

Lipid Medicine

Principal Investigator: Takashi MATSUZAKA

E-mail.address: t-matsuz@md.tsukuba.ac.jp

URL: <https://sites.google.com/view/matsuzakalab-tsukuba/home>



Major Scientific Interests of the Group

Fatty acids are essential for our life as a source of energy, structural components of membranes, and signaling molecules. We identified and characterized a novel mammalian fatty acid elongase, Elovl6, which catalyzes the elongation of C16 saturated and monounsaturated fatty acids to form C18 fatty acids. Our work is focused on the regulation of fatty acid chain length and its role in metabolic disease, neurodegenerative disease, cancer, and rare disease. As well as unravelling the mysteries of the fatty acid diversity and biology, we are interested in the development of new therapeutic approaches to treat various diseases based on the quality control of fatty acids.

Projects for Regular Students in Doctoral or Master's Programs

- 1) Elucidation of the role of Elovl6 in MASLD/MASH
- 2) Elucidation of the role of Elovl6 in Diabetes
- 3) Development of novel cancer therapies targeting Elovl6
- 4) Development of novel therapies for neurodegenerative diseases by targeting Elovl6

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

- 1) Lipid extraction, lipid quantification, and fatty acid composition analysis using mass spectrometry
- 2) Metabolic studies using genetically engineered mice

Selected Publications

- 1) Motomura K, Matsuzaka T, Shichino S, Ogawa T, Pan H, Nakajima T, Asano Y, Okayama T, Takeuchi T, Ohno H, Han SI, Miyamoto T, Takeuchi Y, Sekiya M, Sone H, Yahagi N, Nakagawa Y, Oda T, Ueha S, Ikeo K, Ogura A, Matsushima K, Shimano H. Single-Cell Transcriptome Profiling of Pancreatic Islets From Early Diabetic Mice Identifies Anxa10 for Ca²⁺ Allostasis Toward β -Cell Failure. *Diabetes*. 2024 Jan 1;73(1):75-92.
- 2) Garcia Corrales AV, Verberk SGS, Haidar M, Grajchen E, Dehairs J, Vanherle S, Loix M, Weytjens T, Gervois P, Matsuzaka T, Lambrechts I, Swinnen JV, Bogie JFJ, Hendriks JJA. Fatty acid elongation by ELOVL6 hampers remyelination by promoting inflammatory foam cell formation during demyelination. *Proc Natl Acad Sci U S A*. 2023 Sep 12;120(37):e2301030120.
- 3) Matsuzaka T, Kuba M, Koyasu S, Yamamoto Y, Motomura K, Arulmozhiraja S, Ohno H, Sharma R, Shimura T, Okajima Y, Han SI, Aita Y, Mizunoe Y, Osaki Y, Iwasaki H, Yatoh S, Suzuki H, Sone H, Takeuchi Y, Yahagi N, Miyamoto T, Sekiya M, Nakagawa Y, Ema M, Takahashi S, Tokiwa H, Shimano H. Hepatocyte ELOVL Fatty Acid Elongase 6 Determines Ceramide Acyl-Chain Length and Hepatic Insulin Sensitivity in Mice. *Hepatology*. 2020 May;71(5):1609-1625.
- 4) Zhao H, Matsuzaka T, Nakano Y, Motomura K, Tang N, Yokoo T, Okajima Y, Han SI, Takeuchi Y, Aita Y, Iwasaki H, Yatoh S, Suzuki H, Sekiya M, Yahagi N, Nakagawa Y, Sone H, Yamada N, Shimano H. Elovl6 Deficiency Improves Glycemic Control in Diabetic db/db Mice by Expanding β -Cell Mass and Increasing Insulin Secretory Capacity. *Diabetes*. 2017 Jul;66(7):1833-1846.
- 5) Matsuzaka T, Shimano H, Yahagi N, Kato T, Atsumi A, Yamamoto T, Inoue N, Ishikawa M, Okada S, Ishigaki N, Iwasaki H, Iwasaki Y, Karasawa T, Kumadaki S, Matsui T, Sekiya M, Ohashi K, Hasty AH, Nakagawa Y, Takahashi A, Suzuki H, Yatoh S, Sone H, Toyoshima H, Osuga J, Yamada N. Crucial role of a long-chain fatty acid elongase, Elovl6, in obesity-induced insulin resistance. *Nat Med*. 2007 Oct;13(10):1193-202.