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Consultation hours: Wednesdays, 12.00 – 14.00

Research interests:

Basic and process biochemistry, enzymology, proteomics and genomics: bacteria, yeast, microalgae and plant protein profiling in response to environmental stress, analysis of oxidative stress, study of unique biochemical pathways of recalcitrant xenobiotics biodegradation (C₁-compounds, aliphatic hydrocarbons and aromatic ones - BTEX, PAH, biphenyls, pesticides, phthalates, azo-dyes, EDCs) and heavy metal bioremediation (Cr, Cd) – by bacteria, non-conventional yeast, microalgae, macrophytes and terrestrial plants.

Environmental biotechnology, industrial microbiology: isolation, selection, adaptation and culture of soil bacteria, conventional and non-conventional yeasts – their physiology, biochemistry and applications in industry; identification and activity analysis of pro- and eukaryotic microorganisms inhabiting specific niches: especially clayey soils, microenvironments polluted with organic contaminants, wastewaters and activated sludges, wastewater treatment: both municipal and household as well as industrial effluents, construction of microbial communities consisting of soil bacteria, yeast and microalgae; studies of microbial biodegradation of recalcitrant xenobiotics and bioremediation of heavy-metals, with particular focus on chromium compounds bioremediation and detoxication: proteomic and enzymatic analysis of stress reactions induced by chromate in bacteria, yeast and macrophytes; bioaugmentation of clay minerals with bacterial consortia, immobilization and biostabilization of microbes on mineral carriers; transfer of laboratory-scale biotechnological study results into industrial practice; application of bacteria, yeast and microalgae as well as of complex microbial consortia for environmental cleanup projects, treatment of industrial wastewaters and post-fermentation, eutrophic liquors. Phytoremediation of heavy metals (Cd, Cr, Cu) and phytostabilization with the use of aquatic and terrestrial plants: treatment of polluted waters and reclamation of industrially degraded soils.

Agricultural sciences: construction of mixed bacterial/mineral biofertilizers; beneficiation of soils with plant growth-promoting microorganisms, analyses of soil microbiota, study of nitrification inhibitors, plant rhizosphere – microorganism interaction, antioxidative properties of herbal plants, vegetables and fruits: identification and determination of plant secondary metabolites (phenolic compounds, carotenoids), analysis of antioxidant capacity in plant extracts; functional food and bioactive dietary supplements obtained from agricultural products; health-beneficial activity of fruit extracts and juices.

Research experience:

Methodology: proteome analysis: bacterial, yeast, plant (macrophytes); protein chemistry and structure, biophysical chemistry, enzymology; clinical microbiology (biochemistry and enzymology of staphylococcal proteinases); process biochemistry, bioprocess optimization for environmental biotechnology applications; modern analytical and instrumental methods and laboratory techniques employed for monitoring of microbiological bioprocesses, cellular physiological state, metabolism and respiration, antioxidants and enzymes

Expertise in analytical techniques: liquid chromatography (HPLC, FPLC), gas chromatography (GC, GC-MS), spectrophotometry (UV-VIS), fluorimetry, electrophoretic techniques (1DE: native- and SDS-PAGE, zymography, 2DE), EPR (electron paramagnetic resonance) spectrometry, enzymatic assays, antiradical (antioxidant) capacity determination with ORAC, CUPRAC, FRAP, DPPH, EPR techniques; expertise in fermenter- and bioreactor-based cultures (microbial, microalgal).

Visiting Scholar

Kaszycki P. (2015) Lecture for students of the University in Brno, Faculty of Horticulture, Czech Republic: „*Analysis of bioactive compounds in selected horticultural products.*” 24.11.2015r.

Titles/Degrees:

D.Sci., habilitation dissertation: „*Enzymatic methylotrophic pathway of non-conventional yeasts – studies of the regulatory mechanisms and perspectives for application in environmental biotechnology*”, completed at the Faculty of Biology and Environment Protection, Lodz University, Poland, 2011; field - biological sciences, discipline: biology, speciality: biotechnology.

Ph.D., doctoral thesis: “*Fluorescence studies of molecular dynamics in model systems of biological membranes.*” Jagiellonian University, Faculty of Biology and Earth Sciences, Institute of Molecular Biology, field: biological sciences, speciality: biochemistry: 1990.

M.Sci. dissertation: “*Fluorescence studies of cell plasma membranes of rats with model diabetes.*” Jagiellonian University, Faculty of Biology and Earth Sciences, Institute of Molecular Biology; field: biology, speciality: molecular biology: 1985.

Professional profiles:

ORCID: <http://orcid.org/0000-0002-4968-8833>

List of publications:

Kostecka-Gugała, A.; Kruczek, M.; Ledwożyw-Smoleń, I.; **Kaszycki, P.** Antioxidants and Health-Beneficial Nutrients in Fruits of Eighteen *Cucurbita* Cultivars: Analysis of Diversity and Dietary Implications. *Molecules* 2020, 25, 1792. <https://doi.org/10.3390/molecules25081792>

Nosek, M.; Kaczmarczyk, A.; Jędrzejczyk, R.J.; Supel, P.; **Kaszycki, P.**; Miszański, Z. Expression of Genes Involved in Heavy Metal Trafficking in Plants Exposed to Salinity Stress and Elevated Cd Concentrations. *Plants* 2020, 9, 475. <https://doi.org/10.3390/plants9040475>

Dettenhofer M., Ondrejovič M., Vásáry V., **Kaszycki P.**, Twardowski T., Stuchlík S., Turňa J., Dundar M., Gartland K. M. A., Miertuš S. (2019) Current State and Prospects of Biotechnology in Central and Eastern European Countries. Part I: Visegrad countries (CZ, H, PL, SK). *Critical Reviews in Biotechnology* 39(1): 114–136, doi: 10.1080/07388551.2018.1523131

Śliwa M., **Kaszycki P.**, Supel P., Kornaś A., Kaproń A., Lüttge U., Miszański Z. (2019) Selected physiological parameters of creeping willow (*Salix repens* subsp. *arenaria* (L.) Hiit) – a shrubby plant inhabiting degraded industrial areas. *Trees Structure and Function* 33: 1447–1457, DOI: 10.1007/s00468-019-01872-z

Nosek M., Kaproń A., Śliwa M., Kornaś A., Jędrzejczyk R., Supel P., **Kaszycki P.**, Miszański Z. (2019) The response of a model C3/CAM intermediate semi-halophyte *Mesembryanthemum crystallinum* L. to elevated cadmium concentrations. *Journal of Plant Physiology*, 240 (2019) 153005; DOI <https://doi.org/10.1016/j.jplph.2019.153005>

Stach N., **Kaszycki P.**, Władyka B., Dubin G. (2018) Extracellular proteases of *Staphylococcus* spp. Chapter 11, pp. 135-145 [in:] *Pet-to-man travelling staphylococci: a world in progress*” ed. Vincenzo Savini, 2018 Elsevier Inc., Academic Press, ISBN: 978-0-12-813547-1

Kaszycki P., Dubicka-Lisowska A., Augustynowicz J., Piwowarczyk B., Wesolowski W. (2018) *Callitriche cophocarpa* (water starwort) proteome under chromate stress: evidence for induction of a quinone reductase. *Environmental Science and Pollution Research* 25: 8928–8942, <https://doi.org/10.1007/s11356-017-1067-y>

Brzeszcz J., **Kaszycki P.** (2018) Aerobic bacteria degrading both n-alkanes and aromatic hydrocarbons - an undervalued strategy for metabolic diversity and flexibility. Review. *Biodegradation* 29(4): 359-407, doi: 10.1007/s10532-018-9837-x.

Brzeszcz J., Steliga T., Kapusta P., Turkiewicz A., **Kaszycki P.** (2016) r-strategist versus K-strategist for the application in bioremediation of hydrocarbon-contaminated soils. *International Biodeterioration and Biodegradation* 106: 41–52, <http://dx.doi.org/10.1016/j.ibiod.2015.10.001>

Kwolek-Mirek M., Molon M., **Kaszycki P.**, Zadrag-Tecza R. (2016) L-carnosine enhanced reproductive potential of the *Saccharomyces cerevisiae* yeast growing on medium containing glucose as a source of carbon. *Biogerontology* 17: 737–747, doi 10.1007/S10522-016-9645-9