



UMCS



**DEPARTMENT OF BIOCHEMISTRY
AND BIOTECHNOLOGY
MARIA CURIE-SKŁODOWSKA UNIVERSITY**

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dr hab. Anna Pawlik

dr Renata Bancerz
dr Jolanta Polak
dr Justyna Sulej
dr Marzanna Paździuch-Czochra
dr Dawid Stefaniuk
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dr Katarzyna Szaląpata

Current research topics

- ▶ **Selection of effective overproducers of redox enzymes and hydrolases**
 - ▶ Optimization of synthesis conditions, determination of physico-chemical properties, isolation and purification:
 - ▶ lignolytic enzymes, cellulolytic enzymes, hemicellulolytic enzymes, glucose oxidase, NAD, PQQ and FAD-dependent glucose dehydrogenases, fructose dehydrogenase, proteolytic and lipolytic enzymes
 - ▶ Searching for optimal inducers and increasing the scale of microbial cultivation
 - ▶ optimization of the micro-scale feeding conditions of the selected inducer
 - ▶ Selection of appropriate processing parameters of fermentor cultures to a semi-technical scale



Current research topics

- ▶ **Identification of genes encoding lignocellulolytic enzymes and intensification of the production of these enzymes by genetic engineering methods**
- ▶ **Transcriptomic studies of wood-degrading fungi**
- ▶ **Identification of bacterial and fungal organisms by molecular techniques**



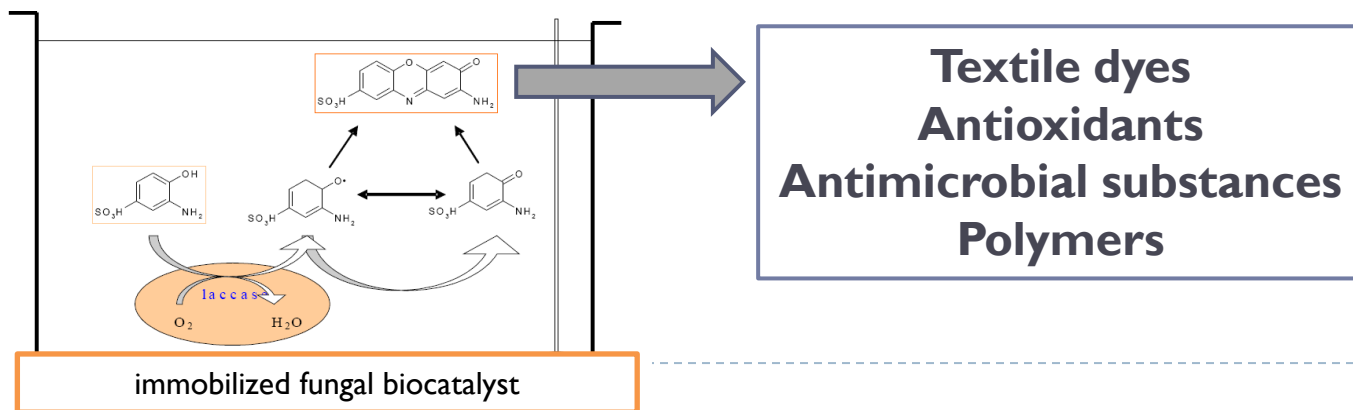
► Fungal degradomics study



Current research topics



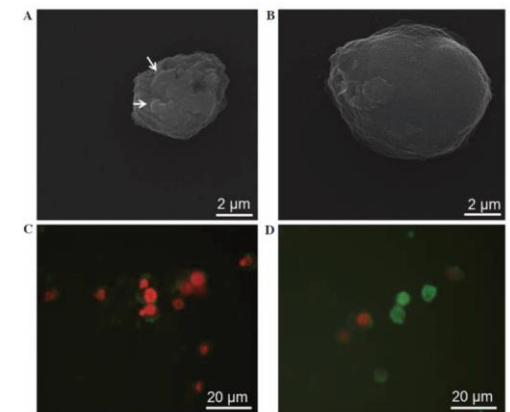
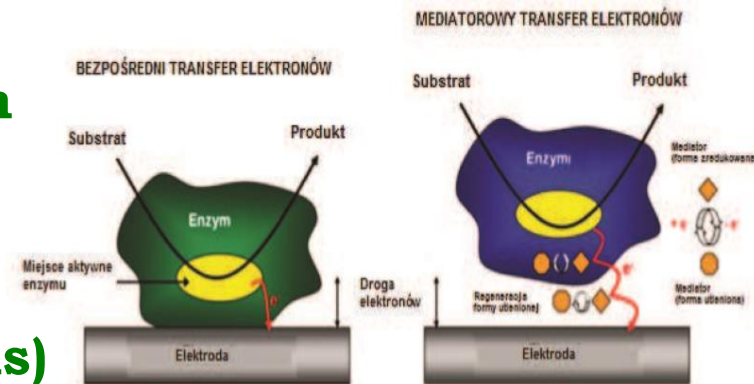
- ▶ **Synthesis of compounds showing new properties with the use of fungal biocatalysts**
- ▶ **Research of extracellular bacterial and fungal polymers:**
 - ▶ with flocculation properties
 - ▶ having immunostimulatory properties
 - ▶ having protective properties against different biomolecules



Rhodococcus opacus
polymer

Current research topics

- ▶ **Searching, isolation and characterization of new fungal bioactive substances and research on the possibilities of their practical application in medicine (anti-cancer and antibacterial activity) and biotechnology (industrial applications)**
 - ▶ Immobilization of various biocatalysts, their complexes and whole cells by physical and chemical methods and cold plasma
 - ▶ The use of laccase preparations as an agent with anti-cancer properties
 - ▶ Application of the obtained enzyme preparations for the production of cathodes and anodes in biofuel cells



RPMI 8226 cells treated with ex-LAC

Research projects (National Science Centre)

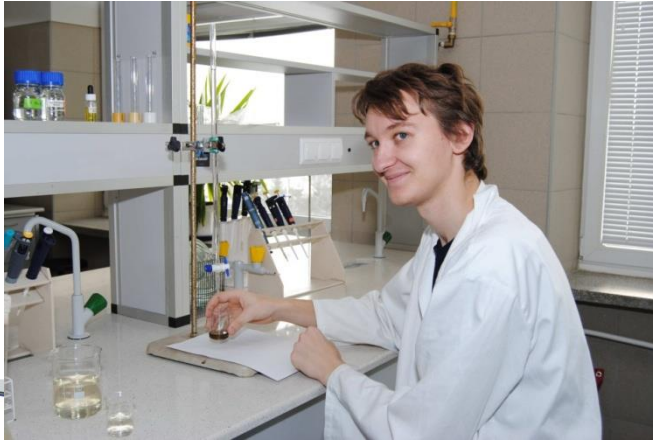
- ▶ **OPUS 13 (NCN) (2017)** „Modification of biomedical materials with the use of proteolytic enzyme inhibitors”. PI: prof. dr hab. Anna Jarosz-Wilkolazka.
- ▶ **MINIATURA 1 (NCN) (2017)** „Evaluation of bioremediation potential of the *Sinorhizobium meliloti* laccase”. PI: dr hab. Anna Pawlik.
- ▶ **MINIATURA 1 (NCN) (2017)** „A new mode of oxalic acid degradation by white and brown wood rot fungi”. PI: dr hab. Marcin Graż, prof. UMCS.
- ▶ **PRELUDIUM 11 (NCN) (2016)** „Analysis of the biological and physicochemical properties of exopolymers produced by *Rhodococcus opacus* FCL1069”. PI: dr Magdalena Czemierska.
- ▶ **SONATA 11 (NCN) (2016)** „Enzymatic synthesis of antimicrobial and antioxidant compounds in two-component transformation systems”. PI: dr Jolanta Polak.
- ▶ **SONATA 9 (NCN) (2015)** „Evaluation of antioxidant and antimicrobial potential of cellobiose dehydrogenase from fungi as a component of active packaging”. PI: dr Justyna Sulej.
- ▶ **PRELUDIUM 9 (NCN) (2015)** „Immobilised fungal laccase as a universal catalyst in the transformation of aromatic compounds”. PI: dr Kamila Wlizio.
- ▶ **OPUS 8 (NCN) (2014)** „Effect of light on *Cerrena unicolor* metabolism”. PI: dr hab. Grzegorz Janusz, prof. UMCS.
- ▶ **OPUS 7 (NCN) (2014)** „Characterisation and significance of a new oxalic acid oxidase (OXOAb) in the response of *Abortiporus biennis* to the presence of heavy metals in the growth environment”. PI: prof. dr hab. Anna Jarosz-Wilkolazka.
- ▶ **PRELUDIUM 8 (NCN) (2014)** „Analysis of selected physicochemical, biological, and pharmacological properties of biomedical materials modified with a synthetic serine protease inhibitor”. PI: dr Katarzyna Szalapat.



Scientific research with the participation of students



Scientific research with the participation of students



Examples of bachelor's theses topics carried out in the 2019/20 academic year

Supervisor	Bachelor's thesis subject
dr Renata Bancerz	The influence of milk components on the functioning of the human body
dr Justyna Sulej	Fungi as functional food
dr Marzanna Paździoch-Czochra	Hydroxy acids- biochemical characteristics and use in cosmetics
dr Dawid Stefaniuk	Personalized diagnostics and therapy of cancer
dr hab. Anna Pawlik	Structure, properties, and biotechnological applications of L- α -arabinofuranosidase
dr Jolanta Polak	Neurodegenerative diseases- causes and mechanism
dr Dawid Stefaniuk	Application of surface plasmon resonance in modern molecular biology and biochemistry
dr hab. Monika Osińska-Jaroszuk	The importance of amino acids and their substitutes in strength training of athletes
dr hab. Grzegorz Janusz	Application of the CRISPR / Cas9 system for genome editing in fungi



Examples of bachelor's theses topics carried out in the 2020/21 academic year

Supervisor	Bachelor's thesis subject
dr hab. Monika Osińska-Jaroszuk	Biological treatment as a method of treating psoriasis
dr Justyna Sulej	Pullulanase – an innovative tool in industrial starch processing, polymer with biomedical potential
dr Marzanna Paździoch-Czochra	Reactive oxygen species in tumorigenesis Melanins - synthesis pathways, biological functions and biotechnological application
dr Dawid Stefaniuk	Review of selected methods of proteins structure analysis and modeling
dr hab. Anna Pawlik	Characteristics, synthesis and application of fungal β -lactam antibiotics
dr Renata Bancerz	Transport of active substances through the skin and the influence of selected compounds on the human body Selected polymers and possibilities of using microorganisms for their degradation



Examples of master's theses topics carried out in the 2019/20 academic year

Supervisor	Master's thesis subject
prof. Anna Jarosz-Wilkolazka	Characteristics of selected biological properties of the natural cecropin A immobilized on a vascular prosthesis
dr hab. Magdalena Jaszek	Dynamics of changes in selected biochemical parameters in <i>Abortiporus biennis</i> mycelium under oxidative stress and changing light conditions
prof. Jerzy Rogalski	Ability of different cultures of yeast groups to attenuate linden honey
dr hab. Grzegorz Janusz	Effect of light on laccase produced by <i>Phlebia lindtneri</i>
dr hab. Magdalena Staszczak	Secretome analysis of <i>Trametes versicolor</i> using the 2D-PAGE technique
dr hab. Marcin Graż	The effect of mediators on the oxidation of selected alcohols in a reaction catalyzed by laccase from <i>Cerrena unicolor</i>



Examples of master's theses topics carried out in the 2020/21 academic year

Supervisor	Master's thesis subject
prof. Anna Jarosz-Wilkolazka	Application of acrylic carriers and nanoparticles TiO ₂ and Fe ₃ O ₄ /SiO ₄ for the immobilization of laccase from <i>Cerrena unicolor</i>
dr hab. Anna Matuszewska	Biochemical characterization and analysis of the antioxidant potential of selected low molecular weight fractions from the cultures of <i>Spongipellis borealis</i>
dr hab. Marcin Graż	Production of oxalate decarboxylase by <i>Bjerkandera fumosa</i> in in vitro culture conditions
dr hab. Magdalena Jaszek	Investigation of biotechnological potential of proteases from <i>Pycnoporus sanguineus</i>
dr hab. Magdalena Staszczak	Secretome analysis of <i>Trametes versicolor</i> using the 2D-PAGE technique
prof. Jerzy Rogalski	Ability of different cultures of yeast groups to attenuate linden honey
Dr hab. Monika Osińska-Jaroszuk	Evaluation of cytotoxic and antimicrobial properties of fungal cellobiose dehydrogenases of biotechnological interest
dr hab. Grzegorz Janusz	The effect of <i>Cerrena unicolor</i> laccase on storage of wine and beer

