

Course name:

**COURSE NAME (capital letters) BIOLOGY**

ECTS	2
Course status	obligatory
Course final assesement/evaluation of outcomes	exam
Prerequisites	no

**Main field of study: agricultural sciences-veterinary and others related**

**field of study name (capital letters)**

Profile of study	General-academic
The code of studies (education level)	SI/SM (bachelor/master)
Semester of studies	winter
Language of instruction	English

**Course offered by: veterinary and others related**

Name of faculty offering the course	University Centre of Veterinary Medicine JU-UA
Name of department offering the course	University Centre of Veterinary Medicine JU-UA
Course coordinator	dr hab. Małgorzata Kotula-Balak, prof. UR

**Learning outcomes of the course:**

Symbol of outcome	Description of learning outcome	Reference to	
		main field of study outcomes	discipline#

**KNOWLEDGE – student knows and/or understands:**

BIO_W1	knows and understands the rules of classification of organisms and phylogenetic analysis, understands basic	A.W1	RW
BIO_W2	describes the relationship between the structure and function of organs, interprets the changes taking place in	A.W2	RW
BIO_W3	knows the pathways of signal transmission between cells, understands the action of protein and steroid	A.W2	RW
BIO_W4	knows and understands issues related to the influence of	A.W4	RW
BIO_W4	knows and understands the importance of effect of photoperiod (photosensitive animals) and temperature	A.W4	RW
BIO_W5	knows and describes the biotic and abiotic factors regulat	A.W5	RW
BIO_W6	Body homeostasis. Aging of the body. Features of an agir	A.W9	RW
BIO_W7	describes and explains the healing properties of biologically active substances, knows the general	A.W5	RW

**SKILLS – student is able to:**

BIO_U1	has the ability to find, understand and analyze information from various sources	A.U8	RW
BIO_U2	is able to use the acquired knowledge in the field of basic sciences in the course of further education	A.U19	RW
BIO_U3	has the ability to work in a team	A.U15	RW

BIO_U4	is able to communicate precisely with various subjects in v	A.U4	RW
BIO_U5	understands the need for continuous learning and expand	A.U21	RW
BIO_U6	is ready for training and self-improvement	A.U19	RW
BIO_U7	is aware of the effects of the decisions made that interfere	A.U16	RW

**SOCIAL COMPETENCE- student is ready to:**

BIO_K1	expressing conclusions from own measurements or observations;	OK_5	RW
BIO_K2	deepening knowledge and improving skills;	OK_8	RW
BIO_3	cooperation with representatives of other professions in the field of public health protection;	OK_11	RW

**Teaching contents:**

**Lectures** **10 hours**

Topics of the lectures	<p>Basic principles for classification of organisms, phylogenetic analysis and some evolutionary processes (e.g. convergent evolution) and basic biological rules</p> <p>Intercellular communication (signal transmission pathways, receptor structure and function, the mechanism of action of protein and steroid hormones and other molecules</p> <p>Body homeostasis. Aging of the body. Features of an aging cell. Types of cell death.</p> <p>The specificity of a cancer cell.</p> <p>The influence of the breeding environment. Features of the taming and domestication of animals (morphological, physiological and behavioral features).</p> <p>Characteristics of medicinal plants and their application.</p>
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Accomplished learning outcomes	<i>symbols of learning outcomes for lectures: BIO_W1, BIO_W</i>
Verification methods, rules and criteria of outcome assessment	<i>together with participation in the final assesement (in %)</i> <i>The criterion for admitting the exam is to obtain a credit from classes (open questions).</i> <i>Written exam in the form of a single choice test. The</i>

**Classes** **18 hours**

Topics of the classes	<p>Biotic and abiotic factors regulating the development and organ structure of animals, part 1. The importance of light conditions (photosensitive animals) and temperature</p> <p>Biotic and abiotic factors regulating the development and structure of animals, part 2.</p> <p>The influence of chemicals in the environment on the development and functions of</p> <p>Microscopic analysis of the relationship between the structure and function of organs at the tissue level.</p> <p>Microscopic analysis of the relationship between the structure and function of organs at the cell level.</p> <p>Basics of tissue and cell culture in vitro.</p> <p>Biological tests - hormone concentration measurments.</p>
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Accomplished learning outcomes	<i>symbols of learning outcomes for classes: BIO_W1, BIO_W2, BIO_W3, BIO_W4, BIO_W5, BIO_U1, BIO_U2</i>
Verification methods, rules and criteria of outcome assessment	<i>together with participation in the final assesement (in %)</i> <i>The criterion for admitting the exam is to obtain a credit from classes (open questions).</i>

**Seminars** **2 hours**

Topics of the seminars	Individual preparation of a multimedia presentation related to the selected topic of the class module.
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Accomplished learning outcomes	<i>symbol of learning outcomes of the seminars BIO_W1, BIO_</i>
Verification methods, rules and criteria of outcome assessment	<i>together with participation in the final assesement (in %)</i> <i>The criterion for admitting the exam is to obtain a credit</i>

**References:**

Basic	<i>Biologia Campbell, Reece JB, Campbell NA, Urry LA, Cain ML, Wasserman SA, Minorsky PV, Jackson RB. Rebis, Poznań 2016</i>
Supplementary	<i>English-language scientific journals (Elsevier, Springer, Wiley) available on-line</i>

**Structure of learning outcomes:**

Discipline: # (provide appropriate symbol)	2.0	ECTS**
Discipline: # (provide appropriate symbol - if the course relates to more than one)	...	ECTS**

**Structure of student activities:**

Contact hours	32	1, 3	ECTS**
including:			
lectures	10		
classes and seminars	20		
consultations	0		
participation in research	0		
mandatory traineeships	0		
participation in examinations	2		
e-learning	0	...	ECTS**
student own work	18	0.7	ECTS**

Syllabus valid from the academic year 2021/2022

\* where 10 hours of classes = 1 ECTS (in case of 15 h → 2 ECTS)

\*\* stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes

# academic discipline code: RZ - animal science and fishery, PB - biological sciences, etc.

## Załącznik nr.2

**Malgorzata Kotula-Balak, Prof. Dr. Ph.D., D.Sc. (Prof. dr hab.)**



University of Agriculture in Krakow

University Centre of Veterinary Medicine JU-UA

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**Email:** malgorzata.kotula-balak@urk.edu.pl

**Consultation hours:** Friday 13.00-15.00

### **Research interest:**

My research focuses on the cellular and molecular regulation of the endocrine glands with special emphasis on the hormonal regulation of the male reproductive system in health and disease. Reproductive tissues and cells (e.g. Leydig cells, spermatozoa) are analyzed to reveal fertility disruption causes. I am interested in histopathology (e.g. hyperplasia, tumorigenesis, fibrosis), cell ultrastructure and molecular status including mRNA, protein expression patterns, cell signaling (e.g. *via* non-classical estrogen receptors), and cellular processes (e.g. senescence, autophagy). For the research, I utilize animals (e.g. boar, horse dog, rodents) and human tissues obtained from medical clinics. I use *in vivo* and *in vitro* (cell lines, primary cultures) systems and a wide range of laboratory techniques: RNA sequencing, siRNA transfection, Western blot, immunohistochemistry, immunoassays, cell imaging techniques (e.g. light and electron microscopies), morphometry.

### **Research experience:**

For many years my scientific interests are focusing on estrogen role in the male gonad. Results of my research (including cooperation with foreign collaborators) broadens knowledge in the biology of reproduction on estrogen signaling in mammalian males. We as first showed (1) estrogen synthase (P450 aromatase) expression and localization in germ cells of seasonally breeding rodent-bank vole; (2) regulation of gap junction proteins by xenoestrogens in cells of seminiferous epithelium in bank vole testis; (3) expression at mRNA and protein level as well as localization and estrogen/xenoestrogen regulation of estrogen-related receptors (ERR) in Leydig cells of rodents; (4) presence of telocytes (unique interstitial tissue cells), and regulation of telocytes by estrogens as well as their effects on Leydig cell function in mouse and bank vole gonad, and (5) epigenetic regulation (proteins controlling biogenesis and function of microRNA; Drosha, Dicer, Argonaute2,

Exportin5) via estrogens in boar immature Leydig cells. These findings allowed for further research and methodological approaches (undertaken also by others) with the use of described cellular and molecular targets for diagnostics and therapy of male infertility based on estrogen action. All mentioned findings were published in original articles from JCR database.

### Visiting Scholar

- School of Biomedical Sciences Adelaide University, Adelaide Australia, 2009; 12 months,
- Section on Genetics and Endocrinology, National Institutes of Health; Bethesda, United States of America, 2013; 3 months
- Graduated School of Veterinary, Kobe University, Kobe, Japan, 2018; 2 weeks
- Biomedical School University of Iceland, Reykjavik, Iceland, 2017; 1 week
- Zhongshan Hospital Institute of Clinical Sciences, Fudan University, Shanghai, China, 2019; 1 week
- Veterinary Faculty, University of Cordoba, Cordoba, Spain 2020; 1 week
- Veterinary Faculty, Ankara University, Ankara, Turkiye 2021; 1 week
- Veterinary Faculty, National University of Hanoi, Hanoi, Vietnam, 2022; 1 week

**D.Sc. (Habilitation)** (2014, *Estrogen role in functioning of rodent Leydig cells and spermatozoa*)

**Ph.D.** (2003; *Androgen aromatization in testes with disturbed spermatogenesis*)

### Professional profiles (examples):

ORCID: <https://orcid.org/my-orcid?orcid=0000-0002-6379-996X>

### List of publications:

1. Ramisz G, Turek W, Chmurska-Gasowska M, Rak A, Pietsch-Fulbiszewska A, Galuszka A, **Kotula-Balak M**, Tarasiuk K. Senescence and adiponectin signaling - Studies in canine testis. *Ann Anat.* 2020; 20;234:151606.
2. Lustofin K, Niedbala P, Pawlicki P, Tuz R, Płachno BJ, Profaska-Szymik M, Galuszka A, Stolarczyk P, Gorowska-Wojtowicz E, **Kotula-Balak M**. Senescent cells in rabbit, nutria and chinchilla testes-Results from histochemical and immunohistochemical studies. *Anim Reprod Sci.* 2021; 226:106701.

3. Leal LF, Szarek E, Berthon A, Nesterova M, Faucz FR, London E, Mercier C, Abu-Asab M, Starost MF, Dye L, Bilinska B, **Kotula-Balak M**, Antonini SR, Stratakis CA. Pde8b haploinsufficiency in mice is associated with modest adrenal defects, impaired steroidogenesis, and male infertility, unaltered by concurrent PKA or Wnt activation. *Mol Cell Endocrinol*. 2021; 15;522:111117.
4. Witkowski M, Pardyak L, Pawlicki P, Galuszka A, Profaska-Szymik M, Plachno BJ, Kantor S, Duliban M, **Kotula-Balak M**. The G-Protein-Coupled Membrane Estrogen Receptor Is Present in Horse Cryptorchid Testes and Mediates Downstream Pathways. *Int J Mol Sci*. 2021; 22(13):7131.
5. **Kotula-Balak M**, Duliban M, Gurgul A, Krakowska I, Grzmil P, Bilinska B, Wolski JK. Transcriptome analysis of human Leydig cell tumours reveals potential mechanisms underlying its development. *Andrologia*. 2021; 8:e14222.
6. Duliban M, Pawlicki P, Gurgul A, Tuz R, Arent Z, **Kotula-Balak M**, Tarasiuk K. Peroxisome Proliferator-Activated Receptor  $\gamma$ , but Not  $\alpha$  or G-Protein Coupled Estrogen Receptor Drives Functioning of Postnatal Boar Testis-Next Generation Sequencing Analysis. *Animals* 2021; 11(10), 2868.
7. Galuszka A, Pawlicki P, Pardyak L, Chmurska-Gąsowska M, Pietsch-Fulbiszewska A, Duliban M, Turek W, Dubniewicz K, Ramisz G, **Kotula-Balak M**. Abundance of estrogen receptors involved in non-canonical signaling in the dog testis. *Anim Reprod Sci*. 2021; 235:106888.
8. Witkowski M, Duliban M, Rak A, Profaska-Szymik M, Gurgul A, Arent ZJ, Galuszka A, **Kotula-Balak M**. Next-Generation Sequencing analysis discloses genes implicated in equine endometrosis that may lead to tumorigenesis. *Theriogenology*. 2022; 1;189:158-166.
9. Pawlicki P, Galuszka A, Pardyak L, Tuz R, Plachno BJ, Malopolska M, Dubniewicz K, Yang P, **Kotula-Balak M**, Tarasiuk K. Leydig Cells in Immunocastrated Polish Landrace Pig Testis: Differentiation Status and Steroid Enzyme Expression Status. *Int J Mol Sci*. 2022; 30;23(11):6120
10. Pawlicki P, Kozirowska A, Kozirowski M, Pawlicka B, Duliban M, Wieczorek J, Plachno BJ, Pardyak L, Korzekwa AJ, **Kotula-Balak M**. Senescence and autophagy relation with the expressional status of non-canonical estrogen receptors in testes and adrenals of roe deer (*Capreolus capreolus*) during the pre-rut period. *Theriogenology*. 2023; 1;198:141-152