

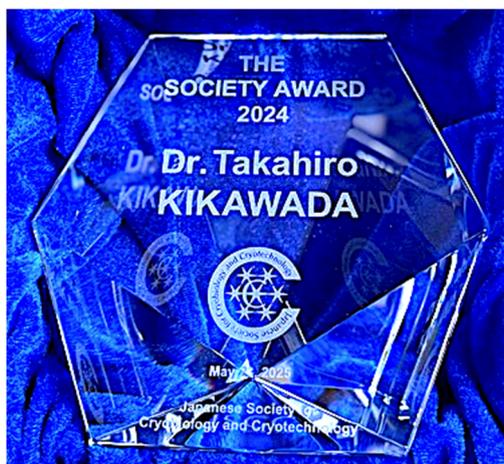
## Grounds for winning the 2024 Society Award of the Japan Society for Cryobiology and Cryotechnology

Molecular Mechanisms of Anhydrobiosis in the Sleeping Chironomid

Takahiro Kikawada

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Dr. Takahiro Kikawada completed his master's degree in Agricultural Chemistry at the Graduate School of Agriculture, Iwate University in March 1994. In April of the same year, he joined the Ministry of Agriculture, Forestry and Fisheries as a researcher at the National Institute of Sericulture and Entomological Science (Tsukuba, Japan). In October 1994, he was transferred to the Laboratory of Genetic Resources in Yamanashi Prefecture, where he worked on the preservation of silkworm genetic resources until July 1999. He was then reassigned to the institute's main office in Tsukuba. Following the reorganization into an incorporated administrative institution in April 2001, the institute became the National Institute of Agrobiological

Sciences (NIAS). Dr. Kikawada was promoted to Senior Researcher in 2005 and obtained his Ph.D. in Engineering from the Tokyo Institute of Technology in April 2009 (Supervisor: Prof. Minoru Sakurai). After a series of promotions—Principal Researcher in 2016, Chief Researcher in 2019—he assumed his current position as Group Leader in 2023. Since 2015, he has also served as Visiting Associate Professor and, since 2023, as Visiting Professor at the University of Tokyo.

Dr. Kikawada's major scientific contributions center on the elucidation of molecular mechanisms of anhydrobiosis in the sleeping chironomid *Polypedilum vanderplanki*, an insect endemic to semi-arid regions of Africa whose larvae can survive almost complete desiccation and resume activity upon rehydration.

He conducted the first genome sequencing of *P. vanderplanki*, revealing the expansion and clustering of desiccation-related genes on a single chromosome (Nature Commun., 2014; NAR Genomics and Bioinformatics, 2022). He further identified HSF1—a known heat shock factor—as a master regulator of anhydrobiosis-related gene expression (PNAS, 2018; Int. J. Mol. Biol., 2021), and reported feedforward regulatory circuits governing transcriptional responses during desiccation (PLoS ONE, 2020). His metabolomic analysis showed a drastic decrease in ATP levels during desiccation and rapid reactivation upon rehydration (PNAS, 2020), confirming the complete metabolic arrest associated with anhydrobiosis.

He also discovered intrinsically disordered LEA proteins in *P. vanderplanki* (BBRC, 2007; Insect Biochem Mol Biol, 2013), and identified the first animal trehalose transporter (TRET1) (PNAS, 2007) and later, a sodium-dependent variant STRT1 (PNAS, 2024), elucidating trehalose homeostasis under desiccation stress.

Collaborative studies established that Pv11 cells—a desiccation-tolerant cell line derived from *P. vanderplanki*—can be stored in a dry state at room temperature for over a year. Dr. Kikawada developed gene transfection techniques for these cells (Extremophiles, 2017; Sci Rep, 2019),

demonstrating that even heterologous proteins can retain function in dried Pv11 cells for extended periods (Sci Rep, 2017). He has also established CRISPR genome editing for Pv11 cells (Sci Rep, 2021).

These achievements have earned him multiple awards including the NIAS Incentive Award, the Society for Extremophiles Young Scientist Award, and the JSCC Young Investigator Award. Recently, he is an invited keynote speaker at CRYO2025 (to be held in Hannover, Germany) at the request of Prof. Dr. Wim Wolkers, a key organizer, where he will present the latest advances in anhydrobiosis research.

Dr. Kikawada also served as Chair of the 57th Annual Meeting of the JSCC in 2012 and organized the NIAS International Seminar for Cryobiology and Cryotechnology. He is currently Chair of the 70th Annual Meeting (2025), a Board Member of JSCC, and has served as General Affairs Director and Chief Editor of the society's journal.

In recognition of his outstanding contributions to the molecular biology of anhydrobiosis and his leadership in advancing applied research and international collaboration, the Japanese Society for Cryobiology and Cryotechnology is proud to confer upon Dr. Takahiro Kikawada the 2025 Society Award.