

Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*)

1. Članica UL (*UL member*):

Zdravstvena fakulteta / *Faculty of Health Sciences*

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

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3. Raziskovalno področje (*Research field*):

Mikrobiologija, biologija, varstvo okolja / *microbiology, biology, environment protection*

4. Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*):

Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce.

slo:

Naraščajoča urbanizacija, vse večja poraba virov, podnebne spremembe in prehod v nizkoogljično družbo zahtevajo večjo prilagodljivost mest in podeželja ter bolj trajnostno ravnanje z odpadno vodo, kar pomeni ponovno uporabo virov, kot so voda, hranila, biomasa in energija. Algne tehnologije kot ene od številnih sonaravnih rešitev doživljajo intenziven napredek na področju čiščenja odpadne vode (npr. novodobna onesnažila, patogeni, večkrat odporne bakterije, hranila) in sočasne obnove virov za kmetijsko uporabo (biomasa alg se šteje za organsko gnojilo, saj vsebuje mikro- in makro hranila). To zahteva razvoj in znanstveno vrednotenje potenciala algnih tehnologij za ponovno rabo vode in proizvodnjo organskih gnojil ter biostimulansov ob hkratnem zmanjševanju možnih okoljskih in zdravstvenih tveganj. Pri tem je še posebej pomembno obvladovanje patogenov in večkrat odpornih bakterij oziroma problem vertikalnega in horizontalnega prenosa večkratno odpornih mikroorganizmov in genov za odpornost proti protimikrobnim snovem preko odpadne vode v okolje.

Zapiranje snovnih tokov z algnimi tehnologijami in povezana mikrobiološka tveganja bodo jedro raziskovalnega dela mladega raziskovalca (MR). Raziskovalno delo bo vključeno v tekoče projekte in program raziskovalne skupine: raziskovalni programa P3-0388 Mehanizmi varovanja zdravja in raziskovalni projekt J2-4427 ALGreen Algne tehnologije za zelene produkte. Delo MR bo potekalo na laboratorijskem in pilotnem nivoju. MR bo ob podpori mentorja in somentorja:

- optimiziral produkcijo algne biomase (zadrževalni čas, vezava hranil iz odpadne vode, dodajanje CO₂, učinek čiščenja odpadne vode),
- testiral različne načine žetja alg (elektrokoagulacija, flokulacija, filtracija),
- preučeval učinek čiščenja algne tehnologije v kombinaciji z naprednimi oksidativnimi postopki na koncentracijo, vrsto in odstranjevanje patogenih mikroorganizmov (bakterij, gliv, parazitov),
- ugotavljal širjenje genov za odpornost v povezavi s prisotnostjo protimikrobnih snovi v odpadni vodi,

- razvil in optimiziral procese pridobivanja produktov iz algne biomase (sušenje, suhi in mokri nosilci biomase),
- ovrednotil produkte čiščenja odpadne vode v luči obnove hranil in mikrobiološkega tveganja za zdravje in okolje.

Ugotovitve iz laboratorijskih poskusov bomo prenesli na pilotni nivo. Pilotni poskusi bodo potekali na pilotnem visoko-pretočnem algnem bazenu (ang. high-rate algal pond - HRAP) na centralni čistilni napravi.

Delo MR bo potekalo v interdisciplinarni raziskovalni skupini s široko domačo in mednarodno mrežo, preko katere se povezujemo v nacionalne in mednarodne projekte na temo sonaravnih rešitev in ponovne rabe virov. MR bo imel možnost mreženja in vpetosti v različne konzorcije, predstavitev svojega dela v mednarodnem znanstvenem kot tudi lokalnem strokovnem okolju, kar je pomembno za nadaljnji razvoj kariere.

Prednostni profil MR je izobrazba magistrske stopnje s področja mikrobiologije, biologije, biotehnologije ali sorodne discipline. Zaželeno so izkušnje in poglobljeno znanje s področja mikrobiologije in sonaravnih tehnologij za čiščenje odpadnih voda in praktična znanja za delo v mikrobiološkem in kemijskem laboratoriju. Prav tako se od kandidata oziroma kandidatke pričakuje samostojno delo (samoiniciativnost), odlično znanje angleškega jezika (tako pisanje kot branje), inovativnost, sposobnost za timsko delo, komunikativnost, organizacijske sposobnosti, zanimanje za ali poznavanje računalniških programov za statistično obdelavo podatkov. Predviden je vpis ali na doktorski študijski program Bioznanosti na Biotehniški fakulteti.

eng:

Increasing urbanization, resource consumption, climate change, and the transition to a low-carbon society require greater urban and rural flexibility and more sustainable wastewater management, i.e., reuse of sources such as water, nutrients, biomass, and energy. Algal technologies, as one of the many nature-based solutions, are experiencing intense advances in wastewater treatment (e.g., contaminants of emerging concern, pathogens, multidrug-resistant bacteria, nutrients) and simultaneous resource recovery for agricultural use (algal biomass is considered an organic fertilizer because it contains micro- and macronutrients). This requires the development and scientific evaluation of the potential of algal technologies for water reuse and the production of organic fertilizers and biostimulants while reducing potential environmental and health risks. In this context, control of pathogens and multidrug-resistant bacteria is of extreme importance. The vertical and horizontal transfer of multidrug-resistant microorganisms and antimicrobial resistance genes to the environment via wastewater is an increasingly pressing problem.

Closing material flows with algal technologies and the associated microbiological risks will be the rationale of the PhD student's work. The research is integrated with ongoing projects and a research group program: P3-0388 research program Mechanisms of Health Protection and research project J2-4427 ALGreen Algal Technologies for Green Products. The PhD student's work will be held at the laboratory and pilot levels. With the support of a mentor and co-mentor, the PhD student will:

- optimize algal biomass production (retention time, nutrient uptake from wastewater, addition of CO₂, efficiency of wastewater treatment),
- test different methods of algae harvesting (electrocoagulation, flocculation, filtration),
- study the treatment efficiency of algal technologies in combination with advanced oxidation processes on the concentration, type, and removal of pathogenic microorganisms (bacteria, fungi, parasites),

- determine the spread of resistance genes associated with the presence of antimicrobial substances in wastewater,
- develop and optimize processes for obtaining algal biomass products (drying, dry and wet biomass carriers),
- evaluate wastewater treatment products in terms of nutrient recovery and microbiological risks to health and the environment.

The findings from the laboratory experiments will be transferred to a pilot scale. The pilot experiments will be conducted on a high-rate algae pond (HRAP) at a central wastewater treatment plant.

The work of PhD student will take place in an interdisciplinary research group with a wide national and international network, through which we connect with national and international projects on nature-based solutions and reuse of resources. PhD student will have the opportunity to network and integrate in different consortia to present his/her work in an international scientific and local professional environment, which is important for further career development.

The preferred profile of the PhD candidate is a Master's degree in microbiology, biology, biotechnology or a related discipline. Experience and in-depth knowledge in the field of microbiology and nature-based technologies for wastewater treatment is desirable, as well as practical skills to work in a microbiology and chemistry laboratory. Also expected are independent work (self-initiative), very good knowledge of English (written and spoken), ability to innovate, work in a team, communication skills, organizational skills, interest in or knowledge of computer programs for statistical data processing. Admission to the PhD program in Biosciences at the Faculty of Biotechnology is foreseen.