

## Shigehiro A. Kawashima, Ph. D.

Male (born in 1980)

Associate Professor

Laboratory of Synthetic Organic Chemistry (KANAI Group)

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### Education/Career

1999(H.11) 筑波大学附属駒場高等学校卒業

1999(H.11) 東京大学理科 II 類入学

2003(H.15) **B.Sc.** in Department of Biophysics & Biochemistry

The University of Tokyo (Prof. Masayuki Yamamoto)

2005(H.17) **M.Sc.** in Graduate School of Science, Biophysics & Biochemistry

The University of Tokyo (Prof. Yoshinori Watanabe)

2008(H.20) **Ph.D. (Science)**

Graduate School of Science, Biophysics & Biochemistry

The University of Tokyo (Prof. Yoshinori Watanabe)

2008(H.20)-2009(H.21) **Postdoctoral Associate**

Institute of Molecular and Cellular Biosciences,

The University of Tokyo (Prof. Yoshinori Watanabe)

2009(H.21)- 2012(H.24) **Postdoctoral Fellow**

Laboratory of Chemistry & Cell Biology

The Rockefeller University (Prof. Tarun Kapoor)

2012(H.24)-2018(H.30) **ERATO project Group Leader**

Graduate School of Pharmaceutical Sciences

ERATO Kanai Life-Science Catalysis Project (Prof. Motomu Kanai)

The University of Tokyo

2016(H.24)-2021(R.3) **Project Lecturer**

Graduate School of Pharmaceutical Sciences

The University of Tokyo (Prof. Motomu Kanai)

2021(R.3)- 2022(R.4) **Project Associate Professor**

Graduate School of Pharmaceutical Sciences

The University of Tokyo (Prof. Motomu Kanai)

2022(R.4)-present **Associate Professor**

Graduate School of Pharmaceutical Sciences  
The University of Tokyo (Prof. Motomu Kanai)

### **Fellowships & Grants**

2005-2008 JSPS Research Fellowship for Young Scientists (DC1)  
2009-2011 JSPS Postdoctoral Fellow for Research Abroad  
2011 Marie-Josée and Henry Kravis Fellowship Postdoctoral Fellowship  
2012 The Uehara Memorial Foundation, research fellowship  
2014-2018 Grant-in-Aid for Young Scientists (A) #26711001  
2016-2018 Grant-in-Aid for Scientific Research on Innovative Areas #16H01300  
2017 薬学振興会 平成 29 年度海外派遣研究者等旅費助成 [travel expenses grant]  
2017 The Naito Foundation, 2017 年度 内藤記念特定研究助成金  
2018 The Uehara Memorial Foundation, 平成 29 年度 研究奨励金  
2018-2019 Grant-in-Aid for Challenging Exploratory Research # 18K19138  
2019 公益財団法人 持田記念医学薬学振興財団 2019 年度研究助成金  
2019 公益財団法人 東京生化学研究会 2019 年度研究奨励金(I)  
2019 かなえ医薬振興財団 2019 年度(第 48 回)研究助成金  
2021 公益財団法人薬学振興会令和 2 年度基礎的研究助成  
2021-2024 Grant-in-Aid for Scientific Research (B) # 21H02074  
2022 一般財団法人材料科学技術振興財団令和 3 年度研究助成  
2022 公益財団法人 旭硝子財団 2022 年度研究助成金  
2023 公益財団法人 武田科学振興財団 2023 年度薬学系研究助成  
2023 公益財団法人 持田記念医学薬学振興財団 2023 年度研究助成金

### **Awards**

2010 第 27 回井上研究奨励賞 (Inoue Research Award for Young Scientists)  
2016 優秀ポスター賞(第 39 回日本分子生物学会年会)  
2019 平成 31 年度科学技術分野の文部科学大臣表彰 若手科学者賞

### **Publication List (\*Corresponding author)**

36. Fujimura A, Ishida H, Nozaki T, Terada S, Azumaya Y, Ishiguro T, Kamimura YR, Kujirai T, Kurumizaka H, Kono H, Yamatsugu K, **Kawashima SA\***, Kanai M\*. Designer adaptor proteins for functional conversion of peptides to small-molecule ligands toward in-cell catalytic protein modification. *ACS Central Science*, *in press* (2023).

35. Habazaki M, Mizumoto S, Kajino H, Kujirai T, Kurumizaka H, **Kawashima SA\***, Yamatsugu K\*, Kanai M\*. A chemical catalyst enabling histone acylation with endogenous acyl-CoA. *Nature Communications*, 14, 5790 (2023).

34. Umeda H, Sawazaki T, Furuta M, Suzuki T, **Kawashima SA**, Mitsunuma H, Hori Y, Tomita T, Sohma Y, Kanai M. Quantitative Assays for Catalytic Photo-Oxygenation of Alzheimer Disease-Related Tau Proteins. *ACS Chemical Neuroscience*, 14, 2710-2716 (2023).
33. Oda H, Sato Y, **Kawashima SA**, Fujiwara Y, Pálffy M, Wu E, Vastenhouw NL, Kanai M, Kimura H. Actin filaments accumulated in the nucleus and remain in the vicinity of condensing chromosomes during prophase in zebrafish early embryo. *Biology Open*, 12, bio059783 (2023).
32. **Kawashima SA**, Kanai M. Live Cell Synthetic Histone Acetylation by Chemical Catalyst. *Chromosome Analysis*, 2519, 155-161 (2022).
31. Zhang J, Li Q, **Kawashima SA**, Nasr M, Xue F, Zhao RY\*. Improving Drug Sensitivity of HIV-1 Protease Inhibitors by Restriction of Cellular Efflux System in a Fission Yeast Model. *pathogens*, 11, 804 (2022).
30. Adamson C, Kajino H, **Kawashima SA**\*, Yamatsugu K\*, Kanai M\*. Live-Cell Protein Modification by Boronate-Assisted Hydroxamic Acid Catalysis. *Journal of the American Chemical Society*, 143, 14976-14980 (2021).
29. Fujiyoshi K, **Kawashima SA**, Yamatsugu K, Kanai M. A Single-Step Asymmetric Phosphodiester Synthesis from Alcohols with Phosphoenolpyruvate Phosphodiester. *Synlett*, 32:1135-1140 (2021).
28. Fujiwara Y, Yamanashi Y, Sato Y, Kujirai T, Kurumizaka H, Kimura H, Yamatsugu K\*, **Kawashima SA**\*, Kanai M\*. Live-Cell Epigenome Manipulation by Synthetic Histone Acylation Catalyst System. *PNAS*, 118(4):e2019554118 (2021).
27. Kajino H, Nagatani T, Oi M, Kujirai T, Kurumizaka H, Nishiyama A, Nakanishi M, Yamatsugu K, **Kawashima SA**\*, Kanai M\*. Synthetic hyperacetylation of nucleosomal histones. *RSC Chemical Biology*, 1:56-59 (2020).
26. Mizumoto S, Xi S, Fujiwara Y, **Kawashima SA**, Yamatsugu K, Kanai M. Hydroxamic Acid-Piperidine Conjugate is an Activated Catalyst for Lysine Acetylation under Physiological Conditions. *Chemistry—An Asian Journal*, 15(6):833-839 (2020).
25. Domon K, Puripat M, Fujiyoshi K, Hatanaka M, **Kawashima SA**, Yamatsugu K, Kanai M. Catalytic Chemoselective O-Phosphorylation of Alcohols. *ACS Central Science*, 6(2):283-292 (2020).

24. Hamajima W, Fujimura A, Fujiwara Y, Yamatsugu K\*, **Kawashima SA\***, Kanai M\*. Site-Selective Synthetic Acylation of a Target Protein in Living Cells Promoted by a Chemical Catalyst/Donor System. *ACS Chemical Biology*, 14:1102-1109 (2019).
23. Kobayashi Y, **Kawashima SA\***. Bub1 kinase- and H2A phosphorylation-independent regulation of Shugoshin proteins under glucose-restricted conditions. *Scientific Reports*, 9:2826 (2019).
22. Chen Z, Suzuki H, Kobayashi Y, Wang AC, DiMaio F, **Kawashima SA**, Walz T, & Kapoor TM. Structural Insights into Mdn1, an Essential AAA Protein Required for Ribosome Biogenesis. *Cell*, 175:822-834 (2018).
21. Yamatsugu K, Furuta M, Xi S, Amamoto Y, Liu J, **Kawashima SA**, Kanai M. Kinetic analyses and structure-activity relationship studies of synthetic lysine acetylation catalysts. *Bioorganic & Medicinal Chemistry*, 26:5359-5367 (2018).
20. Ishiguro T, Tanabe K, Kobayashi Y, Mizumoto S, Kanai M, **Kawashima SA\***. Malonylation of histone H2A at lysine 119 inhibits Bub1-dependent H2A phosphorylation and chromosomal localization of shugoshin proteins. *Scientific Reports*, 8:7671 (2018).
19. Yamatsugu K\*, **Kawashima SA\***, Kanai M\*. Leading Approaches in Synthetic Epigenetics for Novel Therapeutic Strategies. *Current Opinion in Chemical Biology*, 46:10-17 (2018).
18. Tanabe K, Liu J, Kato D, Kurumizaka H, Yamatsugu K, Kanai M\*, **Kawashima SA\***. LC-MS/MS-based quantitative study of the acyl group- and site-selectivity of human sirtuins to acylated nucleosomes. *Scientific Reports*, 8:2656 (2018).
17. Ishiguro T, Amamoto Y, Tanabe K, Liu J, Kajino H, Fujimura A, Aoi Y, Osakabe A, Horikoshi N, Kurumizaka H, Yamatsugu K, **Kawashima SA\***, Kanai M\*. Synthetic chromatin acylation by artificial catalyst system. *Chem*, 2:840-859 (2017).
16. Amamoto Y, Aoi Y, Nagashima N, Suto H, Yoshidome D, Arimura Y, Osakabe A, Kato D, Kurumizaka H, **Kawashima SA\***, Yamatsugu K\*, Kanai M\*. Synthetic Posttranslational Modifications: Chemical Catalyst-Driven Regioselective Histone Acylation of Native Chromatin. *Journal of the American Chemical Society*, 139(22):7568-7576 (2017).
15. **Kawashima SA\*\*\***, Chen Z\*\*, Aoi Y, Patgiri A, Kobayashi Y, Nurse P, Kapoor TM\*. Potent, Reversible, and Specific Chemical Inhibitors of Eukaryotic Ribosome Biogenesis. *Cell*, 167(2):512-524 (2016). (\*\*Equal contribution)

14. Takemoto A, **Kawashima SA**, Li JJ, Jeffery L, Yamatsugu K, Elemento O, Nurse P. Nuclear envelope expansion is crucial for proper chromosomal segregation during a closed mitosis. *Journal of Cell Science*, 129(6):1250-1259 (2016).
13. Kimura Y, Saito N, Hanada K, Liu J, Okabe T, **Kawashima SA\***, Yamatsugu K\*, Kanai M\*. Supramolecular Ligands for Histone Tails by Employing a Multivalent Display of Trisulfonated Calix[4]arenes. *Chembiochem*, 16(18):2599-2604 (2015).
12. Chang F, **Kawashima SA**, Brady S. Mutations in the proteolipid subunits of the vacuolar H<sup>+</sup>-ATPase provide resistance to indolotryptoline natural products. *Biochemistry*, 53(45):7123-7131 (2014).
11. Aoi Y\*\*, **Kawashima SA\*\***, Simanis V, Yamamoto M, Sato M. Optimization of the analogue-sensitive Cdc2/Cdk1 mutant by in vivo selection eliminates physiological limitations to its use in cell cycle analysis. *Open Biology*, 4(7) (2014). (\*\*Equal contribution)
10. Aoi Y, Sato M, Sutani T, Shirahige K, Kapoor TM, **Kawashima SA\***. Dissecting the first and the second meiotic divisions using a marker-less drug-hypersensitive fission yeast. *Cell Cycle*, 13(8):1327-1334 (2014).
9. Komatsu H, Shindo Y, **Kawashima SA**, Yamatsugu K, Oka K, Kanai M. Intracellular activation of acetyl-CoA by an artificial reaction promoter and its fluorescent detection. *Chemical Communications*, 49(28):2876-2878 (2013).
8. **Kawashima SA**, Takemoto A, Nurse P, Kapoor TM. A chemical biology strategy to analyze rheostat-like protein kinase-dependent regulation. *Chemistry & Biology*, 20(2):262-271 (2013).
7. Li X, Foley EA, **Kawashima SA**, Molloy KR, Li Y, Chait BT, Kapoor TM. Examining post-translational modification-mediated protein-protein interactions using a chemical proteomics approach. *Protein Science*, 22(3):287-295 (2012).
6. **Kawashima SA**, Takemoto A, Nurse P, Kapoor TM. Analyzing fission yeast multidrug resistance mechanisms to develop a genetically tractable model system for chemical biology. *Chemistry & Biology*, 19(7):893-901 (2012).
5. **Kawashima SA**, Yamagishi Y, Honda T, Ishiguro K, Watanabe Y. Phosphorylation of H2A by Bub1 prevents chromosomal instability through localizing shugoshin. *Science*. 327(5962):172-177 (2010).

4. Hauf S, Biswas A, Langegger M, **Kawashima SA**, Tsukahara T, Watanabe Y. Aurora controls sister kinetochore mono-orientation and homolog bi-orientation in meiosis-I. *The EMBO Journal*, 26(21):4475-4486 (2007).
3. **Kawashima SA**, Tsukahara T, Langegger M, Hauf S, Kitajima TS, Watanabe Y. Shugoshin enables tension-generating attachment of kinetochores by loading Aurora to centromeres. *Genes & Development*, 21(4):420-435 (2007).
2. Kitajima TS, Sakuno T, Ishiguro K, Iemura S, Natsume T, **Kawashima SA**, Watanabe Y. Shugoshin collaborates with protein phosphatase 2A to protect cohesin. *Nature*, 441(7089):46-52 (2006).
1. Kitajima TS, **Kawashima SA**, Watanabe Y. The conserved kinetochore protein shugoshin protects centromeric cohesion during meiosis. *Nature*, 427(6974):510-517 (2004).