovascular Immunology

## RESEARCH EXPERTISE (SUMMARY)

My research focuses on the mechanisms by which cytoplasmic RNA sensors RIG-I like receptors (RLRs), RIG-I, MDA5 and LGP2, distinguish between viral RNAs and self-RNAs and trigger type I IFNs. Current work examines spontaneous autoimmune symptoms in RLR mutant mice derived via mutagenesis and how RLR-dysregulation causes autoimmune disease including monogenic lupus. I am also particularly interested in the analysis of immune responses and pathogenesis in virus infection in vivo and autoimmune diseases using mouse models.

## ACADEMIC QUALIFICATIONS

- 2005 - 2008     Doctorate, PhD, Department of Host Defense, Institute for Microbial Diseases, BIKEN, Osaka University, Japan
- 2003 - 2005     Master of Science, Department of Host Defense, Institute for Microbial Diseases, BIKEN, Osaka University, Japan
- 2003            Bachelor of Science, Agricultural and Life Science, The University of Tokyo, Japan

## POSTGRADUATE PROFESSIONAL CAREER

- 2018 - pres.    Director (W3), Institute of Cardiovascular Immunology, University Hospital Bonn, Germany
- 2010 – 2017    Associate Professor in Prof. Takashi Fujita's lab, Institute for Virus Research, Kyoto University, Japan
- 2008 – 2010    Postdoctoral fellow under Prof. Craig Mello, University of Massachusetts Medical School, USA

## HONORS AND AWARDS

- 2015 - 2017    Highly cited researcher (Clarivate Analytics / Thomson Reuter)
- 2008 – 2010    Postdoctoral Fellowship for Research Abroad from Japan Society for the Promotion of Science (JSPS)
- 2008            Yamamura Award, Graduate School of Medicine, Osaka University
- 2005 – 2008    Research Fellowship for Young Scientists from Japan Society for the Promotion of Science (JSPS)

## PRINCIPAL FUNDING

2023 – 2026	DFG - Deutsche Forschungsgemeinschaft (TRR 237/1, Teilprojekt B22)
2019 – 2025	DFG - Deutsche Forschungsgemeinschaft (EXC 2151)
2018 – 2022	DFG - Deutsche Forschungsgemeinschaft (TRR 237/1, Teilprojekt B22)
2018 – 2021	AMED (AGS model)
2017 – 2018	The Kyoto University Foundation
2017 – 2018	Kato Memorial Bioscience Foundation (AGS and RLR)
2017 – 2022	AMED (HBV project)
2015 – 2018	AMED (rare autoimmune disease project)
2012 – 2017	AMED (HBV project)
2013 – 2016	Japan Science and Technology Agency (PRESTO)
2013 – 2014	Daiichi Sankyo Foundation of Life Science

## PUBLICATIONS

1. Tsukamoto, Y., Hiono, T., Yamada, S., Matsuno, K., Faist, A., Claff, T., Hou, J., Namasivayam, V., vom Hemdt, A., Sugimoto, S., Ng, Y.J., Christensen, M.H., Tesfamariam, Y.M., Wolter, S., Juranek, S., Zillinger, T., Bauer, S., Hirokawa, T., Schmidt, F.I., Kochs, G., Shimojima, M., Huang, Y-S., Pichlmair, A., Kümmerer, B.M., Sakoda, Y., Schlee, M., Brunotte, L., Müller, C.E., Igarashi, M.\* , **Kato, H.\***. (2023). Inhibition of cellular RNA methyltransferase abrogates influenza virus capping and replication. **Science** 379. <https://www.science.org/doi/10.1126/science.add0875>
2. Bergant, V., Yamada, S., Grass, V., Tsukamoto, Y., Lavacca, T., Krey, K., Muhlhofer, M-L., Wittmann, S., Ensser, A., Herrmann, A., vom Hemdt, A., Tomita, Y., Matsuyama, S., Hirokawa, S., Huang, Y., Piras, A., Jakwerth, C.A., Oelsner, M., Thieme, S., Graf, A., Krebs, S., Blum, H., Kummerer, B.M., Stukalov, A., Schmidt-Weber, C.B., Igarashi, M., Gramberg, T., Pichlmair, A. \*, **Kato, H. \***. 2022. Attenuation of SARS-CoV-2 replication and associated inflammation by concomitant targeting of viral and host cap 2'-O-ribose methyltransferases. **EMBO J**.
3. Ohto, T., A. A. Tayeh, R. Nishikomori, H. Abe, K. Hashimoto, S. Baba, A. P. Arias-Loza, N. Soda, S. Satoh, M. Matsuda, Y. Iizuka, T. Kondo, H. Koseki, N. Yan, T. Higuchi, T. Fujita, and **H. Kato**. 2022. Intracellular virus sensor MDA5 mutation develops autoimmune myocarditis and nephritis. **J Autoimmun** 127: 102794. doi: 10.1016/j.jaut.2022.102794
4. Koenig, P. A., H. Das, H. Liu, B. M. Kummerer, F. N. Gohr, L. M. Jenster, L. D. J. Schiffelers, Y. M. Tesfamariam, M. Uchima, J. D. Wuerth, K. Gatterdam, N. Ruetalo, M. H. Christensen, C. I. Fandrey, S. Normann, J. M. P. Todtmann, S. Pritzl, L. Hanke, J. Boos, M. Yuan, X. Zhu, J. L. Schmid-Burgk, **H. Kato**, M. Schindler, I. A. Wilson, M. Geyer, K. U. Ludwig, B. M. Hallberg, N. C. Wu, and F. I. Schmidt. 2021. Structure-guided multivalent nanobodies block SARS-CoV-2 infection and suppress mutational escape. **Science** 371. doi: 10.1126/science.abe6230
5. Duic, I., H. Tadakuma, Y. Harada, R. Yamaue, K. Deguchi, Y. Suzuki, S. H. Yoshimura, **H. Kato**, K. Takeyasu, and T. Fujita. 2020. Viral RNA recognition by LGP2 and MDA5, and activation of signaling through step-by-step conformational changes. **Nucleic Acids Res** 48: 11664-11674. doi: 10.1093/nar/gkaa935
6. Soda, N., N. Sakai, **H. Kato**, M. Takami, and T. Fujita. 2019. Singleton-Merten Syndrome-like Skeletal Abnormalities in Mice with Constitutively Activated MDA5. **J Immunol** 203: 1356-1368. doi: 10.4049/jimmunol.1900354
7. Oda, H., K. Nakagawa, J. Abe, T. Awaya, M. Funabiki, A. Hijikata, R. Nishikomori, M. Funatsuka, Y. Ohshima, Y. Sugawara, T. Yasumi, **H. Kato**, T. Shirai, O. Ohara, T. Fujita, and T. Heike. 2014. Aicardi-Goutieres syndrome is caused by IFIH1 mutations. **Am J Hum Genet** 95: 121-125. doi: 10.1016/j.ajhg.2014.06.007
8. Funabiki, M.\* , **H. Kato\***, Y. Miyachi, H. Toki, H. Motegi, M. Inoue, O. Minowa, A. Yoshida, K. Deguchi, H. Sato, S. Ito, T. Shiroishi, K. Takeyasu, T. Noda, and T. Fujita. 2014. Autoimmune disorders associated with gain of function of the intracellular sensor MDA5. **Immunity** 40: 199-212. doi: 10.1016/j.immuni.2013.12.014
9. **Kato, H.**, O. Takeuchi, E. Mikamo-Satoh, R. Hirai, T. Kawai, K. Matsushita, A. Hiiragi, T. S. Dermody, T. Fujita, and S. Akira. 2008. Length-dependent recognition of double-stranded ribonucleic acids by retinoic

acid-inducible gene-I and melanoma differentiation-associated gene 5. *J Exp Med* 205: 1601-1610. doi: 10.1084/jem.20080091

10. [Kato, H.](#), O. Takeuchi, S. Sato, M. Yoneyama, M. Yamamoto, K. Matsui, S. Uematsu, A. Jung, T. Kawai, K. J. Ishii, O. Yamaguchi, K. Otsu, T. Tsujimura, C. S. Koh, C. Reis e Sousa, Y. Matsuura, T. Fujita, and S. Akira. 2006. Differential roles of MDA5 and RIG-I helicases in the recognition of RNA viruses. *Nature* 441: 101-105.