

変革を駆動する先端物理・数学プログラム (FoPM)

国外連携機関長期研修 報告書

氏 名	工藤 脩史
所属部局	理学系研究科 化学専攻
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I took Online lectures "Principles of Biochemistry" and "Drug Discovery & Medicinal Chemistry" from 2022/12/01 to 2023/01/31. These courses were offered as Massive Open Online Courses (MOOCs) platform edX courses from Harvard university and Davidson college, respectively.

”Principles of Biochemistry”

I take this course to broaden the use of my research or to deepen my understanding of the position and content of my research. This lecture is developed on biomolecules, mainly proteins. I am able to learn about protein structure and its movement in living organisms. In my research, DNA modification techniques are used for proteins and peptides, and I believe that an understanding of proteins will help my understanding of my research. In addition, although I have been working with biomolecules, I have concentrated on their chemical aspects and have not had a good understanding of their roles in the body. In this lecture, I will be able to learn about the molecular biological aspects of biomolecules because they will also be able to learn about the movement of proteins in the body.

I learned biochemistry from a chemical and small-scale perspective, starting with structural biology and evaluating the basic structure of biomolecules and enzymatic activity. From then on, I learned about metabolic pathways and synthetic pathways of biomolecules, and specific diseases caused by the inhibition of these pathways were mentioned. Section 1 focused on the basic structures of proteins, lipids, and carbohydrates from a structural biology. The section mentioned about the inhibition and evaluation of enzymatic reactions. Section 2 focused on energy production in vivo, such as the glycolytic system, the citric acid cycles, the electron transfer system, and ATP synthesis. The link between energy production and diabetes was mentioned. Section 3 was about energy production in different parts of the body, such as the liver, muscles, and brain, and mentioned phenylketonuria (PKU), which is caused by abnormalities in metabolism. Section 4, on synthesis and degradation of biomolecules, referred to the metabolism of nucleic acids, carbohydrates, and lipids and the biomolecules synthesized by them. Cancer was mentioned as a related disease.

My overall impression was that the course was more practical than the biochemistry I studied as an undergraduate because the effects and numerical values were more concrete and referred to diseases. The specific actions and numerical values gave me a chemical image, which deepened my understanding of reactions in living organisms.

”Drug Discovery & Medicinal Chemistry”

I am taking this course to help in my future career as I am considering working for a pharmaceutical company. In this lecture, in addition to learning about the chemical aspects of drugs, such as their functions in the body and the meaning of their structures, I will also learn about aspects other than chemistry, such as the drug screening process and how to handle data. The molecular biology and non-chemistry aspects of drug molecules are perspectives that are new to me, and I expect that learning about them will broaden my perspective.

In Chapter 1, starting with unmet medical needs, a concept necessary for target selection in drug development, I learned where in the pathogenesis pathway a drug target should be targeted and the steps necessary for a drug to reach the market. In Chapter 2, the topic of enzyme crystallization, evaluation, and inhibition was discussed, as well as hydrogen bonding and other chemical properties of drugs. In Chapter 3, the theme was drug kinetics, and each step in detail according to the basic flow of pharmacokinetics called ADME (absorption, distribution, metabolism, excretion). In Chapter 4, the theme was drug screening, in which chemical modifications to drugs.

I was able to learn about the process of screening and bringing drugs to market, which I had not known before. It was also interesting to learn that, even when looking at the same functional group, the properties of molecules from chemical perspective often focused on the reactions between molecules, but from a pharmacological perspective, the properties are viewed differently, such as membrane permeability and affinity for enzymes.

I learned about understanding the role of biomolecules in the body from both biochemical and pharmaceutical

perspectives.

"Principles of Biochemistry" taught me about metabolic and synthetic pathways and related diseases, and "Drug Discovery & Medicinal Chemistry" taught me about the specific process of bringing a drug to market, which I believe fully fulfilled my initial goal of understanding pharmaceutical science with a view to working for a pharmaceutical company.

