

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: SHIN, JINWOO

eRA COMMONS USER NAME (credential, e.g., agency login): SHIN.JINWOO

POSITION TITLE: POSTDOCTORAL SCHOLAR

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Hallym University, Chuncheon, Republic of Korea	BS	08/2015	Organic Chemistry
Korea University, Seoul, Republic of Korea	PHD	08/2021	Organic Chemistry
Stanford University, Stanford, CA	Postdoctoral Scholar	Present	Chemical Biology

A. Personal Statement

I am a Postdoctoral Scholar in the Department of Chemistry at Stanford University under the guidance of Professor Eric T. Kool. My research integrates organic chemistry, chemical biology, and medicinal chemistry to address fundamental questions in nucleic acid biology and human health. Specifically, my current work focuses on two complementary directions:

- Investigating the genotoxic risks associated with dietary intake of damaged DNA from heat-processed foods.
- Developing fluorogenic covalent labeling strategies for RNA.

I have direct experience over the last 2 years in feeding mice daily by gavage and isolating tissues. I also have extensive experience in isolating DNA from mouse tissues, and extracting DNA from food samples. Previously, during my Ph.D. training, I developed advanced fluorescent probes for Alzheimer's disease imaging and multifunctional phototherapeutics for cancer therapy. These projects broadened my expertise in organic synthesis, photophysics, fluorophore development, and biological evaluation. As a result, those experiences complement my current focus on nucleic acid biology. I have also been recognized internationally through the CAS Future Leaders program and multiple national fellowships, which underscore both the scientific impact and broader potential of my work.

B. Positions, Scientific Appointments, and Honors**Positions and Scientific Appointments**

2023 – Present Postdoctoral Scholar, Stanford University, Stanford, CA
2021 – 2022 Research Professor, The Institute of Basic Science, Korea University, Seoul, Republic of Korea

Honors

2024 Post-Doctoral Overseas Training Fellowship, National Research Foundation of Korea, Republic of Korea.
2023 13th S-Oil Dissertation of the Year Award, Chemistry, The Korean Academy of Science and Technology and S-Oil, Republic of Korea.
2022 CAS Future Leaders 2022, Chemical Abstracts Service, a division of the American Chemical Society.
2015 Summa cum laude, Department of Chemistry, Hallym University, Republic of Korea.

C. Contributions to Science

1. Food-derived DNA Damage as a Source of Genotoxicity

- Discovered ingestion of heat-damaged DNA in foods as a novel source of genotoxic exposure, revealing substantial increases in oxidative (8-oxo-dG) and deaminative (dU) lesions during cooking.
- Established LC-MS/MS-based quantification and complementary cellular assays to evaluate food-derived DNA lesions, providing a foundation for assessing their roles in mutagenesis and carcinogenesis.
 - A. **J. Shin**, P. Jaruga, M. Dizdaroglu, E. T. Kool,* DNA Content and DNA Damage in Raw and Heat-processed Foods. *J. Agric. Food Chem.*, manuscript accepted, **2025**.

2. Fluorogenic Covalent Labeling of RNA

- Developed wavelength-tunable fluorogenic probes (RiboLight) that covalently label RNA via selective 2'-OH acylation, achieving up to 970-fold selectivity over DNA and enabling multicolor, low-background visualization of RNA dynamics.
- Applied these probes for real-time monitoring of RNA synthesis, RNA-selective gel electrophoresis analysis, and wash-free cellular imaging of native and stress-induced RNA structures.
 - A. **J. Shin**, M. J. Kim, E. T. Kool,* Fluorogenic Covalent Probes for RNA. *BioRxiv*, **2025** (DOI: 10.1101/2025.08.29.673142).

3. Advanced Fluorescent Probes

- Developed advanced fluorescent probes for Alzheimer's disease, including two-photon fluorophores for deep-tissue imaging of A β plaques and early diagnostic tools for selective detection of toxic A β oligomers in patient samples with *in vivo* imaging capability.
- Authored a comprehensive *The Royal Society of Chemistry* monograph chapter on ratiometric fluorescent chemosensors, outlining fundamental photophysical mechanisms and design strategies that inform next-generation molecular probe development.
 - A. **J. Shin**, J. An, J. Kim, Y. Noh, P. Jangili,* J. S. Kim,* Ratiometric Fluorescent Chemosensors: Photo-physical/chemical Mechanism Principles and Design Strategies. in *Fluorescent Chemosensors*. eds. L. Wu, A.C. Sedgwick, X.-P. He & T.D. James. (124–159). *The Royal Society of Chemistry*, **2023**. (DOI: 10.1039/9781839167324-00124).
 - B. J. An, K. Kim, H. J. Lim, H. Y. Kim, **J. Shin**, I. Park, I. Cho, H. Y. Kim, S. Kim, C. McLean, K. Y. Choi, Y. Kim*, K. H. Lee*, J. S. Kim,* Early onset diagnosis in Alzheimer's disease patients via amyloid- β oligomers-sensing probe in cerebrospinal fluid. *Nat. Commun.* **2024**, *15*, 1004 (DOI: 10.1038/s41467-024-44818-x).
 - C. **J. Shin**, P. Verwilst, H. Choi, S. Kang, J. Han, N. H. Kim, J. G. Choi, M. S. Oh, J. S. Hwang, D. Kim,* I. M.-Jung,* J. S. Kim,* Harnessing Intramolecular Rotation to Enhance Two-photon Imaging of A β Plaques Through Minimizing Background Fluorescence. *Angew. Chem. Int. Ed.* **2019**, *58*, 5648–5652 (DOI: 10.1002/anie.201900549).

4. Multifunctional Phototherapeutics

- Developed wavelength-engineerable porous organic polymer photosensitizers with protonation-triggered reactive oxygen species generation, enabling tunable photophysical properties and enhanced photodynamic efficacy in cancer.
- Designed mitochondria-targeted nanotheranostic platforms that harness single-laser-activated dual photodynamic and photothermal therapy with dual-mode (photoacoustic/NIR fluorescence) imaging, achieving potent tumor suppression even under hypoxic conditions.
 - A. **J. Shin**, D. W. Kang, J. H. Lim, J. M. An, Y. Kim, J. H. Kim, M. S. Ji, S. Park,* D. Kim,* J. Y. Lee,* J. S. Kim,* C. S. Hong,* Wavelength engineerable porous organic polymer photosensitizers with protonation triggered ROS generation. *Nat. Commun.* **2023**, *14*, 1498 (DOI: 10.1038/s41467-023-37156-x).
 - B. **J. Shin**, Y. Xu, S. Koo, J. H. Lim, J. Y. Lee,* A. Sharma,* Y. Sun,* J. S. Kim,* Mitochondria-targeted Nanotheranostic: Harnessing Single Laser Activated Dual Photo-therapeutic Processing for Hypoxic Tumor Treatment. *Matter* **2021**, *4*, 2508–2521 (DOI: 10.1016/j.matt.2021.05.022).