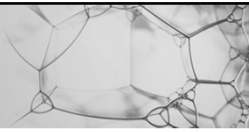




LOSCHMIDT
LABORATORIES



1. Introductory lecture Organization of the course



Bi7430 Molecular Biotechnology

Outline

- Introduction of course
- Content of course and practical class
- Lecturing and evaluation
- Recommended literature
- Biotechnology at MU (*Excursion in LL*)

Introduction of Course

EXTENSIVE MULTIDISCIPLINARITY

PREREQUISITES:

- basic knowledge of microbiology, molecular biology, biochemistry, immunology and genetics

COURSE FOCUS:

- the specific aspects of **modern biotechnology**
- examples of **up to date applications** in industry, agriculture, pharmacy, biomedicine and environmental protection
- the role of modern biotechnology in **sustainable living**



Sustainability




concept of sustainability

with the aim to promote a necessary "... development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

* World Commission on Environment and Development, 1987

Sustainability



- reduce environmental impact
- reduce consumption of **resources** (e.g., raw materials, energy, air, water)
- reduce **waste** production
- increase the **recycling** of waste
- increase use of **renewable materials** (e.g., biomass)

Biotechnology

- KEY TECHNOLOGY** of 21st century

ENVIRONMENTAL ASPECTS

- natural** processes (bioprocesses)
- sustainable** and resource efficient




ECONOMICAL ASPECTS

- 1/3 of worldwide production** derived from bioprocesses
- biotechnology market **300 billion EUR***

* Route to the Knowledge-Based Bioeconomy, 2007

Content of course	
2. Introduction to Molecular Biotechnology	
3. Protein Engineering	METHODOLOGICAL LECTURES
4. Metabolic Engineering I.	
5. Metabolic Engineering II.	
6. Molecular Biotechnology in Industry	TECHNOLOGICAL LECTURES
7. Molecular Biotechnology in Agriculture	
8. Molecular Biotechnology in Medicine I.	
9. Molecular Biotechnology in Medicine II.	
10. Molecular Biotechnology in Medicine III.	
11. Environmental molecular biotechnology	

Content of practicals	
BLOK A (VRI)	
1. Preparation and transformation of liposoms	
2. Analysis of liposoms (e.g., DLS, TEM)	
BLOK B (UKB, INBIT)	
3. Preparation of recombinant <i>E. coli</i>	
4. Cultivation of recombinant <i>E. coli</i>	
5. Purification of recombinant protein	
6. Preparation of biosensor	
7. Biocatalytic preparation of pharmaceutical precursor	

Lecturers	
	<p>Doc. RNDr. Zbyněk Prokop, Ph.D. (UČO 23696)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Loschmidt Laboratories, leader of research team <input type="checkbox"/> co-founder and CEO of Enantis – 1st biotech spin-off at MU <input type="checkbox"/> protein and metabolic engineering <input type="checkbox"/> biotechnological applications
	<p>RNDr. Jaroslav Turánek, CSc. (UČO 28301)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Veterinary Research Institute <input type="checkbox"/> head of Dept. of Pharmacology and Immunotherapy <input type="checkbox"/> immunotherapy, recombinant vaccines <input type="checkbox"/> nanotechnology and drug delivery systems
	<p>Mgr. Pavel Dvořák (UČO 151419)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Loschmidt Laboratories, research specialist <input type="checkbox"/> protein and metabolic engineering <input type="checkbox"/> molecular biology and biotechnology

Instructors



Loschmidt laboratories, MU

Lukáš Chrást, M.Sc. (UČO 269981)
Hana Moskalíková, M.Sc. (UČO 113231)
Koen Beerens, Ph.D. (UČO 233293)



Enantis, Ltd.

Šárka Bidmanová, Ph.D. (UČO 77580)
Veronika Štěpánková, Ph.D. (UČO 106723)

Veterinary Research Institute

PharmDr. Josef Mašek, Ph.D.
Ing. Štěpán Koudelka, Ph.D.
MVDr. Pavel Kulich, Ph.D.
RNDr. Jana Pločková

Instructions

- bring printed copy of the slides as **handouts** for notes



Instructions

- bring printed copy of the slides as **handouts** for notes
- find all materials including printed version of the slides at <http://is.muni.cz/>
- be on time**, come at least 5 min before the lecture opening
- if any problems with the lecture, please, contact lecturers
- be **active** and participate in **discussions**

Lecturing system

- powerpoint slides as well as recommended literature in **English**
- lecturing, discussions and examination in **Czech**
- 2 hrs per week**
- lecture part I. (45 min)**
BREAK (5-10 min)
lecture part II. (45 min)

Evaluation

- written essay**
 - Czech or English, one A4 page, 1.5 spaced, TNR 12
 - Topic 1: „The most interesting/promising molecular biotechnology“
 - Topic 2: „Safety and ethical aspects of molecular biotechnology“
 - Topic 3: „GMOs: Future or emerging apocalypse?“
 - Introduction – main body – discussion – conclusions – references
- progress written tests** during the lecturing period
 - at the beginning of lecture 4., 6., 8., 10. and 12. (duration 10 min)
 - each 10-12 questions from previous topics (cumulative)
- final written test** during the examination period
 - 50 questions from entire content of the course / 1.5 hour

Recommended literature

- M. Wink (Ed.) 2011: **An Introduction to Molecular Biotechnology:** Fundamentals, Methods and Applications, 2nd Edition, Willey-Blackwell
- B. R. Glick, J. J. Pasternak, C. L. Patten 2011: **Molecular Biotechnology:** Principles and Applications of Recombinant DNA, 4th Edition, ASM Press
- J. M. Walker, R. Rapley 2009: **Molecular biology and biotechnology,** 5th Edition, RSC Publishing

Loschmidt Laboratories, MU

RESEARCH AND DEVELOPMENT OF BIOTECHNOLOGICAL APPLICATIONS

BIOCATALYSIS

BIOSENSING

BIODEGRADATION

Biocatalysis

Bradyrhizobium japonicum

Drugs

Feromones

DSM SMART SCIENCE. BRIGHTER LIVING.

ZENTIVA SPOLEČNOST SKUPINY SANDOZ

¹ Prokop, Z., Damborsky, J., Nagaie, Y., Janssen, D.B. 2004. WO 2006079295.
² Prokop, Z., Sato, Y., Bresovsky, J., et al. 2010. *Angew. Chem., Int. Ed.* 49: 6111-6115.

Biodegradation

Sphingobium japonicum

Pacific Northwest NATIONAL LABORATORY

Bundeswehr

Foster-Miller

¹ Prokop, Z., Damborsky, J., Oplustil, F., Jesenska, A., Nagaie, Y. 2005. WO 2006128390
² Prokop, Z., Oplustil, F., DeFrank, J., Damborsky, J. 2006. *Biotech. J.* 1: 1370-1380

Biosensing

LED PMT
480 nm 520 nm

Optical fiber

Fluorescence photometer

Measurement cell

LinB

BSA

$\text{BrCH}_2\text{-CH}_2\text{-Br}$

$\text{BrCH}_2\text{-CH}_2\text{-OH}$

H^+

Photon Systems Instruments

* Bidmanova, et al. 2010. Analytical and Bioanalytical Chemistry, 398:1691-1698

* Bidmanova, et al. 2010. Chemické Listy 104: 302-308

Mol Biotechnology at MU

Applications

Research

Development

Education
