University of Gdańsk

Subject card

Subject name and code	Mechanisms of intracellular protein transport, PG_00154745		
Field of study	Biology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	Master's studies	Subject group	Obligatory subject group in the field of study Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	1.0
Learning profile	academic	Assessment form	credit
Conducting unit	Laboratory of Intracellular Signalling -> Department of Medical Biology and Genetics -> Faculty of Biology -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Monika Słomińska-Wojewódzka	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	15	2.0	8.0	25

Subject objectives

1. Characterization of protein rerecording sequences.

2. Learning about the main mechanisms of protein transport in the cell.

3. Mechanisms of trans-membrane and vesicular transport.

4. Getting acquainted with the mechanisms of quality control of protein folding in the endoplasmic reticulum.

5. Familiarization with selected human diseases associated with impaired intracellular transport of proteins.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOLMU2_W05] the graduate understands the dynamic development of the biological sciences and is familiar with new research directions and disciplines	He recognizes the dynamic development of cell biology and the emergence of new lines of research on cell function.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLMU2_W04] the graduate has an in-depth knowledge of the chosen specialisation in the biological sciences	He has an in-depth knowledge of the detailed mechanisms of intracellular transport of proteins.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLMU2_W01] the graduate has an in-depth knowledge and understanding of natural phenomena and processes at different levels of complexity	Understands the phenomena and processes involved in intracellular transport of proteins at different levels of complexity.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

Subject contents	General mechanisms of intracellular transport, ways to study protein translocation across membranes. Transport between nucleus and cytoplasm: nuclear localisation signals, structure of the nuclear pore complex, mechanism of transport between nucleus and cytoplasm. Transport into mitochondria and chloroplasts: signal sequences, characterisation of proteins involved in transport, mechanisms of transport within mitochondrial and chloroplast structures. Transport into peroxisomes: signalling sequences, proteins involved in transport. Bacterial protein export: role of Sec proteins, transport strategies across the inner membrane of Escherichia coli. Transport into the endoplasmic reticulum: signalling sequences, SRP protein, structure of the Sec61 translocon. Major classes of membrane proteins synthesised in the ER. Protein modifications and folding in the endoplasmic reticulum: role of reticular chaperone proteins, protein folding control system, mechanism of response to misfolded proteins. Vesicular intracellular transport: protein secretion and endocytosis pathways in the cell in general, techniques to study vesicular transport. Types of vesicle-forming proteins, mechanism of vesicle fusion. Mechanisms of protein transport between the Golgi apparatus and the endoplasmic reticulum and from the Golgi apparatus to lysosomes. Endocytosis: partitioning, mechanisms of cellular uptake. Exocytosis: protein sorting in the TGN, formation of secretory vesicles, exocytosis in polarised cells. Presentation of selected human diseases related to the different stages of transport.
Prerequisites and co-requisites	Basic knowledge of cell biology, molecular biology, biochemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test - includes the degree of mastery of the material covered in the lectures in written form	51.0%	100.0%

Recommended reading

Basic literature	1. Molecular Cell Biology, Lodish H., Berk A., Zipursky S.L., Matsudaira P., Baltimore D., Darnell J.E.; W.H. Freeman and Company, 2016 2. Molecular Biology of the Cell, Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P.; 2022 3. Genes VIII, Lewin B., Benjamin Cummings, 2014
Supplementary literature	1. Biochemistry, Berg J.M., Stryer L., Tymoczko J.L., Polish edition, PWN, 2019 2. Cytobiochemistry, Kłyszejko-Stefanowicz L., PWN 2022 3. Slominska-Wojewodzka M, Gregers TF, Walchli S, Sandvig, K. EDEM Is Involved in Retrotranslocation of Ricin From the Endoplasmic Reticulum to the Cytosol. Mol Biol Cell, 2006, 17: 1664-75. 4. Slominska-Wojewodzka M, Sandvig, K. The Role of Lectin-Carbohydrate Interactions in the Regulation of ER-Associated Protein Degradation. Molecules, 2015, 20: 9816-46. 5. Nowakowska-Gołacka J, Sominka H, Sowa-Rogozińska N, Słomińska-Wojewódzka M. Toxins Utilize the Endoplasmic Reticulum-Associated Protein Degradation Pathway in Their Intoxication Process. Int J Mol Sci, 2019, 20 (6).
eResources addresses	

Example issues/ example questions/ tasks being completed	What are the general pathways of transmembrane and vesicular transport.
Work placement	Not applicable

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