

**Course Syllabus**

**MBMB 651 Thalassemia: From Bench to Bedside**

**Academic year 2025**

<b>Course ID and Title</b>	MBMB 651 Thalassemia: From Bench to Bedside ชมชม ๖๕๑ ธาลัสซีเมีย จากห้องปฏิบัติการสู่การรักษา
<b>Course coordinator</b>	Dr.Kittiphong Paiboonsukwong, M.D., Ph.D. Institute of Molecular Biosciences, Mahidol University Tel: 0-2441-9003 to 7 Ext. 1312, 1357 Email: kittiphong.pai@mahidol.ac.th Office: A301 (3 <sup>rd</sup> floor, wing-A) Lab: C303 (3 <sup>rd</sup> floor, wing-C) Institute of Molecular Biosciences, Mahidol University
<b>Instructor:</b>	Assoc. Prof.Saovaros Svasti, Ph.D. Asst. Prof.Natee Jearawiriyapaisarn, Ph.D. Asst. Prof.Phatchariya Phannasil, Ph.D. Dr.Kittiphong Paiboonsukwong, M.D., Ph.D. Dr.Benjaporn Kiatpakdee, Ph.D. Dr.Thongperm Munkongdee, Ph.D.
<b>Support staff:</b>	Miss Nattrika Buasuwan Miss Usa Nuttapolwat
<b>Credits:</b>	2 (1-2-3)
<b>Curriculum:</b>	Master of Science Program in <b>Molecular and Integrative Biosciences</b> (elective course) Doctor of Philosophy Program in <b>Molecular and Integrative Biosciences</b> (elective course)
<b>Semester offering:</b>	Second semester
<b>Pre-requisites:</b>	None

**Course learning outcomes (CLOs):**

**By the end of the course, students should be able to:**

1. Discuss the fundamental concepts of thalassemia, covering the topic from its molecular biology to clinical manifestations, diagnosis, and treatments (**Knowledge**);
2. Conduct laboratory diagnosis of thalassemia (**Skills**);
3. Demonstrate scientific integrity, responsibility, and safety practices (**Ethics**);
4. Demonstrate critical thinking, teamwork, and interpersonal skills (**Characters**).
5. Effectively communicate laboratory findings through discussions and presentations (**Characters**).

**Alignment of Teaching and Assessment Methods to Course Learning Outcomes:**

Course Learning Outcomes	Teaching Method	Assessment Method
1. Discuss the fundamental concepts of thalassemia, covering the topic from its molecular biology to clinical manifestations, diagnosis, and treatments	1. Case studies and problem-based project 2. Discussion 3. Assignment	1. Discussion performance 2. Assignment
2. Conduct laboratory diagnosis of thalassemia	1. Hands-on lab practice	1. Laboratory performance 2. Lab report
3. Demonstrate scientific integrity, responsibility, and safety practices	1. Lab safety orientation 2. Discussion 3. Lab report 4. Assignment	1. Discussion performance 2. Laboratory performance 3. Report and assignment submission 4. Assignment 5. Plagiarism detection
4. Demonstrate critical thinking, teamwork, and interpersonal skills	1. Case studies and problem-based project 2. Discussion 3. Group activities	1. Discussion performance 2. Laboratory performance 3. Performance in group activities
5. Effectively communicate laboratory findings through discussions and presentations	1. Discussion 2. Presentation	1. Discussion performance 2. Presentation performance

**Course description:**

Erythropoiesis; Hemoglobin Synthesis and Regulation; Pathophysiology and Clinical Manifestations of Thalassemia; Molecular Biology of Thalassemia and Abnormal Hemoglobin; Genotype-phenotype Interaction; Iron Overload; Conventional Managements; Novel Therapies; Laboratory Diagnosis; Prevention and Control

กระบวนการสร้างเม็ดเลือดแดง การสังเคราะห์ฮีโมโกลบินและการควบคุม พยาธิสรีรวิทยาและอาการทางคลินิกของโรคธาลัสซีเมีย อณูชีววิทยาของโรคธาลัสซีเมียและฮีโมโกลบินผิดปกติ ปฏิสัมพันธ์ระหว่างพันธุกรรมและลักษณะปรากฏ ภาวะเหล็กเกิน เวชปฏิบัติทั่วไป การรักษาแนวทางใหม่ การตรวจวินิจฉัยทางห้องปฏิบัติการ การป้องกันและควบคุม

**Course Schedule (Tentative):**

(Classroom XXX and Lab Classroom XXX)

	Activities	Description	Time	Instructors and Assistants
Day 1				
1	Lecture/Discussion: Erythropoiesis	The concepts and molecular mechanisms of erythropoiesis will be introduced and discussed.	9.00 – 10.30	PP
2	Lecture/Discussion: Hemoglobin synthesis and regulation	The concepts, molecular mechanisms, and regulation of hemoglobin synthesis will be introduced and discussed.	10.30 – 12.00	NJ
Day 2				
1	Lecture/Discussion: Pathophysiology and clinical manifestations of thalassemia	Pathophysiology and clinical manifestations of thalassemia will be introduced and discussed.	9.00 – 10.30	KP
2	Lecture/Discussion: Molecular biology of thalassemia and abnormal hemoglobin	Types and molecular biology of thalassemia and abnormal hemoglobin will be introduced and discussed.	10.30 – 12.00	SS
Day 3				

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1	Lecture/Discussion: Genotype-phenotype interaction	Genotype-phenotype interaction of thalassemia will be introduced and discussed.	9.00 – 10.30	TM
2	Lecture/Discussion: Iron overload	Iron overload and its implications in thalassemia will be introduced and discussed.	10.30 – 12.00	BK
Day 4				
1	Lecture/Discussion: Conventional managements	Conventional managements for thalassemia, including supportive and curative treatments, will be introduced and discussed.	9.00 – 10.30	KP
2	Lecture/Discussion: Novel therapies	Novel therapies for thalassemia, including small molecule-based approaches and gene therapies, will be introduced and discussed.	10.30 – 12.00	NJ
Day 5				
1	Lecture/Discussion: Laboratory diagnosis	Laboratory diagnosis of thalassemia, including screening tests, hemoglobin typing, and DNA analysis will be introduced and discussed.	9.00 – 10.30	TM
2	Lecture/Discussion: Prevention and control	Prevention and control for thalassemia will be introduced and discussed.	10.30 – 12.00	KP
Day 6: Laboratory for Thalassemia diagnosis				
1	Lab: Screening tests: Osmotic fragility (OF) test, and dichlorophenol indophenol precipitation (DCIP) test	- Lab safety training - To perform screening tests (OF and DCIP) for thalassemia diagnosis.	9.00 – 12.00	All Staff
2	Lab: Screening tests: Complete blood	- To perform screening tests (CBC and blood smear) for thalassemia diagnosis.	13.00 – 16.00	All Staff

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	count (CBC), and blood smear			
Day 7: Laboratory for Thalassemia diagnosis				
1	Lab: Hemoglobin (Hb) Typing	- To perform Hb typing by high-performance liquid chromatography (HPLC) and Capillary Electrophoresis (CE) for thalassemia diagnosis.	9.00 – 12.00	All Staff
2	Lab: Hb Typing (continued)	- To interpret Hb typing results.	13.00 – 14.30	All Staff
3	Lab: DNA extraction	- To extract DNA from blood samples (unknown).	14.30 – 16.00	All Staff
Day 8: Laboratory for Thalassemia diagnosis				
1	Lab: DNA analysis for $\alpha$ -thalassemia: Gap-PCR and real-time PCR	- To do gap-PCR and real-time PCR for diagnosis of $\alpha$ -thalassemia.	9.00 – 12.00	All Staff
2	Lab: DNA analysis for $\alpha$ -thalassemia (continued)	- To analyze PCR products by agarose gel electrophoresis and interpret results. - To interpret results from real-time PCR.	13.00 – 14.30	All Staff
3	Lab: DNA analysis for $\beta$ -thalassemia: Reverse dot-blot hybridization (RDB)	- To amplify $\beta$ -globin gene by PCR for RDB reaction.	14.30 – 16.00	All Staff
Day 9: Laboratory for Thalassemia diagnosis				
1	Lab: DNA analysis for $\beta$ -thalassemia (continued)	- To do reverse dot-blot hybridization (RDB).	9.00 – 12.00	All Staff
2	Lab: DNA analysis for $\beta$ -thalassemia (continued)	- To do reverse dot-blot hybridization (continued). -To interpret RDB results.	13.00 – 16.00	All Staff
Day 10: Laboratory for Thalassemia diagnosis				
1	Problem-based learning: Family study	- To identify high-risk couples having a child with severe thalassemia.	9.00 – 12.00	All Staff

2	Presentation, discussion, reflection, and after-action review	<ul style="list-style-type: none"> <li>- To present results achieved in the class.</li> <li>- To discuss the techniques used to diagnose thalassemia.</li> <li>- To provide students opportunities to describe their learning experiences received from this course and how they can be applied to their future learning.</li> <li>- To collect comments, and suggestions from students for further improvements of the course.</li> </ul>	13.00 – 16.00	All Staff
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**Assessment Criteria:**

Assessment method		Performance criteria	Scoring rubric
1	Class attendance & participation (10%)	Attendance and punctuality (5%)	Punctually (4) 5 minutes late (3) 10 minutes late (2) 15 minutes late (1) > 20 minutes late or absent (0)
		Participation (5%)	Frequently participates (4) Moderately participates (2-3) Seldom participates (1) Never participates (0)
2	Assignment (20%)	Punctual assignment submission (1%)	On-time (4) 1 day late (3) 2 days late (2) 3 days late (1) 4 days late or later (0)
		Creativity (3%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)

		- Organization (2%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Content accuracy (10%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Supporting evidence (2%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Grammar and originality (2%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
3	Discussion (20%)	Participation and performance (5%)	Active (4) Fairly active (2-3) Inactive (1)
		Professional and interpersonal skills (responsibility, teamwork, and leadership) (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Creative and high-order thinking skills (10%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
4	Lab performance (20%)	Safety practice (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Lab skills (5%)	Excellent (4) Above average (3) Average (2)

			Needs improvement (1)
		Time management (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Troubleshooting skills (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
5	Lab report (20%)	Punctual submission (2%)	On-time (4) 1 day late (3) 2 days late (2) 3 days late (1) 4 days late or later (0)
		Report organization: intro, methods, results, discussion and conclusion (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Data presentation, analysis and interpretation (10%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Grammar and originality (3%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
6	Presentation (10%)	Organization (1%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Content (3%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)



		Subject knowledge/Answering questions (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Presentation style (1%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)

Student's achievement will be graded using symbols: A, B+, B, C+, C, D+, D and F, based on the criteria as follows:

Percentage range	Grade	Description
80-100	A	Excellent
75-79	B+	Very Good
70-74	B	Good
65-69	C+	Fairly Good
60-64	C	Fair
55-59	D+	Poor
50-54	D	Very Poor
0-49	F	Fail

Date of Revision: XXX 20XX