

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

1. Članica UL (*UL member*):

Medicinska fakulteta, UL, Inštitut za biologijo celice (*Faculty of Medicine, Institute of Cell Biology*)

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

Samo Hudoklin, samo.hudoklin@mf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Celična biologija (*Cell biology*); molekularna celična biologija (*Molecular cell biology*)

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:

Mladi raziskovalec (M/Ž) se bo priključil kolektivu Inštituta za biologijo celice, Medicinska fakulteta v Ljubljani, ki ima tradicijo kakovostnega pedagoškega in raziskovalnega dela ter razvoja metod celične biologije v našem prostoru. Raziskovalno se na inštitutu ukvarjamo s proučevanjem bazičnih in aplikativnih vidikov delovanja epitelija sečnega mehurja (urotelija) v normalnih in patoloških stanjih, pri čemer uporabljamo sodobno opremo ter interdisciplinarno sodelujemo z domačimi in tujimi inštitucijami. Mladi raziskovalec bo vključen v raziskovalni program inštituta z naslovom »Diferenciacija urotelijskih celic« (P3-0108), v študijskem letu 2023/2024 se bo vpisal na interdisciplinarni doktorski študijski program Biomedicina Univerze v Ljubljani, kasneje pa bo imel možnost spoznati tudi pedagoško delo.

Znanstvenoraziskovalno delo mladega raziskovalca bo zajemalo dva medsebojno povezana sklopa, tj. i) raziskovanje celične biologije urotelija in ii) razvoj naprednih metod elektronske mikroskopije. i) Osrednja tema raziskovalnega dela bo proučevanje celičnih organelov, ki so vključeni v nastanek, organizacijo in transport urotelijskih plakov (Golgijev aparat, post-Golgijevi predelki, fuziformni vezikli) ter mitohondrijev, ki so odgovorni za energijsko ravnotežje v urotelijskih celicah. Znano je, da urotelijski plaki, tj. specifične membranske domene, ključne za vzdrževanje krvno-urinske pregrade sečnega mehurja, postopoma zorijo v omenjenih organelih, vendar so mehanizmi nastanka ter prostorsko-časovni odnosi med njimi slabo poznani. Prav tako ni znano, kakšna je vloga mitohondrijev v različno diferenciranih urotelijskih celicah. Namen dela bo analizirati te vloge in odnose s pomočjo *in vitro* modelov normalnih in rakavih urotelijskih celic ter *in vivo* živalskih modelov normalnega urotelija in urotelija med regeneracijo po poškodbi. ii) Za iskanje odgovorov na znanstvena vprašanja bo mladi raziskovalec uporabil biokemijske metode, metode svetlobne (konfokalne) ter elektronske (presevne, vrstične) mikroskopije. Slednja ima na Inštitutu za biologijo celice več kot 50 letno tradicijo, a razvoj novih aparatov in metod elektronske mikroskopije v zadnjem obdobju odpira nove možnosti analize krio-fiksiranih vzorcev, označevanja proteinov, korelativne svetlobne in elektronske mikroskopije, ter analize in avtomatizirane rekonstrukcije tridimenzionalnih odnosov med celičnimi strukturami. Mladi raziskovalec se bo spoznal s temi metodami, jih prilagodil ter

optimiziral protokole za pripravo urotelijskih vzorcev.

Rezultate raziskav, ki bodo izvedene na Inštitutu in deloma v tujini, bomo objavili v mednarodnih revijah s faktorjem vpliva, kandidat pa bo v tem obdobju zaključil doktorski študij. Na delovno mesto naj se prijavijo kandidati naravoslovnih smeri študija na 2. stopnji (biologija, biokemija, mikrobiologija, farmacija, medicina, dentalna medicina, veterina, laboratorijska biomedicina ipd.), ki jih veseli raziskovalno delo, učenje novih veščin in so pripravljeni odprto in sistematično delati v kolektivu. Poznavanje računalniških programov (MS Office, Photoshop, programiranje), izkušnje z delom v laboratoriju in mikroskopiranjem je dobrodošlo, ni pa pogoj.

eng:

The young researcher (m/f) will join team of the Institute of Cell Biology at the Faculty of Medicine in Ljubljana, which has a tradition of high-quality teaching, research, and development of cell biology methods in Slovenia. At the Institute, we investigate basic and applied aspects of the functioning of the urinary bladder epithelium (urothelium) under normal and pathological conditions, for which we use modern equipment and cooperate in an interdisciplinary manner with national and international partners. The young researcher will be included in the Institute's research programme entitled "Urothelial cell differentiation" (P3-0108), in the academic year 2023/2024 he/she will be enrolled in the interdisciplinary PhD programme in Biomedicine at the University of Ljubljana, and later he/she will have the opportunity to be involved in teaching.

The scientific work of the young researcher will cover two interrelated areas, namely i) the study of urothelial cell biology and ii) the development of advanced electron microscopic methods. i) The central research topic will be the study of cell organelles involved in the formation, organisation, and transport of urothelial plaques (e.g., Golgi apparatus, post-Golgi compartments, fusiform vesicles) and mitochondria, which are responsible for energy balance in urothelial cells. It is known that urothelial plaques, i.e., specific membrane domains crucial for maintaining the blood-urine permeability barrier of the urinary bladder, progressively mature in the above organelles, but the mechanisms of formation and their spatiotemporal relationships are poorly understood. It is also not known what role mitochondria play in the differently differentiated urothelial cells. The aim of the work is to analyse these roles and relationships using *in vitro* models of normal and cancerous urothelial cells as well as *in vivo* models of normal and regenerating urothelium after injury in rodents. ii) To find answers to scientific questions, the young researcher will use biochemical-, light- (e.g., confocal) and (scanning, transmission) electron microscopy methods. The latter has a tradition of more than 50 years at the Institute of Cell Biology, but the development of new equipment and methods of electron microscopy in recent years opens new possibilities for the analysis of cryofixed samples, protein labelling, correlative light and electron microscopy as well as the analysis and automated reconstruction of three-dimensional relationships between cellular compartments. The young researcher will learn these methods, and optimise the protocols for the preparation of urothelial samples. Part of the research will take place abroad, the research results will be published in international journals, and the candidate will complete his/her PhD studies during this time. Candidates who have studied natural sciences at the 2nd level (biology, biochemistry, microbiology, pharmacy, medicine, dentistry, veterinary medicine, laboratory biomedicine, etc.), who enjoy research work and learning new skills, and who are willing to work systematically in a team should apply for the position. Knowledge of computer programmes (MS Office, Photoshop, programming) and experience of working in a laboratory or with microscopes is welcome but not a prerequisite.