

## 课程详述

### COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 <b>Course Title</b>	动物生理学/ <b>Animal Physiology</b>
2.	授课院系 <b>Originating Department</b>	生物系/ <b>Department of Biology</b>
3.	课程编号 <b>Course Code</b>	BIO311-14
4.	课程学分 <b>Credit Value</b>	
5.	课程类别 <b>Course Type</b>	专业核心课（生物科学专业） <b>Major Core Courses (Biological Sciences)</b> 专业选修课（生物技术、生物信息专业） <b>Major Elective Courses (Biotechnology, Bioinformatics)</b>
6.	授课学期 <b>Semester</b>	春季 <b>Spring</b> / 秋季 <b>Fall</b>
7.	授课语言 <b>Teaching Language</b>	英文 <b>English</b> / 中英双语 <b>English &amp; Chinese</b>
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	侯圣陶，教授，生物系 <b>HOU Shengtao, Professor, Department of Biology</b> <b>Hou.st@sustc.edu.cn</b> 程龙珍，助理教授，生物系 <b>CHENG Longzhen, Assistant Professor, Department of Biology</b> <b>Chenglz@sustc.edu.cn</b>
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 <b>To be announced</b>
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	

11. 授课方式 Delivery Method	讲授	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	Total
学时数 Credit Hours	38	8		2 (presentation, class project)	48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 None				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 None				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 None				

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

《动物生理学》是生命科学的核心，为一门研究动物机体基本生命活动及其规律的学科，是医学，动物医学、生物学、生物技术、医学工程等专业必修的专业基础课。通过《动物生理学》的学习，使学生掌握动物在适应环境变化的过程中所发生的包括行为、各器官系统、细胞及其组成物质分子在内的活动变化与机制的基本规律、基本理论；了解《动物生理学》的理论在动物医学、动物生产、动物资源保护与利用等实践活动中的作用；了解《动物生理学》和其它相关学科间的相互关系及该学科发展的前沿热点问题，为后续课程的学习和今后从事动物生理学及其相关学科的研究、发展打下宽厚的理论基础。

This course will provide an introduction to the physical and chemical principles governing the lives of animals with an emphasis on understanding the physiological problems animals face, how those problems vary in relation to animals' environments, and the processes by which animals solve their problems. The laboratory focuses on independent investigation and collaborative team work (taking the theory class is a prerequisite to the laboratory class). This is a compulsory course for students studying Medicine, Biology, Biotechnology, and Bioengineering.

#### 16. 预达学习成果 Learning Outcomes

##### [掌握]

1. 动物生理学研究的任务、对象；机体机能活动机制的内涵及生命活动的物质属性；

1. The research task and object of animal physiology; the function of organism activity mechanism and the material property of life activity;

2. 动物机能调节方式及其相互关系、反馈性机能调节在生命活动中的意义。

2. The mode of regulation of animal and their relationship, the function of feedback in life activities.

##### [熟悉]

1. 《动物生理学》研究动物生命活动的三个水平，建立机体机能整体性概念；

1. The three levels of animal life activities in "Animal physiology", the concept establishment of body function integrity;

2. 内环境、内环境稳态、神经内分泌系统的概念。

2. The concepts of inner environment, internal environment steady state and neuroendocrine system

##### [了解]

1. 《动物生理学》是实验性学科，实验的重要性和研究的方法；

1. "Animal physiology" is the experimental discipline, the importance of the experiment and the method of research;

17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）

**Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)**

第一章细胞的基本功能

学时：6 学时

Chapter 1 Basic Functions of Cells

Hours: 6 h

主要内容：

Outline:

1 细胞物质转运功能

1 Cell material transport function

细胞膜的结构

The structure of cell membrane

细胞膜的跨膜物质转运功能

Transmembrane transport function of Cell membrane

2 细胞的跨膜信号转导功能

2 Cell transmembrane signal transduction function

由离子通道介导的跨膜信号转导

Ion channel - mediated transmembrane signal transduction

由 G 蛋白耦联受体介导的跨膜信号转导

G - protein - coupled receptor - mediated transmembrane signal transduction

酶耦联受体介导的跨膜信号转导

Enzyme - coupled receptor - mediated transmembrane signaling

3 细胞的兴奋性和生物电现象

3 Cell excitability and bioelectric phenomena

细胞的兴奋性和刺激引起兴奋的条件

The excitability of the cells and conduction of stimulate caused excitement

细胞的生物电现象及其产生机制

The bioelectric phenomenon of cells and its mechanism

动作电位的引起和它在同一个细胞上的传导

Action potential and its conduction on the same cell

4 兴奋在细胞间的传递

4 Transmit of excitement between cells

经典的突触传递

Synaptic transmission

电突触

Electrical synapses

教学要求:

Requirements:

[掌握]

1. 细胞跨膜物质转运中的各种被动转运、主动转运的机制

1.Passive transport and active transport mechanism of cell transmembrane transport

2.由离子通道和由 G 蛋白耦联受体介导的跨膜信号转导过程

2. Ion channel - mediated and G - protein - coupled receptor - mediated transmembrane signal transduction

3. 生物电的种类、产生、特性、传导和传递机制及其与兴奋性之间的关系

3. The type, generation, character, conduction and transmission mechanism of bioelectricity and its relationship with excitability

[熟悉]

1. 细胞膜镶嵌蛋白的生理功能

1. Physiological function of cell membrane mosaic protein

2. 膜物质转运和跨膜信号转导作用间的相互关系

2. The relationship between membrane material transport and transmembrane signal transduction

3. 可兴奋细胞的兴奋性、兴奋及其与离子通道的状态与通透性之间的关系

3. The excitability of cells, excitement and its relationship with the state and permeability of ion channels

[了解]

1.受体蛋白和离子通道蛋白结构及功能差异性

1. Receptor protein and ion channel protein structure and functional differences

2. G 蛋白结构及其效应器种类、功能、可充当第二信使的物质

2. G protein structure and its effector species, function, and second messenger material

3. 由酶耦联受体介导的跨膜信号转导特征

3. Receptor - mediated transmembrane signal transduction characterized by enzyme - coupled receptors

4. 引起兴奋的刺激条件，伴随生物电变化出现的细胞膜两侧电荷分布状态

4. Excitatory stimulation conditions, the charge distribution status on both sides of the cell membrane accompanied by changes in bioelectricity

5. 突触的结构

5. Synaptic structure

重点、难点：细胞兴奋性 膜动作电位概念，过程和机制。

Key and difficulty: the concepts of cell membrane excitability and action potentials, processes and mechanisms.

其它教学环节：结合实验课，深入理解动作电位形成机制。

Appendix: combined with the experimental class, in-depth understanding of action potential formation mechanism.

第二章 血液

学时 3 学时

Chapter 2 Blood

Hours: 3 h

主要内容:

Outline:

1. 体液、细胞外液、内环境和内环境稳态（血液的组成与理化特性，血浆渗透压，血浆的酸碱平衡，血液的机能，等）。

1. Body fluids, extracellular fluid, internal environment and the steady state (blood composition and physicochemical properties, plasma osmotic pressure, plasma pH, blood function, etc.).

2. 血细胞生理

2. Blood cell physiology

红细胞生理特性 (可塑性，红细胞悬浮稳定性，红细胞渗透脆性)

Physiological characteristics of red blood cells (plasticity, erythrocyte suspension stability, osmotic fragility)

红细胞的生成调节

Regulation of erythrocyte formation

3. 白细胞的生理特性、功能

3. Physiological characteristics and function of leukocytes

4. 血小板的生理特性、功能

4. Physiological characteristics and function of platelet

5. 生理止血，血液凝固与纤维蛋白溶解

5. Physiological hemostasis, blood coagulation and fibrinolysis

6. 血型 and 红细胞凝集

6. Blood type and erythrocyte agglutination

教学要求:

Requirements:

[掌握]

1. 内环境及内环境稳态的基本概念

1. The basic concept of internal environment and internal environment steady state

2. 血液在维持内环稳态中的几个方面的作用:渗透压、pH 值、红细胞数相对稳定及其机制

2. The several aspects role of blood in maintaining homeostasis: osmotic pressure, pH, relative stability of red blood cells number and its mechanism

3. 生理性止血、血液凝固、纤维蛋白溶解的生理意义和机制

3. Physiological hemostasis, blood coagulation, the physiological significance and mechanism of fibrinolysis

[熟悉]

1. 血液的功能

1. Function of blood

2. 白细胞的生理功能 (游走、趋化性、吞噬作用)

2. Physiological function of leukocytes (migration, chemotaxis, phagocytosis)

3. 血细胞生成的调节

3. Regulation of blood cell formation

[了解]

1. 血细胞生理特性

1. Physiological characteristics of blood cell

2. 血型及输血原则

2. Blood type and blood transfusion principle

重点、难点: 红、白血细胞的生理功能, 血型的医学临床实践

Key and difficulty: The physiological function of red and white blood cells, the clinical practice of blood type

其它教学环节: 讨论血液病

Appendix: discuss blood disease

第三章 血液循环 学时 3 学时

Chapter 3 Blood circulation Hours: 3 h

主要内容:

Outline:

1.心脏的泵血功能

1. Heart pump function

2.心肌的生物电现象和生理特性

2. Myocardial electrical phenomena and physiological characteristics

3.血管生理

3. Vascular physiology

4.心血管活动的调节

4. Regulation of cardiovascular activity

教学要求:

Requirements:

[掌握]

1.心动周期、心输出量概念及心脏泵血功能的调节

1. The concepts of cardiac cycle and cardiac output, cardiac pump function adjustment

2. 各种心脏细胞与心脏泵血功能相适应的生理特性

2. Physiological characteristics of various cardiac cells and cardiac pump function

3. 血压形成的机制及影响血压的因素

3. The mechanism of blood pressure formation and the influence factors

4. 组织液和淋巴液的生成

4. The formation of tissue fluid and lymph fluid

[熟悉]

1.心、血管活动的神经、体液调节

1.The nerves and body fluid regulation of heart and vascular activity

[了解]

1.心动周期中心室内压力、容积的变化、瓣膜开闭与血流的情况及心音的形成

1. Cardiac cycle centre pressure, volume changes, valve opening and closing and blood flow and the formation of heart sounds

2. 心电图的形成及波形的意义

2. The formation of electrocardiogram and the meaning of the waveform

3. 微循环的通路

3. Microcirculation

重点、难点：血压形成的机制及影响血压的因素

Key and difficulty: the mechanism of blood pressure formation and the influence factors

其它教学环节：讨论高血压对心脑血管系统的影响

Appendix: discuss the impact of hypertension on the cardiovascular system

第四章 呼吸

学时 4 学时

Chapter 4 Respirator

Hours: 4 h

主要内容：

Outline:

1.呼吸器官的通气活动（包括：哺乳动物的肺通气，肺通气的原理，肺通气功能的评价，肺容量与肺通气量，等）

1.Respiratory organ ventilation (including: mammalian lung ventilation, pulmonary ventilation principle, pulmonary ventilation function evaluation, lung volume and lung ventilation, etc.)

2. 气体交换：气体交换的原理，气体交换的过程

2.Gas exchange: the principle of gas exchange, gas exchange process

3.气体运输：气体在血液中的形式，氧的运输，Hb 的氧合作用，氧离曲线，影响氧离曲线的因素，CO<sub>2</sub> 的运输，碳酸氢盐，氨基甲酸 Hb

3. Gas transportation: the form of gas in the blood, the transport of oxygen, the oxygenation of Hb, the oxygen evolution curve, the influence factors of oxygen curve, the transport of CO<sub>2</sub>, bicarbonate, carbamate Hb

4.呼吸运动的调节（包括：神经调节，呼吸中枢，呼吸运动的反射性调节，化学因素对呼吸的调节，化学感受器，Pco<sub>2</sub>、pH、Po<sub>2</sub> 对呼吸的影响）

4.The regulation of respiratory movement (including: neuromodulation, respiratory centre, the reflective regulation of



respiratory movement, chemical factors on the regulation of respiration, chemical receptors, the impact of  $P_{CO_2}$ , pH and  $P_{O_2}$  on breathing)

教学要求:

Requirements:

[掌握]

1.肺通气和肺换气的原理

1. Principles of pulmonary ventilation and lung ventilation

2. 气体运输过程

2. Gas transportation process

3. 呼吸运动的反射性调节和化学因子对呼吸运动的调节

3. Reflective regulation of respiratory movement and regulation of respiratory activity by chemical factors

[了解]

1.呼吸的意义及呼吸的基本过程

1. The meaning of breathing and the basic process of breathing

2.气体交换过程与规律

2. Gas exchange process and law

重点、难点: 肺通气和肺换气的原理、气体交换原理

Key and difficulty: lung ventilation and lung ventilation principle, the principle of gas exchange

其它教学环节: 利用所学呼吸原理讨论几种肺病的机制

Appendix: use the principle of breathing to discuss several mechanisms of lung disease

第五章 消化与吸收

学时 4 学时

Chapter 5 Digestion and Absorption

Hours: 4 h

主要内容:

Outline:

1.概述

1.Introduction

1 消化的方式

1 Digestive way

2 消化道平滑肌的特性

2 Characteristics of digestive tract smooth muscle

3 消化道的神经支配

3 Innervation of the digestive tract

4. 胃肠道激素

4. Gastrointestinal hormones

2 机械性消化

2 Mechanical digestion

1 胃肠运动形式及作用

1 Gastrointestinal movement form and function

2. 胃的排空

2. Emptying the stomach

3 化学性消化

3 Chemical digestion

1 口咽腔的消化酶

1 Digestive enzymes in oropharyngeal cavity

2 胃液及其分泌调节

2 Gastric juice and its secretion regulation

3 胰液的分泌调节

3 Secretion of pancreatic juice regulation

4 胆汁的分泌与排出

4 Bile secretion and discharge

5 小肠液的分泌

5 Small intestine secretion

6 复胃(微生物)消化

6 Microbial digestion

7 吸收

## 7 Absorption

1 吸收途径与方式

1 Absorption routes and methods

2 小肠内主要营养物质的吸收

2 The absorption of major nutrients in the small intestine

3 水的吸收

3 Water absorption

4 无机盐的吸收

4 Inorganic salt absorption

5 糖的吸收

5 Sugar absorption

6 蛋白质的吸收

6 Absorption of protein

7 脂质的吸收

7 Absorption of lipids

8 胆固醇的吸收

8 Absorption of cholesterol

教学要求:

Requirements:

[掌握]

1. 胃、肠运动的调节和胃排空机制

1. Gastric and intestinal motility regulation and gastric emptying mechanisms

2. 胃液、胰液、胆汁的生理功能及分泌调节

2. Physiological function of gastric juice, pancreatic juice and bile, and the secretion regulation

3. 主要胃肠道激素的生理功能

3. The physiological function of the main gastrointestinal hormones

4. 消化道吸收的路径及主要方式

4. Digestive tract absorption path and the main way

5.糖、蛋白质、脂质的吸收

5. sugar, protein, lipids absorption

[熟悉]

1.复胃、大肠微生物消化

1. Complex stomach, large intestine microbial digestion

2.营养物质吸收的主要方式和路径

2. The main way and path of nutrient absorption

[了解]

1.消化道运动的方式

1. The way of digestive tract movement

2.小肠液的成分及作用

2. Small intestine fluid composition and role

3.小肠执行吸收功能的结构特征及其它物质的吸收

3. Structural features of small intestine perform the absorption and other substances absorbed

重点、难点：生物大分子消化吸收的机制，途径。

Key and difficulty: Mechanism and pathway of digestion and absorption of biological macromolecules.

第六章 能量代谢及体温

学时 3 学时

Chapter 6 Energy Metabolism and Body Temperature Hours: 3 h

Outline:

1.能量的来源与消耗

1. The source and consumption of energy

2.能量消耗的路径

2. The path of energy consumption

3.能量代谢的测定

3. Determination of energy metabolism

4.影响能量代谢的因素

4. Factors that affect energy metabolism

5.基础代谢和静止能量代谢

5. Basic metabolic and resting energy metabolism

6.动物的体温及其调节

6. Animal's body temperature and its regulation

7.体表温度和体核温度

7. Body surface temperature and body temperature

8.动物体温的正常变动

8. Normal changes in animal body temperature

9.动物体温恒定的原理

9. Animal body temperature constant principle

10. 体温调节

10. Temperature regulation

11.动物对高温和低温的耐受能力与适应

11. The tolerance and adaptation of animals to high temperature and low temperature

教学要求:

Requirements:

[掌握]

1.掌握体温的概念及其正常变动

1. Master the concept of body temperature and its normal changes

2.机体的产热和散热过程

2. Heat production and dissipation of body

3.掌握体温调节机制

3. Master the body temperature regulation mechanism

[熟悉]

1.食物热价, 氧热价, 呼吸商的、基础代谢和基础代谢率等概念, 食物的特殊动力作用

1. The concepts of thermal equivalent of food, respiratory quotient, Basal metabolism and basal metabolic rate, specific dynamic action of food.

2. 影响能量代谢的因素

## 2. Influence factors of energy metabolism

[了解]

1. 能量代谢中能量的来源与去路

1. Energy sources and pathways of energy

2. ATP、CP 在动物新陈代谢中的重要作用

2. ATP and CP in animal metabolism

3. 能量代谢的测定原理

3. The principle of energy metabolism

重点、难点：基础代谢和基础代谢率等概念，食物的特殊动力作用

Key: Concepts of basal metabolism and basal metabolic rate, specific dynamic action of food.

其它教学环节：讨论肥胖与食物热量，吸收的关系

Appendix: discuss the relationship between obesity and food calories and absorption

第七章 肾脏与排泄

学时 4 学时

Chapter 7. Kidney and Excretion

Hours: 4 h

主要内容:

Outline:

1. 肾的功能解剖特征（肾单位和集合管，皮质肾单位和近髓肾单位，球旁器，血液供应特征）

1. Functional anatomical characteristics of the kidney (nephron and collecting ducts, cortical neonatal units and myeloid neonatal units, squares, blood supply)

2. 尿的生成

2. Urine generation

3. 尿的生成的调节

3. Regulation of urine generation

4 动物机体的水盐平衡和渗透压调节

4. Balance of water and salt in animal body and osmotic pressure regulation

教学要求:

Requirements:

[掌握]

1.肾的功能单位的结构特征

1. The functional characteristics of nephron

2.尿生成的基本过程及尿生成的调节

2. The basic process of urine formation and the regulation of urine generation

3.肾小管、集合管重吸收与分泌特点，各种物质转运间的相互关系

3. Characteristics of renal tubular, collecting tube reabsorption and secretion, the relationship between the various substances transport

[熟悉]

1.尿液稀释与浓缩的机制及体内水盐平衡

1. Urine dilution and concentration mechanism, and the body water and salt balance

[了解]

1.动物排泄的途径、其它排泄器官

1. Excretion of animals, other excretion organs

2.尿的排空

2. Urine emptying

3.肾脏的酸碱平衡作用

3. The acid-base balance of the kidney

重点、难点：肾脏结构，尿的产生和盐碱平衡

Key : Kidney structure, urinary production and saline-alkali balance

第八章神经系统

学时：12 学时

Chapter 8. Nervous System

Hours: 12 h

主要内容：

Outline:

神经元活动的一般规律

General rules of neurons activity

1.神经元

1. Neuron
2. 神经纤维传导兴奋的特征
2. Characters of excitation transmitted through nerve fibres
3. 神经纤维传导的速度和分类
3. Speed and classification of nerve fibre transduction
4. 神经的营养性作用
4. Functions of neurotrophic factors
5. 中枢神经元的联系方式及其生理意义
5. Connection of the central neuron system and their physiological significance
6. 局部回路神经元和局部神经元回路
6. Local circuit neurons
7. 神经递质
7. Neurotransmitter
8. 外周神经递质
8. Peripheral neurotransmitter
9. 中枢神经递质
9. Central neurotransmitter
10. 递质与调质的概念
10. Concept of neurotransmitter and neuromodulator
11. 递质的共存
11. Coexistence of neurotransmitter
12. 神经递质的受体
12. Receptor of neurotransmitter
13. 反射活动的一般规律
13. General rules of reflex activity
14. 反射中枢内兴奋的传递
14. Excitation transmission in the reflex center
15. 兴奋性突触后电位





15. Excitatory postsynaptic potential

16. 中枢内兴奋传布的特征

16. Excitation transmission within the centre

17. 中枢抑制

17. Central inhibition

18. 抑制性突触后电位

18. Inhibitory postsynaptic potential

19. 突触后抑制

19. Postsynaptic inhibition

20. 突触前抑制

20. Presynaptic inhibition

21. 反射活动的一般特性

神经系统的感觉功能

21. Characters of reflex activity

Sensation of nervous system

22. 感受器的定义与分类

22. Definition and classification of sensor

23. 感受器的一般生理特性

23. Physiological characters of sensor

24. 视觉

24. Vision

25. 听觉

25. Auditognosis

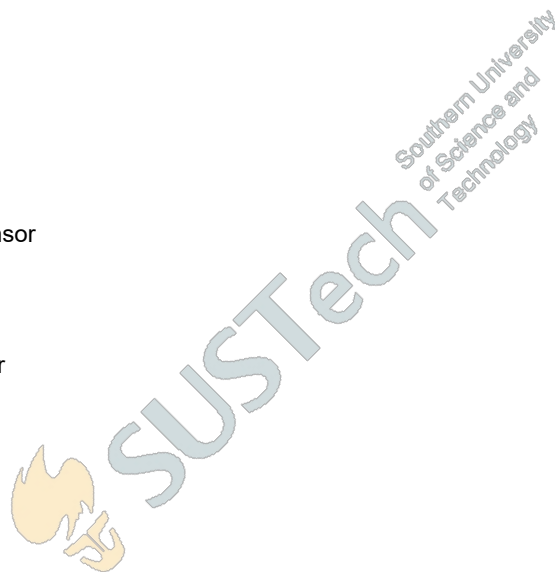
26. 嗅觉和味觉

26. Olfaction and gustation

27. 神经系统的感觉分析功能

27. Sensory analysis of nervous system

28. 脊髓与低位脑干的感觉传导功能



- 28.Sensory conducting of spinal cord and lower brain stem
- 29.丘脑及其感觉投射系统
- 29.Thalamus and the sensory projection system
- 30.大脑皮层的感觉分析功能
- 30.Sensory analysis function of the cerebral cortex
- 31.神经系统对内脏活动的调节
- 31.How the nervous system regulates the visceral activities
- 32.自主神经系统的结构与功能特征
- 32.Structure and function of the autonomous nervous system
- 33.自主神经功能的中枢调节
- 33.Central integration of the autonomous nervous system
- 34.神经系统对躯体运动的调节
- 34.How the nervous system regulates somatic movement
- 35.脊髓对躯体运动的调节
- 35.How the spinal cord regulates somatic movement
- 36.脊髓的运动神经元和运动单位
- 36.Motor neurons and motor unit of the spinal cord
- 37.脊髓反射
- 37.Spinal reflex
- 38.脑干对肌紧张和姿势的调节
- 38.How the brain stem regulates muscle tonus and posture
- 39.脑干的网状结构
- 39.Reticular structure of the brain stem
- 40.去大脑僵直
- 40.Decerebrate rigidity
- 41.小脑对躯体运动的调节
- 41.How the cerebellum regulates somatic movement
- 42.基底神经节对躯体运动的调节

42.How the basal ganglia regulate the somatic movement

43.大脑皮层的主要运动区

43.Central motor area of cerebral cortex

44.主要的传导路（锥体系）

44.Conduction path (pyramidal system)

45.脑的高级功能

45.Advanced functions of the brain

46.条件反射

46.Conditional reflex

47.条件反射的形成

47.Formation of the conditional reflex

48.条件反射的消退

48.Extinction of the conditional reflex

49.条件反射的泛化与分化

49.Generalization and differentiation of the conditional reflex

50.条件反射的生物学意义

50.Physiological significance of the conditional reflex

51.动力定型

51.Dynamic stereotype

52.神经活动类型

52.Classification of neurons activity

53.醒和睡眠

53.Awakening and sleeping

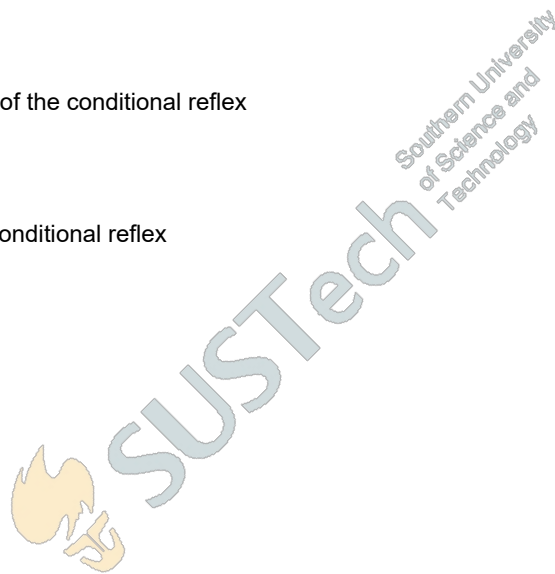
教学要求:

Teaching requirements:

[掌握]

1.主要的外周神经递质及其受体的种类、分布、生理功能.

1.Understanding the basic peripheral neurotransmitters and their classification, distribution, physiological function, and



corresponding receptors.

2.反射活动的协调基础及意义；中枢抑制的种类及结构基础

2.The Harmonization basics and significance of reflex activity. Classification and structure basic of central inhibition.

3.自主神经系统的结构特征、生理功能

3.Structural characters and physiological function of autonomous nervous system.

4.感受器的一般特征

4.General characters of sensory receptors.

[熟悉]

1.兴奋在中枢传播的特征

1.Characters of excitation propagate in the centre.

2.中枢神经系统的感觉功能

2.Sensory function of the central nervous system.

3.中枢神经系统对内脏活动的调节作用

3.How the central nervous system regulates the visceral activities.

4.中枢神经系统对躯体运动的调节作用

4.How the central nervous system regulates the somatic movement.

[了解]

1.神经元功能特征

1.Functional characteristics of neurons.

2.反射及反射弧、中枢神经元连接的方式及局部神经元回路

2.Reflexion, reflex arc and central neuron connection and local neurons circuits.

3.调质与递质的区别、中枢神经递质的种类

3.Difference between transmitters and regulators, classifications of central neurotransmitters.

4.脑的高级功能

4.Advanced functions of the brain

重点:

Key:

1.主要的外周神经递质及其受体的种类、分布、生理功能.

1.Understanding the basic peripheral neurotransmitters and their classification, distribution, physiological function, and corresponding receptors.

2.反射活动的协调基础及意义；中枢抑制的种类及结构基础

2.The Harmonization basics and significance of reflex activity. Classification and structure basic of central inhibition.

3.自主神经系统的结构特征、生理功能

3.Structure features and physiological function of autonomous nervous system.

4.感受器的一般特征

4.General characters of sensory receptors.

其它教学环节：邀请生物系陈放怡教授介绍听力生理研究前沿。

Appendix: Inviting Prof. Fangyi Chen to introduce frontier in auditory physiology.

第九章 内分泌

学时 3 学时

Chapter 9. Endocrine

Hours: 3 h

主要内容:

Outline:

1.概述

1.Overview

1 脊椎动物的内分泌系统

1.Endocrine system of vertebrate

2 激素

2Hormones

3 激素的作用机制

3Mechanism of hormones activity

4 激素分泌的调控

4Regulation of hormones secretion

2 下丘脑

2.Hypothalamus



3 垂体

3.Pituitary gland

1 神经垂体

1Neurohypophysis

2 腺垂体

2Adenohypophysis

4 甲状腺

4.Thyroid

5 甲状旁腺与调节钙、磷的激素

5.Parathyroid and hormones that regulate calcium and phosphorus

6 肾上腺

6.Adrenal gland

7 胰岛

7.Pancreatic islet

8 其它内分泌腺

8.Other endocrine glands

1 松果体

1pineal body

2 胸腺

2Thymus

3 前列腺素

3Prostaglandin

4 尾下垂体

4Urophysis

5 胃肠道激素和性激素

5gastrointestinal hormones and sex hormones

教学要求:

Teaching requirements:



[掌握]

1.掌握体液调节的基本概念

1.Understanding the concept of humoral regulation.

2.下丘脑、脑垂体、甲状腺、甲状旁腺、肾上腺、胰岛所分泌的激素及其生理功能和激素的分泌调节

2.Regulation of hormones secretion and their physiological functions.

3.神经系统与内分泌系统间的相互关系，下丘脑-腺垂体-靶腺作用轴的生理意义

3.Connection between nervous system and endocrine system. The physiological significance of the hypothalamus-pituitary-target gland axis.

[熟悉]

1.各类激素的作用机制

1.Mechanisms of different hormones.

2.松果体的生理功能

2.Physiological function of the pineal body.

[了解]

1.了解内分泌系统及其主要作用，激素作用的特点

1.Understanding the function of endocrine system and characteristics of different hormones.

2.动物机体主要的内分泌腺及其分泌激素的化学本质

2.The major endocrine glands in animal and the chemical basis of the hormones.

3.甲状腺素、胰岛素、肾上腺激素的合成与代谢

3.The synthesis and metabolism of thyroxine, insulin, and adrenaline.

4.其它分泌腺的生理功能

4.Physiological function of other secretory glands.

重点、难点： 神经系统与内分泌间的关系

Difficulty: The connection and relation between nervous system and endocrine system

其它教学环节： 讨论糖尿病机理机制

Appendix: Discussion of the pathological mechanism of diabetes

Chapter 10. Reproduction and Lactation      Hours: 3 h

主要内容:

Outline:

性腺的功能

Function of sex glands

1. 睾丸 (睾丸的生精作用, 睾丸的内分泌机能, 睾丸的功能调节)

1. Testicle (spermatogenesis, endocrine, and functional regulation)

2. 卵巢 (卵巢的生卵作用, 卵巢的内分泌功能)

2. Ovary (oogenesis and endocrine)

3. 高等脊椎动物的生殖活动

3. Reproduction of higher vertebrate

1. 生殖周期 (性成熟和体成熟, 性季节 (母畜))

1. reproductive cycle (sexual maturity and body maturity)

2. 交配与受精 (交配行为和受精, 受精部位和时间, 精子与卵子在受精前的准备, 受精过程)

2. Mating and fertilization (mating behaviour and fertilization; time and place of fertilization; preparation of sperm and oocyte; fertilization process)

3. 妊娠 (妊娠的建立和维持, 妊娠期胚胎的生长发育与营养, 妊娠期的生理变化)

3. Conception (establishing and maintaining of conception; development and nutrition of the embryo; physiological changing during gestation period)

4. 分娩 (分娩过程, 分娩机制)

4. Childbirth (process and mechanism)

5. 泌乳

5. Lactation

1. 乳腺的结构

1. Structure of the mammary gland

2. 乳腺的发育及其调节

2. Development and regulation of the mammary gland

3. 乳的分泌

3. Secretion of milk



4.排乳

4.Milk ejection

教学要求:

Teaching requirements:

[掌握]

1.性腺类固醇激素的生理作用

1.Physiological function of the gonadal steroid hormones.

2.乳的分泌与调节

2.Secretion and regulation of milk

[熟悉]

1.性腺功能的调节, 下丘脑-腺垂体-性腺轴

1.Regulation of the sex glands, the hypothalamus-pituitary-gonadal axis.

2.雄激素、雌激素、孕激素的生物合成中的相互关系

2.Biosynthesis and interaction of androgen, estrogen, and progestin.

3.有关哺乳动物的生殖活动过程

3.Reproduction process of mammals.

4.乳腺的结构与发育; 乳的分泌与调节; 排乳过程及调节

4.Structure and development of the mammary gland; secretion and regulation of milk; regulation of milk ejection

[了解]

1.性腺的生精或生卵功能; 精子、卵子的生理特性;

1.Spermatogenesis or oogenesis in the sex glands; physiological characteristic of sperm and oocyte.

重点、难点: 性腺类固醇激素的生理作用

Difficulty: physiological function of the gonadal steroid hormones

第十一章神经免疫调节

学时 3 学时

Chapter 11: Neuroimmunomodulation

Hours: 3 h

主要内容:

Outline:

1.神经内分泌系统对免疫系统的调节

1.Regulation of immune system via neuroendocrine system

2.激素对免疫系统的调节

2.Regulation of immune system via hormones.

教学要求:

Teaching requirements:

[了解]

1.神经内分泌系统与免疫系统具有相互调制的物质基础

1.Substantial foundation of the interaction between immune system and neuroendocrine system.

2.神经内分泌系统对免疫的调制的作用

2.Regulation of immune system via neuroendocrine system.

3.免疫系统对神经内分泌系统的调制作用

3.Regulation of neuroendocrine system via immune system.

4.整体情况下神经内分泌系统与免疫系统间相互作用的路径

4.Mechanism and path of the interaction between immune system and neuroendocrine system.

重点、难点:

Difficulty:

其它教学环节: 邀请清华大学深圳研究院史小军教授专题讲座【生理应激】高原反应。

Appendix: Inviting Prof. Xiaojun Shi from Tsinghua University to give a lecture about "Physiological Stress – Altitude Sickness

## 18. 教材及其它参考资料 Textbook and Supplementary Readings

教材(Teaching material): 《Animal Physiology, 3rd Edition, 2012》 Sinauer by Hill, Wyse, and Anderson

参考书 (Reference book):

1. 《动物生理学(第2版)》 杨秀平, 肖向红, 主编

网络资源:

1. <http://sites.sinauer.com/animalphys3e/>

2. Quiz Website: <http://sites.sinauer.com/animalphys3e/quiz/>

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10	缺席一次扣 2 分 A deduction of 2 points for each time late	
课堂表现 Class Performance		10		
小测验 Quiz		10		
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test		30		
期末考试 Final Exam		40		
期末报告 Final Presentation				
其它（可根据需要 改写以上评估方 式） Others (The above may be modified as necessary)				

Southern University  
of Science and  
Technology

20. 记分方式 GRADING SYSTEM

- A. 十三级等级制 Letter Grading  
 B. 二级记分制（通过/不通过） Pass/Fail Grading

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过  
 This Course has been approved by the following person or committee of authority

本课程经生物系本科教学指导委员会审议通过。  
 This Course has been approved by Undergraduate Teaching Steering Committee of Department of Biology.