

Thesis Abstract

No. _____

Registration Number	☐ “KOU” ☐ “OTSU” No. _____ *Office use only	Name	SATO kensuke
Thesis Title Dynamics of Host Physiology and Gut Microbiota Through Dietary Behaviors and Nutrient Factors			
Thesis Summary Diet is a fundamental biological activity that plays a crucial role in the survival and physiology of living organisms. Dietary styles shifted from a hunting and gathering lifestyle next to starvation and malnutrition to the modern era of satiation with calories and nutrients. Concurrently, a multitude of novel health issues have emerged. In addition, the gut microbiome has associations with the host’s physiological functions and diseases. The impact of basic dietary behaviors and dietary factors, alone or in combination, on the gut microbiota and host physiology remains poorly understood. Here, we examined the impacts of feeding behaviors and dietary factors directly and via the gut microbiota on gene expression and pathology in host tissues and their potential for regulation. Chapter 1 introduces changes in the human diet and dietary factors that alter gut microbiota and their functions. In Chapter 2, it is shown that water restriction disrupts intestinal homeostasis through the bloom of intestinal bacteria and the decreases in immune cells, which diminishes the ability to eliminate pathogenic bacteria. Chapters 3-4 demonstrated that combined exposure to dietary factors or a combination of fasting and dietary factors can enhance the effects on the host and gut microbiota. Co-exposure to methylmercury and copper specifically altered gene expression in the brain of fetal mice and discussed the importance and risks of understanding the biological effects (Chapter 3). On the other hand, the combination of fasting and Microbiota-Accessible Carbohydrates (MACs) that are non-digestible for the host can dramatically alter the gut microbial structures in a short time and enhance IgA production (Chapter 4). These results proposed a powerful method to effectively alter the robust gut microbiota. In Chapter 5, sorbitol, which is used as a sweetener, aggravates colitis via gut bacteria-derived metabolite. These findings indicate that the consumption of MACs does not always have a beneficial effect and underscore the importance of understanding the function of gut microbiome in each pathology and tailoring interventions to condition of each individual. Finally, Chapter 6 summarizes the findings of this study and presents insights for future research. By evaluating the significance of fundamental dietary behaviors, this study contributes to further research for understating the relationship between the gut microbiota and the host and the application to health maintenance. Keywords: Water restriction, Gut microbiome, Metal exposures, Microbiota-Accessible Carbohydrates, Mucosal immunity			