

Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*)

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, Biotehniška fakulteta

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

Anja Klančnik, anja.klancnik@bf.uni-lj.si

3. Šifra in naziv raziskovalnega področja (*Research field*):

4.02 Biotehnika / Živalska produkcija in predelava

4. Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*):

Navedite tudi morebitne druge zahteve, vezane na usposabljanje mladega raziskovalca (npr. znanje tujih jezikov, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje...).

slo:

Raziskovalna tema posega v aktualen problem sodobnega načina življenja - proizvodnjo obstojne in varne hrane. Izpostavljena je odpornost bakterij, prenosljivih s hrano, kot grožnja javnemu zdravju in ekonomiji. Eden od mehanizmov odpornosti je biofilm, ki bakterije ščiti pred neugodnimi okoljskimi dejavniki in imunskim odzivom gostitelja. »Globalni akcijski načrt proti AMR (angl. Antimicrobial Resistance)« in pristop »Eno zdravje« [1-3] usmerjata v razvoj novih / alternativnih načinov omejevanja kontaminacij in/ali zdravljenje mikrobnih okužb. V »post-antibiotični« dobi so to tudi alternativne protimikrobne učinkovine z delovanjem na več kot eno znotrajcelično tarčo že v sub-inhibitorni koncentraciji. Raziskovalni model bodo bakterije rodu *Campylobacter*, s hrano prenosljivi vodilni povzročitelji črevesnih okužb ljudi v razvitih državah. **Osrednji cilj projekta bo modulacija števila/pristonosti bakterij zaradi kritičnih pogojev v živilski verigi** kot posledica obdelave živil, prisotne mikrobne združbe ter odpornosti bakterij *Campylobacter*. Izhodišče so predhodne raziskave mehanizmov večkratne odpornosti kampilobaktrov (izlivne črpalke), stresnega odziva in preživetvenih oblik (VBNC, biofilm), kolonizacija biotskih/abiotskih površin [4] in mikrobne interakcije - osrednja tema PS Mikrobiologija in biotehnologija živil in okolja. **Fokus raziskovanja bo razumevanje vplivov mikrobne združbe, potencialno prisotne v živilih, na celične mehanizme adhezije/interakcije/stresnega odgovora bakterij *Campylobacter*.** Prav tako bo zajeto sistematično vrednotenje vpliva proizvodno-tehnoloških parametrov (npr. površine, T/atmosfera, dodatek učinkovin) in mehanizmov preživetja bakterij *C. jejuni* (npr. stresni odgovor, pritrjevanje, biofilm, medsebojna interakcija). Celosten pristop bo vključeval raziskave na nivoju genskih informacij, proteinov in zunajceličnega matriksa do fiziološkega odziva celice in biofilma. **Uporabili bomo nove bioinformatične pristope obdelave podatkov** ter izpostavili ključne gene in proteine moduliranih celičnih metabolizmov, ter predlagali potencialne tarče za usmeritev inovativnih strategij nadzora bakterij *Campylobacter*. Tematika povezuje aktualne projekte, programsko skupino ter odlične slovenske/tuje raziskovalce. Rezultat bodo nova znanstvena dognanja o premalo raziskanih kampilobaktirih, ter razvoj

inovativnega pristopa inaktivacije z alternativnimi strategijami (nov pristop, nova učinkovina, tehnologija ovir, nove tarče znotraj/zunaj celice) za zmanjšanje vpliva na okolje, ekonomijo in zdravje.

Zaželena je samostojnost in motiviranost za raziskovalno delo, delovne izkušnje v laboratoriju z bakterijami ter znanje angleškega jezika.

1. WHO (2019) New report calls for urgent action to avert antimicrobial resistance crisis. Geneva, <https://www.who.int/news-room/detail/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis>
2. WHO (2017) WHO publishes list of bacteria for which new antibiotics are urgently needed, <https://www.who.int/news-room/detail/27-02-2017-who-publishes-list-of-bacteria-for-which-new-antibiotics-are-urgently-needed>
3. EFSA, ECDC (2019) The European Union one health 2018 zoonosis report. EFSA J 17(12): 5926, <https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2019.5926>
4. Klančnik s sod. (2020) Anti-adhesion activity of phytochemicals to prevent *Campylobacter jejuni* biofilm formation on abiotic surface. Photochemistry Reviews, <https://doi.org/10.1007/s11101-020-09669-6>

eng:

The research topic focusses on the current problem of modern life - the production of sustainable and safe food. Resistance to environmental stress of food-borne bacteria to environmental stressors is a threat to public health and the economy. One of the bacterial resistance mechanism is also biofilm formation, which protects the bacteria from environmental stress and the host immune response. The "Global Antimicrobial Resistance Action Plan" and the "One Health" approach [1-3] focus on the development of novel/alternative strategies to limit bacterial contamination and treat microbial infections. In the "post-antibiotic" era, these are also alternative antimicrobial agents with multiple intracellular targets used at their sub-inhibitory concentration. The research model will be *Campylobacter*, a leading foodborne pathogen of human intestinal infections in developed countries.

The main objective of the project will be to develop novel strategies and approaches, allowing the modulation/elimination of bacterial number/transmission due to critical conditions in the food chain according to food treatment, microbial community and cell resistance. The starting point is previous research into the mechanisms of multiple resistance of campylobacter (efflux pump), stress response and survival forms (VBNC, biofilm), colonization of biotic/abiotic surfaces [4] and microbial interactions - a central topic of PG Microbiology and Biotechnology of Food and Environment. **The main research focus will be to understand the effects of the microbial community potentially present in foods on mechanism of adhesion/interacion/stress response of *Campylobacter*.** It will also focus on the impact of production-technology parameters (e.g. surface, T/storage atmosphere, active compounds) and bacterial survival mechanisms (e.g. stress response, adhesion, biofilm, interaction). The holistic approach will include research at the level of genetic information, proteins, extracellular matrix and physiological response of the cell and biofilm. **We will use new bioinformatics data**

processing approaches, such as gene and protein expression analysis to understand cell mechanism and predict innovative control strategy. The research topic links active projects, a program group, and excellent Slovenian/foreign researchers. The result will be new scientific knowledge on biology of *Campylobacter* needed for the development of an innovative and alternative control approach that will reduce the negative impact of *Campylobacter* on human health, environment and economy.

Independence and motivation for research work, experience in working with bacteria and good knowledge of English language is desirable.

1. WHO (2019) New report calls for urgent action to avert antimicrobial resistance crisis. Geneva, <https://www.who.int/news-room/detail/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis>
2. WHO (2017) WHO publishes list of bacteria for which new antibiotics are urgently needed, <https://www.who.int/news-room/detail/27-02-2017-who-publishes-list-of-bacteria-for-which-new-antibiotics-are-urgently-needed>
3. EFSA, ECDC (2019) The European Union one health 2018 zoonosis report. EFSA J 17(12): 5926, <https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2019.5926>
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