

SCPA 607

Pathobiology and mechanisms of cancer

Semester 2/2017

Department of Pathobiology

Faculty of Science

Mahidol University

Course Syllabus

(Lecture-Lab-Self-study)

SCPA 607 Pathobiology and mechanisms of cancer 2(2-0-4)

Introduction to cancer, characteristics of benign and malignant tumors, histopathology of cancer, basic mechanisms of cancer development, invasion, and metastasis, carcinogenesis and carcinogenic agents, molecular basis of cancer, biological markers for diagnosing cancer and predicting treatment outcomes, chemotherapy and the development of novel therapeutics, cell culture and animal models for studying cancer

Prerequisite None

Type of Course Elective courses

Session 2nd Semester

Course Conditions class size : None

Course Objectives

At the completion of the course, students should be able to:

1. Describe terms of benign and malignant tumors
2. Describe characteristics and histopathology of benign and malignant tumors
3. Discuss the roles of molecular basis on cancer development and cancer progression including invasion and metastasis
4. Discuss biological markers for diagnosing cancer and predicting treatment outcomes
5. Discuss chemotherapy and the development of novel therapeutics
6. Create the research concept of cancer field by using the knowledge of cell culture and animal models

Course Outline

Weeks	Topic	Hour			Instructor
		Lecture/ Discussion	Lab.	Self- study	
1	Introduction to cancer	2	0	4	PS
2	Mechanisms of cancer invasion and metastasis	2	0	4	WP
3	Benign and malignant tumors	2	0	4	PS
4	Host defense against tumors	2	0	4	NC
5	Identification and histopathology of cancer	2	0	4	SN
6	Biological markers for cancer diagnosis	2	0	4	WJ
7	Chemotherapy and the development of novel therapeutics	2	0	4	SN
8	Q&A, Discussion I	2	0	4	PS, WP, NC, SN, WJ
Examination I (L1-L7)					
9	Epigenetics and cancer	2	0	4	ANJ
10	Molecular basis of cancer	2	0	4	WP
11	Tumor microenvironment	2	0	4	WP
12	Stem cells and cancer	2	0	4	PC
13	Carcinogenesis and carcinogenic agents	2	0	4	PS
14	Experimental models for cancer research	2	0	4	NK
15	Q&A, Discussion II	2	0	4	ANJ, WP, PC, PS, NK
Examination II (L9-L14)					

Teaching methods

Lectures in class 30 hours.

Teaching Media

1. Handouts
2. Power point presentation
3. Research article

Measurement and Evaluation of Students Achievement

1. Discussion, Participation, Presentation and Interactive performance 35%
2. Written Examination 65%
3. Student Examination Grade = A, B+, B, C+, C, D+, D, F

Course Evaluation

1. Students gain knowledge according to the course objectives.
2. Students give written course evaluation at the end of the course.
3. Evaluate students' satisfaction towards teaching and learning of the course using a questionnaire.
4. The lecturer will be notified with the result of the course evaluation from students to further improve the lecturing process.

References

1. Robert A. Weinberg. The Biology of Cancer 2nd Edition. 2013.
2. Vinay Kumar, Abul K. Abbas, Jon C. Aster. Robbins Basic Pathology 9th Edition. 2013.
3. The Biology of Cancer (http://sphweb.bumc.bu.edu/otlt/MPH-Modules/PH/PH709_Cancer/index.html)
4. Cancer Invasion and Metastasis: Molecular and Cellular Perspective (<https://www.ncbi.nlm.nih.gov/books/NBK164700/>)

Instructors

1. ANJ = Assistant Professor Amornrat Naranuntarat Jensen, Ph.D
2. NC = Nisamenee Charoenchon, Ph.D
3. NK = Niwat Kangwanrangsan, Ph.D
4. PC = Pornthip Chaichompoo, Ph.D
5. PS = Assistant Professor Prasit Suwannalert, Ph.D
6. SN = Somphong Narkpinit, M.D.
7. WJ = Associate Professor Wannee Jiraungkoorskul, Ph.D
8. WP = Witchuda Payuhakrit, Ph.D

Coordinator Assistant Professor Prasit Suwannalert, Ph.D
Department of Pathobiology, Faculty of Science,
Mahidol University
Tel. 02-201-5558, E-mail: prasit.saw@mahidol.ac.th

Leading questions:

L1- Introduction to cancer

1. What is the definition of cancer?
2. How to diagnose for cancer?

L2- Mechanisms of cancer invasion and metastasis

1. How the cancer cells invasion?

L3- Benign and malignant tumors

1. What are the different characteristics between benign and malignant tumors?
2. What is the TNM staging system?

L4- Host defense against tumors

1. How is important of host defense mechanism in the role of antitumor?

L5- Identification and histopathology of cancer

1. Describe the characteristic of malignant cell morphology.

L6- Biological markers for cancer diagnosis

1. What is the biomarker?
2. What are the characteristics of an ideal tumor marker?

L7- Chemotherapy and the development of novel therapeutics

1. Describe the principals of chemotherapy

L9- Epigenetics and cancer

1. What is epigenetics?
2. How does epigenetics affect gene expression?

L10- Molecular basis of cancer

1. What are the oncogenes?

L11- Tumor microenvironment

1. What is the tumor microenvironment?

L12- Stem cells and cancer

1. What are the important issue of reprogramming technique that changed mature cells to became pluripotent cells by Shinya Yamanaka and John B. Gurdon?
2. Defined the term of "cancer stem cells" and "stem cells for cancer therapy".

L13- Carcinogenesis and carcinogenic agents

1. What are the definitions of initiation, promotion, and progression in carcinogenesis?
2. Why the high-risk HPV can induce cervical cancer?

L14- Experimental models for cancer research

1. How many categories of cancer research? What are they?
2. What kind(s) of cancer research that need the experimental model?

Lesson Plan

1. Topic	Introduction to cancer
2. Name Lecturer	Dr. Prasit Suwannalert
Education	Ph.D. (Pathobiology)
Position	Assistant Professor
Contact	02-201-5558, Email: prakit.suw@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	25 January 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe basic terms of cancer 2. Describe the regulations of cell division, differentiation, and apoptosis 3. Discuss the pathogenesis of cancer development and progression
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Basic terms of cancer 2. The regulations of cell division, differentiation, and apoptosis 3. Pathogenesis of cancer development and progression
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	10 January 2018

Lesson Plan

1. Topic	Mechanisms of cancer invasion and metastasis
2. Name Lecturer	Dr. Witchuda Payuhakrit
Education	Ph.D. (Pathobiology)
Position	Lecturer
Contact	02-201-5572, Email: witchuda.pay@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	30 January 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe the concept of cancer invasion and metastasis 2. Explain the mechanism of cancer invasion and metastasis
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Cancer invasion and metastasis 2. Mechanism of cancer cell metastasis
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination
12. Date of Improvement	23 January, 2018

Lesson Plan

1. Topic	Benign and malignant tumors
2. Name Lecturer	Dr. Prasit Suwannalert
Education	Ph.D. (Pathobiology)
Position	Assistant Professor
Contact	02-201-5558, Email: prakit.suw@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	1 February 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
<ol style="list-style-type: none"> 1. Describe the nomenclature of tumors 2. Describe the characteristics of benign and malignant tumors 3. Discuss the grading and staging of cancer in case study 	
7. Topic Detail	
<ol style="list-style-type: none"> 1. Nomenclature of tumors 2. Characteristics of benign and malignant tumors 3. Cancer grading and staging 	
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	10 January 2018

Lesson Plan

1. Topic	Host defense against tumors
2. Name Lecturer	Dr. Nisamanee Charoenchon
Education	Ph.D. (Medicine)
Position	Lecturer
Contact	02-201-5573, nisamanee.cha@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	6 February 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe the characteristics of host defense mechanisms in roles of antitumor (humoral mechanisms, cellular mechanisms and host defense peptides) 2. Discuss about mechanisms and effects from immunomodulators in the roles of antitumor
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Concepts and characteristics of humoral mechanisms, cellular mechanisms and host defense peptides in a roles of of antitumor 2. Immunomodulators' mechanism and effects in a roles of antitumor
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article, Video clips
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	15 January 2018

Lesson Plan

1. Topic	Identification and histopathology of cancer
2. Name Lecturer	Somphong Narkpinit
Education	M.D.
Position	Lecturer
Contact	02-201-5550, email : somphong.nar@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	8 February 2018, Time : 1.00-3.00 pm.
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Explain the cell morphology of neoplastic cell. 2. Give histopathology picture of some important neoplastic disease (benign and malignant)
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Cell morphology of neoplastic cell 2. Histopathology picture of some important neoplastic disease
8. Learning Methods	Lecture
9. Teaching Media	Power point presentation, Handout, Text book
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	2 January 2018

Lesson Plan

1. Topic	Biological markers for cancer diagnosis
2. Name Lecturer	Dr. Wannee Jiraungkoorskul
Education	Ph.D. (Biology)
Position	Associate Professor
Contact	02-201-5571, Email: wannee.jir@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	13 February 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe the definition, purpose of use, and classification of tumor marker. 2. Describe the most common tumor marker used in various cancers.
7. Topic Detail	
	1. Definition, use, and classification of tumor marker
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	10 January 2018

Lesson Plan

1. Topic	Chemotherapy and the development of novel therapeutics
2. Name Lecturer	Somphong Narkpinit
Education	M.D.
Position	Lecturer
Contact	02-201-5550, email : somphong.nar@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Program Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	15 February 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe the principals of chemotherapy 2. Describe the mechanisms of malignant tumor and pathogenesis 3. Describe the action and mechanism of medication treated malignant tumor
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Principals of chemotherapy 2. Mechanisms of malignant tumor and pathogenesis 3. Action and mechanism of medication treated malignant tumor
8. Learning Methods	Lecture
9. Teaching Media	Power point presentation, Handout, Text book
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	2 January 2018

Lesson Plan

1. Topic	Epigenetics and cancer
2. Name Lecturer	Dr. Amornrat Naranuntarat Jensen
Education	Ph.D. (Toxicology)
Position	Assistant Professor
Contact	02-201-5579, Email: amornrat.nar@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	6 March 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Explain major mechanisms of epigenetics 2. Describe the effect of epigenetics on gene expression 3. Discuss the involvement of epigenetics in cancer
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Major mechanisms of epigenetics 2. Effect of epigenetics on gene expression 3. The involvement of epigenetics in cancer with examples of related research
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PowerPoint slides, Handout, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	22 January 2018

Lesson Plan

1. Topic	Molecular basic of cancer
2. Name Lecturer	Dr. Witchuda Payuhakrit
Education	Ph.D. (Pathobiology)
Position	Lecturer
Contact	02-201-5572, Email: witchuda.pay@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	8 March 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Explain the role of molecular basis in carcinogenesis 2. Describe the function of oncogenes 3. Describe the function of tumor suppressor cells 4. Describe the essential alterations for malignant transformation
7. Topic Detail	
	<ol style="list-style-type: none"> 1. The role of molecular basis in carcinogenesis 2. Function of oncogenes 3. Function of tumor suppressor cells 4. The essential alterations for malignant transformation
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination
12. Date of Improvement	23 January, 2018

Lesson Plan

1. Topic	Tumor microenvironment
2. Name Lecturer	Dr. Witchuda Payuhakrit
Education	Ph.D. (Pathobiology)
Position	Lecturer
Contact	02-201-5572, Email: witchuda.pay@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	13 March 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe the concept of tumor microenvironment 2. Describe the effect of tumor microenvironment with cancer progression 3. Describe the effect of tumor microenvironment with cancer invasion and metastasis
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Tumor microenvironment 2. Tumor microenvironment promote cancer progression 3. Tumor microenvironment promote cancer invasion and metastasis
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination
12. Date of Improvement	23 January, 2018

Lesson Plan

1. Topic	Stem cells and cancer
2. Name Lecturer	Dr. Pornthip Chaichompoo
Education	Ph.D. (Immunology)
Position	Lecturer
Contact	Email: pornthip.chh@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	15 March 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Classified types of stem cells 2. Apply stem cell and gene modification as cell model for cancer biology 3. Design stem cells and gene engineering techniques for cancer therapy
7. Topic Detail	
	<ol style="list-style-type: none"> 1. History and classification of stem cell and gene therapy 2. Principle of stem cell and gene therapy for cancer biology 3. Application of stem cell and gene therapy for treatment patients with cancer
8. Learning Methods	Presentation, Group discussion
9. Teaching Media	Power point presentation
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Examination
12. Date of Improvement	22 January 2018

Lesson Plan

1. Topic	Carcinogenesis and carcinogenic agents
2. Name Lecturer	Dr. Prasit Suwannalert
Education	Ph.D. (Pathobiology)
Position	Assistant Professor
Contact	02-201-5558, Email: prakit.suw@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	20 March 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Describe carcinogenesis and carcinogenic agents 2. Describe cancer incidence and mortality 3. Discuss the pathological changes in cervical and colorectal carcinogenesis
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Carcinogenesis 2. Carcinogenic agents 3. Pathological changes in cervical and colorectal carcinogenesis
8. Learning Methods	Lecture, Discussion, and Self study
9. Teaching Media	PPT, Handout, Text book, Research article
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Short answer questions, Class participation
12. Date of Improvement	10 January 2018

Lesson Plan

1. Topic	Experimental models for cancer research
2. Name Lecturer	Dr. Niwat Kangwanrangsana
Education	Ph.D. (Medical Sciences)
Position	Lecturer
Contact	02-201-5576, Email: niwat.kan@mahidol.ac.th , scnkw@mahidol.ac.th
3. Course	SCPA607: Pathobiology and mechanisms of cancer
4. Programme Title	M.Sc. in Pathobiology Ph.D. in Pathobiology
5. Date and Time	22 March 2018, Time 1.00 - 3.00 pm
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> 1. Understand the important of models in cancer research 2. Describe the various types of cell lines and animal models for cancer research 3. Explain how to choose the in appropriate models for each type of cancer research
7. Topic Detail	
	<ol style="list-style-type: none"> 1. Cancer research and experimental models 2. Cancer cell lines; animal and human tissues 3. Animal models for cancer
8. Learning Methods	Lecture and discussion
9. Teaching Media	Power point presentation, Handout, Text books, Publications
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination and participation in class
12. Date of Improvement	21 January 2018