



Theme of Master Thesis:

Title

Development of lipoprotein eye drops for therapy of eye diseases

High-density lipoprotein (HDL) is an anti-atherosclerotic lipid nanoparticle in blood. Its nascent form (nanodisc) can be reconstituted by mixing recombinant apolipoprotein A-I (apoA-I) and phospholipids. Recently, microfluidic methods for nanodiscs have been developed, which is expanding the medical applications of HDL. Focusing on the pathological similarity between atherosclerosis and age-related macular degeneration, our lab is aiming at developing nanodisc eye drops by protein engineering to enhance the corneal/conjunctival absorption, the targeting ability, and the anti-atherosclerotic activities.

The MSc candidates will learn the techniques for:

1. E. coli culture for protein expression
2. Protein purification with affinity chromatography
3. Microfluidic preparation of nanodiscs
4. Physicochemical (size, zeta potential, circular dichroism spectroscopy, etc) and biochemical analyses (protein/lipid quantification) of nanodiscs
5. Eye drop studies in mice (preparation and fluorescence microscopy analysis of thin sections of mouse eyes)

**Prof. Dr. Tatsuya Murakami**

Department of Pharmaceutical Engineering, Faculty of Engineering, Toyama Prefectural University

5180 Kurokawa, Imizu

939-0398 Toyama, Japan

Phone: +81-766-56-7500 ext. 1752

[murakami@pu-toyama.ac.jp](mailto:murakami@pu-toyama.ac.jp)

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