

Course title	Clinical pathophysiology 1		
Term	後期 2nd Half		
Credit(s)	1		
The main day		The main period	
Program/Department	48 Physiological Sciences		
Lecturers	Motohiro Nishida, Junichi Nabekura, et al.		
成績評価区分 Grading Scale	A, B, C, Dの4段階評価 Four-grade evaluation		
レベル Level	Level 3		
力量 Competence	専門力 Academic expertise		

Instructor
Full name
* FURUSE MIKIO
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Outline	About each of four topics, cardiovascular system, nociception and pain, epithelial homeostasis, and metabolic regulation, lecturers in the basic fields will give an overview of the mechanisms of the normal functioning. After that, clinical researchers invited from outside will give a lecture on the clinical pathology and treatment for diseases caused by abnormalities in these mechanisms. By relating the basic understanding of physiology to pathologies, students will learn how abnormalities in basic physiology contribute to the development of diseases and pathologies. Students will also understand how the normalization of basic physiological mechanisms can lead to the treatment of pathologies and diseases.
Learning objectives	(1) To explain the signaling mechanisms of cardiovascular dynamism and their pathophysiology in terms of biological functions of molecules and cells constituting the cardiovascular system. (2) To explain the mechanism by which nociceptive stimuli are received at peripheral nerve endings and transmitted through the spinal cord to the cerebrum where they are modified and become pain sensations. (3) To explain the cellular basis of epithelial homeostasis and pathologies caused by its failure, with a particular focus on the epithelial barrier function. (4) To explain the mechanism of whole-body homeostasis by organ-organ interaction, including the brain, that regulates feeding and metabolism.
Grading policy	Assignments will be given for each of the four topics of the course: Cardiovascular System, Nociception and Pain, Epithelial Homeostasis, and Metabolic Regulation. Students are required to prepare and submit a report on one of them. The faculty member in charge of each topic will evaluate the content of the report. Attendance of at least half of the class is required for credit.
Lecture Plan	1st lecture, October 23 (Wed) 10:00–11:30 AM “Cardiovascular system (clinical)” Motohiko Sato (Aichi Medical University, Graduate School of Medicine) Cardiovascular system consisting of the heart and vessels plays important roles to maintain the biological function of human and animals. In this lecture, the mechanism of the heart as blood pump and regulation of the cardiac output within the systemic circulation will be described. Consequently, students will increase understanding of 1) cardiac excitation–contraction coupling, 2)the harmonized coordination of each cardiac chambers and valves to facilitate blood flow, and 3) the compensatory mechanism embedded in the cardiovascular system which is essential for upholding systemic circulation under human disease.

2nd lecture, October 30 (Wed) 10:00–11:30 AM

“Cardiovascular system (basic)”

Motohiro Nishida (Physiological Sciences Program)

In this lecture, I will introduce the pathophysiological mechanisms of diseases resulting from the formation, maintenance, and dysfunction of cardiovascular tissues responsible for blood circulation in human body. First, I will discuss ion channels and signal transduction molecules that serve as the basis for the control of electrical excitation conduction and muscle contraction in mature cardiomyocytes and vascular smooth muscle cells. Additionally, I will introduce therapeutic targets for heart failure and discuss the pathophysiological mechanisms of cardiovascular dysfunction. Furthermore, I will introduce the roles of central metabolic pathways and organ-organ interactions in the pathogenesis of drug-resistant heart failure.

3rd lecture, November 6 (Wed) 10:00–11:30 AM

“Nociception and pain (basic 1)”

Makoto Tominaga (Nagoya City University, Center for Advanced Research and Development)

Nociception is caused by activation of nociceptive receptors in the peripheral sensory neurons. Most of the receptors are ion channels, activation of which leads to the action potential generation through activation of voltage-gated Na⁺ channels.

4th lecture, November 13 (Wed) 10:00–11:30 AM

“Nociception and pain (basic 2)”

Junichi Nabekura (Physiological Sciences Program)

Nociceptive information is conveyed to the brain through spinal code, and the ‘pain’ sensation occurs. The nociceptive signals go to limbic system involved in memory and emotion in addition to the sensory area of cerebral cortex in the brain while the signals are well modified in the brain.

5th lecture, November 27 (Wed) 10:00–11:30 AM

“Nociception and pain (clinical)”

Takahiro Ushida (Aichi Medical University, Graduate School of Medicine)

In the lecture “Treatment Strategies for Pain Patients in Clinical Practice,” we explore the essentials of understanding pain’s physiological and psychological aspects. We differentiate between chronic and acute pain and discuss assessment methods like observation, interviewing, and examination. The lecture highlights a comprehensive approach to treatment, incorporating pharmacotherapy, physical therapy, psychotherapy, and complementary medicine. The objective is to enhance participants’ skills in applying these strategies effectively in clinical settings.

6th lecture, December 11 (Wed) 10:00–11:30 AM

“Epithelial homeostasis (basic)”

Mikio Furuse (Physiological Sciences Program)

In this lecture, I will introduce the epithelial barrier function and the pathologies caused by its dysfunction. First, I will present the mechanisms that support the epithelial barrier function, which separates the inside and outside of the body, of the intestinal tract and skin as examples. Next, I will explain the mechanisms that limit the permeation of substances through the intercellular space, and the pathologies caused by abnormalities in these mechanisms.

7th lecture, December 18 (Wed) 10:00–11:30 AM

“Epithelial homeostasis (clinical)”

Akiharu Kubo (Kobe University, Graduate School of Medicine)

In this lecture I will present the mechanisms that maintain the homeostasis of the skin, which is the barrier that covers our body and is the interface with the outside world. I will also introduce the pathological mechanisms of diseases, including atopic dermatitis, caused by the breakdown of the skin barrier. In particular, (1) the mechanism of cell replacement with maintaining the tight junction barrier in the epidermis, where cells are continuously replaced by cell turnover, and (2) the symptoms caused by clonal proliferation of mutant cells in the epidermis and the mechanism to inhibit their overgrowth will be presented.

8th lecture, January 15 (Wed) 10:00–11:30 AM

“Metabolic regulation (basic)”

Yasuhiko Minokoshi (Sugiyama Jogakuen University, School of Life Studies)

In this lecture, I will introduce the mechanisms of whole-body homeostasis by feeding and peripheral metabolism. First, I will introduce how organ-organ interaction, including the brain, maintains homeostasis by controlling feeding-induced metabolic disturbance. Next, I will overview the molecular mechanisms of feeding. In this theme, I will introduce the idea that feeding involves feeling “positive valence,” and the mechanism, such as the reward system, contributes to metabolic homeostasis and abnormality.

	<p>9th lecture, January 29 (Wed) 10:00–11:30 AM</p> <p>“Metabolic regulation (clinical)”</p> <p>Hiroshi Arima (Nagoya University, Graduate School of Medicine)</p> <p>Water balance is regulated by water intake and an antidiuretic hormone, vasopressin, which is released from the posterior pituitary, while energy balance is regulated by food intake and energy expenditure. In this lecture, I will explain the regulation of water and energy balance by hypothalamus, as well as the pathophysiology and treatment of the disorders such as central diabetes insipidus, hyponatremia and obesity.</p>
Location	online
Language	English (Some lectures may be given in Japanese)
Textbooks and references	<p>Arnold M. Katz, “Physiology of the Heart”, Lippincott Williams & Wilkins (1st lecture)</p> <p>Guyton and Hall Textbook of Medical Physiology (13th edition) (2nd lecture)</p>
Notes for students of other programs	Please contact the faculty member in charge in advance.
Contact for Course Inquiries	<p>Mikio Furuse</p> <p>furuse@nips.ac.jp</p>