

Ústav molekulárnej biológie SAV



**Správa o činnosti organizácie SAV
za rok 2020**

Bratislava
január 2021

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1. Základné údaje o organizácii

1.1. Kontaktné údaje

Názov: Ústav molekulárnej biológie SAV

Riaditeľ: Ing. Eva Kutejová, DrSc.

Zástupca riaditeľa: Ing. Daniela Krajčíková, CSc.

Vedecký tajomník: Mgr. Ľuboš Kľučár, PhD.

Predseda vedeckej rady: RNDr. Imrich Barák, DrSc.

Člen Snemu SAV: Mgr. Ľuboš Kľučár, PhD.

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Názvy a adresy organizačných zložiek a detašovaných pracovísk:

Organizačné zložky: nie sú

Detašované pracoviská: nie sú

Vedúci organizačných zložiek a detašovaných pracovísk:

Organizačné zložky: nie sú

Detašované pracoviská: nie sú

Členovia Snemu SAV za organizačné zložky:
nie sú

Typ organizácie: Príspevková od roku 2017

1.2. Údaje o zamestnancoch

Tabuľka 1a Počet a štruktúra zamestnancov

Štruktúra zamestnancov	K	K		K do 35 rokov		F	P	T	O
		M	Ž	M	Ž				
Celkový počet zamestnancov	69	22	47	3	9	65	59.67	45.58	3.7
Vedeckí pracovníci	42	17	25	2	5	38	36.73	34.73	0
Odborní pracovníci VŠ (výskumní a vývojoví zamestnanci ¹)	10	1	9	1	3	10	6.93	6.93	0
Odborní pracovníci VŠ (ostatní zamestnanci ²)	5	1	4	0	1	5	4.09	0	0

Odborní pracovníci ÚS	4	0	4	0	0	4	4	3	3
Ostatní pracovníci	8	3	5	0	0	8	7.92	0.92	0.7

¹ odmeňovaní podľa 553/2003 Z.z., príloha č. 5² odmeňovaní podľa 553/2003 Z.z., príloha č. 3 a č. 4

K – kmeňový stav zamestnancov v pracovnom pomere k 31.12.2020 (uvádzať zamestnancov v pracovnom pomere, vrátane riadnej materskej dovolenky, zamestnancov pôsobiacich v zahraničí, v štátnych funkciách, členov Predsedníctva SAV, zamestnancov pôsobiacich v zastupiteľských zboroch)

F – fyzický stav zamestnancov k 31.12.2020 (bez riadnej materskej dovolenky, zamestnancov pôsobiacich v zahraničí v štátnych funkciách, členov Predsedníctva SAV, zamestnancov pôsobiacich v zastupiteľských zboroch)

P – celoročný priemerný prepočítaný počet zamestnancov

T – celoročný priemerný prepočítaný počet riešiteľov projektov

O – celoročný priemerný prepočítaný počet obslužného personálu podieľajúceho sa na riešení projektov (technikov, laborantov, projektových manažérov a pod.) mimo zamestnancov v administratívne, správe a údržbe budov, upratovačiek, vodičov a pod.

M, Ž – muži, ženy

Tabuľka 1b Štruktúra vedeckých pracovníkov (kmeňový stav k 31.12.2020)

Rodová skladba	Pracovníci s hodnosťou				Vedeckí pracovníci v stupňoch		
	DrSc.	CSc./PhD.	prof.	doc.	I.	II.a.	II.b.
Muži	6	11	0	1	6	7	4
Ženy	1	24	0	0	1	15	9

Tabuľka 1c Štruktúra pracovníkov podľa veku a rodu, ktorí sú riešiteľmi projektov

Veková štruktúra (roky)	< 31		31-35		36-40		41-45		46-50		51-55		56-60		61-65		> 65	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Muži	1	0.2	2	2.0	2	1.1	2	2.0	3	3.0	2	1.5	2	2.0	3	3.0	0	0.0
Ženy	3	1.4	5	5.0	2	2.0	4	4.0	2	2.0	0	0.0	9	9.0	4	4.0	4	3.7

A – Prepočet bez zohľadnenia úväzkov zamestnancov

B – Prepočet so zohľadnením úväzkov zamestnancov

Tabuľka 1d Priemerný vek zamestnancov organizácie k 31.12.2020

	Kmeňoví zamestnanci	Vedeckí pracovníci	Riešitelia projektov
Muži	49.8	48.5	47.5
Ženy	48.8	47.6	49.8
Spolu	49.1	48.0	49.1

1.3. Iné dôležité informácie k základným údajom o organizácii a zmeny za posledné obdobie (v zameraní, v organizačnej štruktúre a pod.)

V roku 2020 sa skončilo prvé funkčné obdobie riaditeľky Ing. Evy Kutejovej, DrSc, ktorá bola opätovne zvolená do funkcie riaditeľky vo voľbách, ktoré sa uskutočnili v septembri 2020 na ÚMB SAV a v októbri 2020 na Predsedníctve SAV. Tento rok sme prijali štyroch doktorandov, z toho jedného doktoranda nám bolo umožnené prijať mimo počtu povolených novoprijatých doktorandov (3). Na základe úspešnej aplikácie o finančný príspevok z fondu Š. Schwarza sa podarilo prijať do skupiny Apidológie a apiterapie Mgr. Marcelu Bučekovú, PhD., po jej post-doktorandskom pobyte na prestížnom pracovisku (National University of Singapore).

V rámci medzinárodného projektu Interreg SK-AT „Budovanie výukových a výskumných kapacít v štruktúrnej a funkčnej analýze biomolekúl pre potreby biomedicíny a biotechnológií“ a významnou podporou Predsedníctva SAV vo forme pôžičky, sme vybudovali automatizované laboratórium štruktúrnej biológie, prvého svojho druhu na Slovensku. Vytvorilo sa takto zázemie pre kvalitné vzdelávanie, poskytovanie poradenstva a špičkový výskum v oblasti biomedicíny a biotechnológií <http://www.imb.savba.sk/strubiomol/index.php?id=home&lang=sk>.

Skupina Apidológie a apiterapie pod vedením Ing. Juraja Majtána, DrSc. založila projekt Medové laboratórium, ktorého snahou je poskytovať širokej verejnosti možnosť analýzy antibakteriálnej aktivity medov a už v tomto roku zaznamenala značný záujem, hlavne drobných včelárov.

Zložitá pandemická situácia, ktorá vznikla v dôsledku výskytu koronavírusu nás tiež prinútila zaviesť na pracovisku preventívne opatrenia, ktorých cieľom bolo zabrániť šíreniu ochorenia COVID-19, odporúčali sme všetkým zamestnancom, ktorých prítomnosť nebola na ústave nevyhnutá, aby pracovali z domu a zabezpečili sme striedanie zamestnancov, ktorí potrebovali pracovať v laboratóriách. Naši pracovníci sa aktívne zapojili do procesu testovania pomocou PCR na Ústave verejného zdravotníctva a sú stále registrovaní pre prípad urgentnej potreby navýšenia počtu PCR testov. Pracovníci sa tiež aktívne zapojili do plošného testovania v novembri 2020.

V roku 2020 sa podarilo uskutočniť prvú etapu rekonštrukcie rozvodov v budove A ÚMB, oceňujeme, že P SAV poskytlo pracovisku finančnú podporu, bez ktorej by sa tieto práce nemohli uskutočniť.

2. Vedecká činnosť

2.1. Domáce projekty

Tabuľka 2a Domáce projekty riešené v roku 2020

ŠTRUKTÚRA PROJEKTOV	Počet		Čerpané financie (€)					
	A	B	A				B	
			Zo zdrojov SAV		Z iných zdrojov		Zo zdrojov SAV	Z iných zdrojov
			Spolu	Pre organizáciu	Spolu	Pre organizáciu		
1. Projekty VEGA	14	2	119304	119304	-	-	1110	-
2. Projekty APVV	6	10	-	-	155964	146890	-	82439
3. Projekty OP ŠF	0	0	-	-	-	-	-	-
4. Projekty SASPRO	0	0	-	-	-	-	-	-
5. Iné projekty (FM EHP, ŠPVV, Vedecko-technické projekty, ESF, na objednávku rezortov a pod.)	0	0	-	-	-	-	-	-

A - organizácia je nositeľom projektu

B - organizácia sa zmluvne podieľa na riešení projektu

Tabuľka 2b Domáce projekty podané v roku 2020

Štruktúra projektov	Miesto podania	Organizácia je nositeľom projektu	Organizácia sa zmluvne podieľa na riešení projektu
1. Účasť na nových výzvach APVV r. 2020	-		3
2. Projekty výziev OP ŠF podané r. 2020	Bratislava		
	Regióny		

2.2. Medzinárodné projekty

2.2.1. Medzinárodné projekty riešené v roku 2020

Tabuľka 2c Medzinárodné projekty riešené v roku 2020

ŠTRUKTÚRA PROJEKTOV	Počet		Čerpané financie (€)					
	A	B	A				B	
			Zo zdrojov SAV		Z iných zdrojov		Zo zdrojov SAV	Z iných zdrojov
			Spolu	Pre organizáciu	Spolu	Pre organizáciu		
1. Projekty 7. RP EÚ a Horizont 2020	0	0	-	-	-	-	-	-
2. Projekty ERA.NET, ESA, JRP	0	0	-	-	-	-	-	-
3. Projekty COST	0	0	-	-	-	-	-	-
4. Projekty EUREKA, NATO, UNESCO, CERN, IAEA, IVF, ERDF a iné	1	0	-	-	781786	746040	-	-
5. Projekty v rámci medzivládnych dohôd	0	0	-	-	-	-	-	-
6. Bilaterálne projekty MAD	0	0	-	-	-	-	-	-
7. Bilaterálne projekty ostatné	1	1	-	-	-	-	-	11000
8. Podpora MVTs z národných zdrojov okrem SAV (APVV a iné)	0	0	-	-	-	-	-	-
9. Iné projekty	0	0	-	-	-	-	-	-

A - organizácia je nositeľom projektu

B - organizácia sa zmluvne podieľa na riešení projektu

2.2.2. Medzinárodné projekty Horizont 2020 podané v roku 2020

Tabuľka 2d Počet projektov Horizont 2020 v roku 2020

	A	B
Počet podaných projektov Horizont 2020		

A - organizácia je nositeľom projektu

B - organizácia sa zmluvne podieľa na riešení projektu

Údaje k domácim a medzinárodným projektom sú uvedené v Prílohe B.

2.2.3. Zámery na čerpanie štrukturálnych fondov EÚ v ďalších výzvach

2.3. Najvýznamnejšie výsledky vedeckej práce (maximálne 1000 znakov + 1 obrázok; bibliografický údaj uvádzajte rovnako ako v zozname publikačnej činnosti, vrátane IF)

2.3.1. Základný výskum

A. Tvorba bakteriálnych nanotrubíc ako „post mortem“ prejav stresovanej bunky.

Autori (za ÚMB SAV): I. Barák, K. Muchová

Bakteriálne nanotrubice boli objavené už pred desiatimi rokmi. K unikátnym schopnostiam týchto nanotrubíc boli pripísané procesy, ako sú prenos DNA, RNA a bielkovín medzi bunkami rôznych baktérií, ako aj „upírske“ vysatie živín z eukaryotickej bunky. Naše výsledky sú vo veľkom protiklade s predtým publikovanými zisteniami. Ukázali sme, že nanotrubice v princípe vznikajú z každej bunky keď použijeme rôzne stresové faktory, napríklad tlak alebo ich vystavíme pôsobeniu antibiotík. Bakteriálna bunková stena dokáže vo vnútri bunky udržiavať tlak až dvadsať atmosfér. Pokiaľ ale dôjde buď mechanicky, alebo pôsobením antibiotík k narušeniu steny, ďalšie udržanie takého veľkého tlaku nie je možné. Tento tlak zapríčiní doslova „vystrelenie“ cytoplazmatickej membrány vo forme nanotrubice do vonkajšieho prostredia cez vzniknuté otvory v bunkovej stene. Dôležitým zistením bolo, že práve v okamihu, keď bunka „vystrelí“ nanotubicu, bunka zomiera. To znamená, že tvorba nanotrubíc nie je riadený biologický proces ale „post mortem“ prejav stresovanej bunky.



Snímka zo skenovacej elektrónovej mikroskopie buniek *Bacillus subtilis*, ktoré sú akoby poprepávané nanotubicami (O. Benada, Mikrobiologický ústav, Akadémie vied, ČR).

Projekty

1. VEGA 2/0007/17 - Mechanizmy asymetrického bunkového delenia počas sporulácie *Bacillus subtilis*
2. APVV-18-0104 - Asymetrické bunkové delenie počas tvorby bakteriálnej endospóry

Výstupy

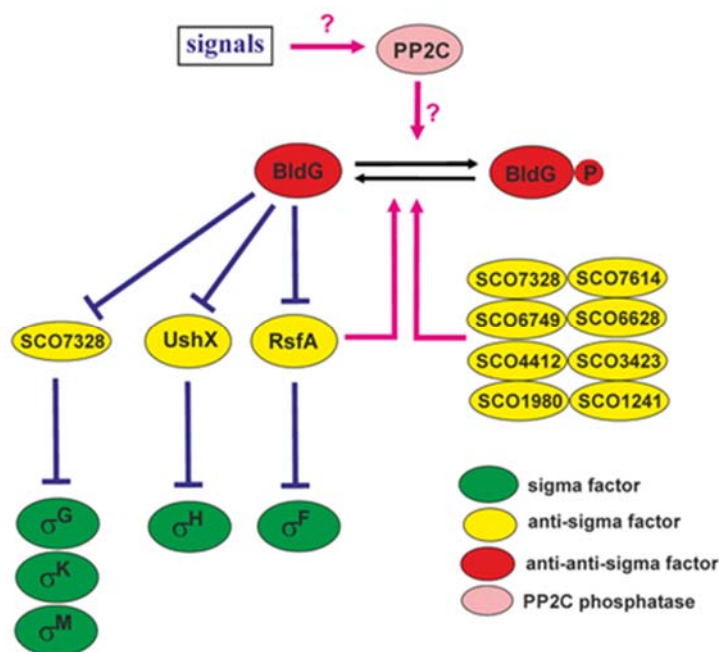
1. POSPÍŠIL, J. - VÍTOVSKÁ, D. - KOFROŇOVÁ, Olga - MUCHOVÁ, Katarína -

- ŠANDEROVÁ, H. - HUBÁLEK, M. - ŠIKOVÁ, M. - MODRÁK, M. - BENADA, O.** - BARÁK, Imrich - KRÁSNY, L. Bacterial nanotubes as a manifestation of cell death. In Nature Communications, 2020, vol. 11, no. 4963. (2019: 12.121 - IF, Q1 - JCR, 5.569 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 2041-1723. Dostupné na: <https://doi.org/10.1038/s41467-020-18800-2>
2. MUCHOVÁ, Katarína - CHROMÍKOVÁ, Zuzana - BARÁK, Imrich**. Linking the peptidoglycan synthesis protein complex with asymmetric cell division during bacillus subtilis sporulation. In International Journal of Molecular Sciences, 2020, vol. 21, no. 4513. (2019: 4.556 - IF, Q1 - JCR, 1.317 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents, WOS, SCOPUS). ISSN 1422-0067. Dostupné na: <https://doi.org/10.3390/ijms21124513>
 3. WOLLMAN, A. - MUCHOVÁ, Katarína - CHROMÍKOVÁ, Zuzana - WILKINSON, A.J. - BARÁK, Imrich - LEAKE, Mark C.**. Single-molecule optical microscopy of protein dynamics and computational analysis of images to determine cell structure development in differentiating Bacillus subtilis. In Computational and Structural Biotechnology Journal, 2020, vol. 18, 1474–1486. (2019: 6.018 - IF, Q1 - JCR, 1.782 - SJR, Q1 - SJR). ISSN 2001-0370. Dostupné na: <https://doi.org/10.1016/j.csbj.2020.06.005>
 4. GACEK-MATTHEWS, A. - CHROMÍKOVÁ, Zuzana - SULYOK, Michael - LÜCKING, G. - BARÁK, Imrich** - EHLING-SCHULZ, M. Beyond toxin transport: novel role of ABC transporter for enzymatic machinery of cereulide NRPS assembly line. In mBio, 2020, vol. 11, no. e01577. (2019: 6.784 - IF, Q1 - JCR, 3.876 - SJR, Q1 - SJR). ISSN 2150-7511. Dostupné na: <https://doi.org/10.1128/mBio.01577-20>
 5. SOBOLEV, E. - ZOLOTAREV, S. - GIEWEKEMEYER, K. - BIELECKI, J. - OKAMOTO, K. - BARÁK, Imrich - MAIA, Filip R.N.C.**. Megahertz single-particle imaging at the European XFEL. In Communications Physics, 2020, vol. 3, no. 97. (2019: 4.684 - IF, Q1 - JCR, 2.310 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 2399-3650. Dostupné na: <https://doi.org/10.1038/s42005-020-0362-y>
 6. M. Bodík, D. Krajčíková, J. Hagara, E. Majkova, I. Barák and P. Šiffalovič (2021) Diffraction pattern of Bacillus subtilis CotY spore coat protein 2D crystals. Colloids and Surfaces B-Biointerfaces, doi: 10.1016/j.colsurfb.2020.111425 (IF = 4.39) (Q1 JCR2019; Q1 SJR2019)

B. Pleiotropický kľúčový anti-anti-sigma faktor BldG je fosforylovaný viacerými anti-sigma faktormi a reguluje päť sigma faktorov SigF, SigG, SigH, SigK, SigM u Streptomyces coelicolor A3(2)

Autori: B. Ševčíková, B. Řežuchová, E. Mingyar, D. Homerová, R. Nováková, Ľ. Fecková, J. Kormanec.

Streptomyces coelicolor obsahuje až 9 homológov sigma faktora SigB, 45 homológov anti-sigma faktora RsbW, 17 homológov anti-anti-sigma faktora RsbV, čo súvisí s jej diferenciáciou. Anti-anti-sigma faktor BldG hrá dôležitú úlohu v diferenciácii a produkcii antibiotík. Aktivuje sigma faktory SigH a SigF prostredníctvom interakcie s anti-sigma faktormi UshX a RsfA, z ktorých iba RsfA fosforyluje BldG. V mutante rsfA dochádza k fosforylácii BldG, čo naznačuje že ďalšie proteín-kinázy fosforylujú BldG. Identifikovali sme 15 homológov RsbW interagujúcich s BldG, z ktorých 7 fosforyluje BldG na Ser57. Vyšetrovali sme interakciu týchto homológov RsbW s deviatimi SigB faktormi. Iba SCO7328 interagoval so sigma faktormi SigG, SigK, SigM. Tieto výsledky naznačujú unikátny fosforylačný mechanizmus regulácie BldG pri aktivácii piatich sigma faktorov, prostredníctvom viacerých anti-sigma faktorov, čo naznačuje komplexnú reguláciu odozvy na stres a diferenciácie v S. coelicolor (obrázok).



Projekty

1. VEGA 2/0026/20 – Signálne kaskády regulácie sigma faktorov RNA polymerázy pri odozve na stres, bunkovej a fyziologickej diferenciácii u pôdných baktérií rodu *Streptomyces*

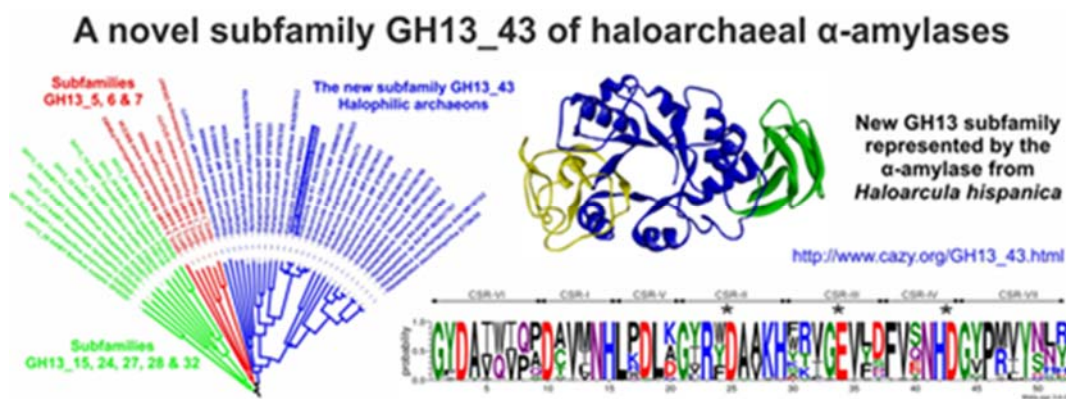
Výstupy

1. ŠEVČÍKOVÁ, Beatrice - REŽUCHOVÁ, Bronislava - MINGYAR, Erik - HOMEROVÁ, Dagmar - NOVÁKOVÁ, Renáta - FECKOVÁ, Ľubomíra - KORMANEC, Ján*. Pleiotropic anti-anti-sigma factor BldG is phosphorylated by several anti-sigma factor kinases in the process of activating multiple sigma factors in *Streptomyces coelicolor* A3(2). In *Gene*, 2020, vol. 755, no. 144883. (2019: 2.984 - IF, Q2 - JCR, 0.898 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 0378-1119. Dostupné na: <https://doi.org/10.1016/j.gene.2020.144883>

C. Identifikácia novej podrodiny v α -amylázovej rodine GH13 reprezentovanej α -amylázou z halofilného archeóna *Haloarcula hispanica*

Autori (za ÚMB SAV): Š. Janeček, B. Zámocká (diplomantka)

α -Amyláza katalyzuje endohydrolýzu α -1,4-glukozidových väzieb v škrobe a príbuzných α -glukánoch. V databáze CAZy (<http://www.cazy.org/>) je väčšina α -amyláz klasifikovaná do rodiny glykozidových hydroláz GH13, ktorá v súčasnosti obsahuje viac ako 107 tisíc sekvencií a viac ako 30 rôznych enzýmových špecifít. Väčšina členov rodiny bola doteraz rozdelená do 42 podrodín; ďalšie podrodiny sú etablované priebežne. Na základe detailnej bioinformatickej štúdie bola navrhnutá nová podrodina reprezentovaná α -amylázou z halofilného archeónu *Haloarcula hispanica*, pokrývajúca presvedčivú skupinu hypotetických haloarcheálnych α -amyláz. Skupina navzájom zdieľa unikátne sekvenčné podobnosti a v evolučnom strome tvorí svoj vlastný klastor, separovaný od reprezentantov už etablovaných GH13 podrodín. Z evolučného hľadiska táto nová podrodina je najviac príbuzná k dvom klastrom GH13 podrodín so špecifitou α -amylázy, t.j. k podrodinám GH13_5, 6 a 7, ako aj GH13_15, 24, 27 a 28.



Projekty

1. VEGA 2/0146/17 – Evolúcia amylolytických enzýmov

Výstupy

1. JANEČEK, Štefan** - ZÁMOCKÁ, Barbora. A new GH13 subfamily represented by the α -amylase from the halophilic archaeon *Haloarcula hispanica*. In *Extremophiles*, 2020, vol. 24, 207–217. (2019: 2.462 - IF, Q3 - JCR, 0.734 - SJR, Q2 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 1431-0651. Dostupné na: <https://doi.org/10.1007/s00792-019-01147-y>

2.3.2. Aplikačný typ

A. Nový antimikrobiálny rekombinantný proteín EN534-C s lytickými vlastnosťami voči patogénnym kmeňom *Streptococcus agalactiae*.

Autori (za ÚMB SAV): G. Bukovská, L. Bocánová, N. Halgašová, M. Kajsiková

Patogénne baktérie *Streptococcus agalactiae* skupiny B (GBS) vyvolávajú u ľudí závažné ochorenia a sú známe najmä ako pôvodcovia infekcií u tehotných žien a detí. Pripravili sme nový endolyzín EN534-C, ktorý je prvým endolyzínom pôvodom z humánneho klinického izolátu *Streptococcus agalactiae* KMB-534 (GBS) s usporiadaním domén amidáza-3, CHAP a LysM. Rekombinantný endolyzín sme nadprodukovali v expresnom systéme *E. coli*, optimalizovali sme podmienky izolácie proteínu a reakčné podmienky pre stanovenie lytickej aktivity. Endolyzín EN534-C sme testovali na spektre bakteriálnych substrátov z bunkových stien alebo živých buniek kmeňov streptokokov. Potvrdili sme jeho špecifické pôsobenie voči kmeňom streptokokov, najmä voči patogénnej baktérii *S. agalactiae* GBS. Nový endolyzín EN534-C má potenciálne využitie pre liečbu, prevenciu a diagnostiku ochorení spôsobených patogénnymi baktériami streptokokov a predstavuje alternatívu k antibiotikám, najmä v prípadoch tehotných žien a novorodencov.

Projekty

1. APVV-16-0168 - Príprava bakteriofágov na terapiu vaginálnych a močových infekcií

Výstupy

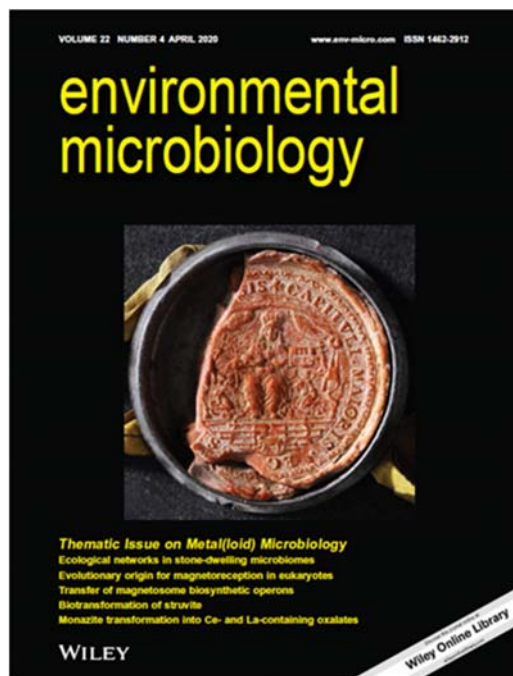
1. LIČHVARIKOVÁ, A. - ŠOLTYS, Katarína - SZEMEŠ, T. - SLOBODNÍKOVÁ, Livia - BUKOVSKÁ, Gabriela - TURŇA, Ján - DRAHOVSKÁ, H.**. Characterization of Clinical and Carrier *Streptococcus agalactiae* and Prophage Contribution to the Strain Variability. In *Viruses*, 2020, vol. 12, p. 1323. (2019: 3.816 - IF, Q2 - JCR, 1.633 - SJR, Q1 - SJR). ISSN 1999-4915. Dostupné na: <https://doi.org/10.3390/v12111323>
2. Nová patentová prihláška č. PP 50075-2020 v Slovenskej republike, Prihlasovateľia: Ústav

molekulárnej biológie SAV, Univerzita Komenského v Bratislave, Názov: "Antimikrobiálny proteín, antimikrobiálny rekombinantný proteín s lytickými vlastnosťami, expresný vektor, spôsob ich prípravy a použitie“.

B. Aplikácia sekvenovania tretej generácie (MinION, Oxford Nanopore Technologies) na skúmanie mikrobioty vzoriek kultúrneho dedičstva.

Autori (za ÚMB SAV): D. Pangallo, M. Bučková, A. Puškárová, L. Kraková, M. Planý

Naša skupina je pravdepodobne prvou [1] alebo patriacou medzi prvé skupiny na svete, ktorá použila sekvenovanie pomocou MinION na skúmanie mikrobiómu niekoľkých vzoriek historickej pečate z karnaubského vosku (XVIII. storočie) a pohrebných doplnkov [2] (XVII. storočie). Vysoko výkonná sekvenčná analýza ukázala prítomnosť komplexného zastúpenia mikroorganizmov na pečati z karnaubského vosku, ktoré tvorili hlavne zástupcovia mikroskopických vláknitých húb, ktorí preukázali zaujímavé vlastnosti týkajúce sa spracovania lipidov a olova. Popísaná bola aj tvorba olovnatých mydiel a sekundárnych biogénnych minerálov. Táto technika bola navyše užitočná, a to v rámci skúmania pohrebných doplnkov, na detekciu nebezpečných degradujúcich mikroorganizmov, ktoré sú schopné hydrolyzovať rôzne organické substráty, ako je fibroín, keratín a celulóza. Boli tiež odhalené baktérie zodpovedné za koróziu kovov a biomineralizáciu a entomopatogénne a fytopatogénne huby.



Obrázok štúdie s pečatou z karnaubského vosku vybral časopis *Environmental Microbiology* pre titulnú stránku svojho aprílového čísla roku 2020

(<https://sfamjournals.onlinelibrary.wiley.com/toc/14622920/2020/22/4>).

Projekty

1. VEGA 2/0061/17 – Inovatívne stratégie dezinfekcie: vplyv esenciálnych olejov na mikroflóru a materiály objektov kultúrneho dedičstva
2. APVV-19-0059 – Farebné škvrny na historických papieroch: biologická a chemická charakterizácia spojená s ich odstraňovaním

Výstupy

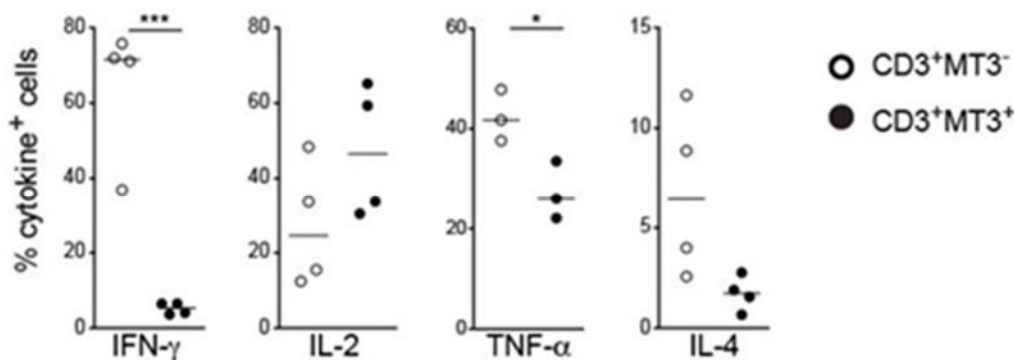
1. ŠOLTÝS, K. - PLANÝ, Matej - BIOCCA, P. - VIANELLO, V. - BUČKOVÁ, Mária - PUŠKÁROVÁ, Andrea - SCLOCCHI, M.C. - COLAIZZI, P. - BICCHIERI, M. - PANGALLO, Domenico** - PINZARI, F. Lead soaps formation and biodiversity in a XVIII. In Environmental microbiology, 2020, vol. 22, 1517–1534. (2019: 4.933 - IF, Q1 - JCR, 2.180 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 1462-2912. Dostupné na: <https://doi.org/10.1111/1462-2920.14735>
2. KISOVÁ, Zuzana - PLANÝ, Matej - PAVLOVIČ, Jelena - BUČKOVÁ, Mária - PUŠKÁROVÁ, Andrea - KRAKOVÁ, Lucia - KAPUSTOVÁ, Magdaléna - PANGALLO, Domenico** - ŠOLTYS, Katarína. Biodeteriogens Characterization and Molecular Analyses of Diverse Funeral Accessories from XVII Century. In Applied Sciences-Basel, 2020, vol. 10, p. 5451. (2019: 2.474 - IF, Q2 - JCR, 0.418 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 2076-3417. Dostupné na: <https://doi.org/10.3390/app10165451>

2.3.3. Medzinárodné vedecké projekty

MAL proteín (myelin and lymphocyte protein) ako funkčný ukazovateľ diferenciácie a aktivácie CD4 T-buniek

Autori (za ÚMB SAV): Vladimír Leksa

V rámci medzinárodnej spolupráce sme identifikovali antigén MT3 ako proteín MAL, ktorý je známy ako transportný receptor pre kinázu Lck, preukazuje vysokú povrchovú expresiu na naivných CD4⁺ T-bunkách a zníženú expresiu na efektorových pamäťových T-bunkách. Naše detailne experimenty ukázali, že regulácia exprese proteínu MAL v T-bunkách je spojená s aktiváciou indukovanou diferenciáciou ľudských T-buniek, ale nie s membránovou lokalizáciou signalizačnej kapacity Lck.



Projekty

1. Austrian Science Fund (P19014-B13 a P22908)
2. APVV-16-0452 - Regulácia pericelulárnej proteolýzy: od molekulárnych mechanizmov k novým subsetom imunitných buniek a terapeutickým nástrojom
3. VEGA 2/0020/17 - Ľudský mliečny bioaktívny glykoproteín laktoferín ako regulátor homeostázy

Výstupy

1. Leitner, J., Mahasongkram, K., Schatzlmaier, P., Pfisterer, K., Leksa, V., Pata, S., Kasinrerker, W., Stockinger, H., Steinberger, P. Differentiation and activation of human CD4 T⁺ cells is associated with a gradual loss of myelin and lymphocyte protein. European Journal of Immunology, first published: 20 December 2020, IF2019 4,4
<https://onlinelibrary.wiley.com/doi/epdf/10.1002/eji.202048603>

2.4. Publikačná činnosť (zoznam je uvedený v prílohe C)

Tabuľka 2e Štatistika vybraných kategórií publikácií

PUBLIKAČNÁ A EDIČNÁ ČINNOSŤ	Počet v r. 2020/ doplňky z r. 2019
1. Vedecké monografie a monografické štúdie vydané v domácich vydavateľstvách (AAB, ABB)	0 / 0
2. Vedecké monografie a monografické štúdie vydané v zahraničných vydavateľstvách (AAA, ABA)	0 / 0
3. Odborné monografie, vysokoškolské učebnice a učebné texty vydané v domácich vydavateľstvách (BAB, ACB, CAB)	1 / 0
4. Odborné monografie a vysokoškolské učebnice a učebné texty vydané v zahraničných vydavateľstvách (BAA, ACA, CAA)	0 / 0
5. Kapitoly vo vedeckých monografiách vydaných v domácich vydavateľstvách (ABD)	0 / 0
6. Kapitoly vo vedeckých monografiách vydaných v zahraničných vydavateľstvách (ABC)	1 / 0
7. Kapitoly v odborných monografiách, vysokoškolských učebniciach a učebných textoch vydaných v domácich vydavateľstvách (BBB, ACD)	0 / 0
8. Kapitoly v odborných monografiách, vysokoškolských učebniciach a učebných textoch vydaných v zahraničných vydavateľstvách (BBA, ACC)	0 / 0
9. Vedecké práce registrované v Current Contents Connect (ADCA, ADCB, ADDA, ADDB)	31 / 0
10. Vedecké práce registrované vo Web of Science Core Collection alebo Scopus (ADMA, ADMB, ADNA, ADN B)	10 / 0
11. Vedecké práce v ostatných domácich časopisoch (ADFA, ADFB)	1 / 0
12. Vedecké práce v ostatných zahraničných časopisoch (ADEA, ADEB)	0 / 0
13. Vedecké práce v domácich recenzovaných zborníkoch (AEDA)	0 / 0
14. Vedecké práce v zahraničných recenzovaných zborníkoch (AECA)	0 / 0
15. Publikované príspevky na domácich vedeckých konferenciách (AFB, AFD)	0 / 0
16. Publikované príspevky na zahraničných vedeckých konferenciách (AFA, AFC)	0 / 0
17. Vydané periodiká evidované v CCC, WoS Core Collection, SCOPUS	1
18. Ostatné vydané periodiká	0
19. Zostavovateľské práce knižného charakteru (FAI)	0 / 0
20. Preklady vedeckých a odborných textov (EAJ)	0 / 0
21. Heslá v odborných terminologických slovníkoch a encyklopédiách (BDA, BDB)	0 / 0
22. Recenzie v časopisoch a zborníkoch (EDI)	0 / 0

Evidujú len tie práce zamestnancov a doktorandov, v ktorých je uvedená afiliácia k organizácii

Tabuľka 2f Štatistika vedeckých prác podľa kvartilu vedeckého časopisu

Kvartil vedeckého časopisu	Q1	Q2	Q3	Q4	Spolu
Podľa IF z r. 2019 (zdroj JCR) <i>Počet článkov / doplnky</i>	13 / 0	15 / 0	8 / 0	4 / 0	40 / 0
Podľa SJR z r. 2019 (zdroj Scimago) <i>Počet článkov / doplnky</i>	28 / 0	9 / 0	4 / 0	0 / 0	41 / 0

Tabuľka 2g Ohlasy

OHLASY	Počet v r. 2019/ doplnky z r. 2018
Citácie vo WOS (1.1, 2.1)	1173 / 4
Citácie v SCOPUS (1.2, 2.2)	87 / 3
Citácie v iných citačných indexoch a databázach (9, 10, 3.2, 4.2)	0 / 0
Citácie v publikáciách neregistrovaných v citačných indexoch (3, 4, 3.1, 4.1)	1 / 1
Recenzie na práce autorov z organizácie (5, 6, 7, 8)	0 / 0

2.5. Aktívna účasť na vedeckých podujatiach

Tabuľka 2h Vedecké podujatia

Prednášky a vývesky na medzinárodných vedeckých podujatiach	4
Prednášky a vývesky na národných vedeckých podujatiach	4

2.6. Vyžiadané prednášky

Ak boli príspevky publikované, sú súčasťou prílohy C, kategória (AFC, AFD, AFE, AFF, AFG, AFH)

2.6.1. Vyžiadané prednášky na medzinárodných vedeckých podujatiach

2.6.2. Vyžiadané prednášky na národných vedeckých podujatiach

2.6.3. Vyžiadané prednášky na významných vedeckých inštitúciách

2.7. Patentová a licenčná činnosť na Slovensku a v zahraničí v roku 2020

2.7.1. Vynálezy, na ktoré bol v roku 2020 udelený patent

a) na Slovensku

b) v zahraničí

2.7.2. Vynálezy prihlásené v roku 2020

a) na Slovensku

Názov vynálezu: Antimikrobiálny proteín, antimikrobiálny rekombinantný proteín s lytickými vlastnosťami, expresný vektor, spôsob ich prípravy a použitie.

Číslo prihlášky: Nová patentová prihláška č. PP 50075

Dátum priority: 17.12.2020

Majiteľ / spolumajiteľ: Ústav molekulárnej biológie SAV / Univerzita Komenského v Bratislave

Pôvodcovia vynálezu: Bukovská Gabriela, Bocánová Lucia, Halgašová Nora, Kajsiková Mária, Drahovská Hana, doc. RNDr. PhD.

b) v iných krajinách ako prioritná prihláška

c) PCT

d) EP

e) v iných krajinách v rámci tzv. národnej fázy po PCT, resp. po validácii EP

2.7.3. Úžitkové vzory na Slovensku

a) prihlásené v roku 2020

b) udelené v roku 2020

2.7.4. Realizované vynálezy

a) predané patenty resp. prihlášky vynálezov (v prípade úplnej zmeny majiteľa patentu)

b) predané licencie (v prípade že majiteľom ostáva organizácia SAV)

Finančný prínos pre organizáciu SAV v roku 2020 a súčet za predošlé roky sa neuvádzajú, ak je zverejnenie v rozpore so zmluvou súvisiacou s realizáciou patentu.

2.8. Účast' expertov na hodnotení národných projektov (APVV, VEGA a iných)

Tabuľka 2i Experti hodnotiaci národné projekty

Meno pracovníka	Typ programu/projektu/výzvy	Počet hodnotených projektov
Bučková Mária	VEGA	1
Majtán Juraj	VEGA	1
Pevala Vladimír	Výskumná agentúra/OPVaI	1
Zámocký Marcel	APVV PP-Covid 2020	1

2.9. Účast' na spracovaní hesiel do encyklopédie Beliana

Počet autorov hesiel: 0

2.10. Recenzovanie publikácií a príspevkov vo vedeckých časopisoch

Tabuľka 2j Počet recenzovaných monografií, článkov, zborníkov

Meno pracovníka	Knížné monografie		Príspevky v časopisoch			Zborníky	
	Domáce	Zahra-ničné	WoS, SCOPUS	Iné databázy	Ostatné	Domáce	Zahra-ničné
Barák Imrich	0	0	7	0	0	0	0
Bučeková Marcela	0	0	8	0	0	0	0

Bukovská Gabriela	0	0	4	0	0	0	0
Janeček Štefan	0	0	34	0	0	0	0
Kľučár Ľuboš	0	0	1	0	0	0	0
Majtán Juraj	0	0	26	0	0	0	0
Zámocký Marcel	0	0	4	0	0	0	0
Spolu	0	0	84	0	0	0	0

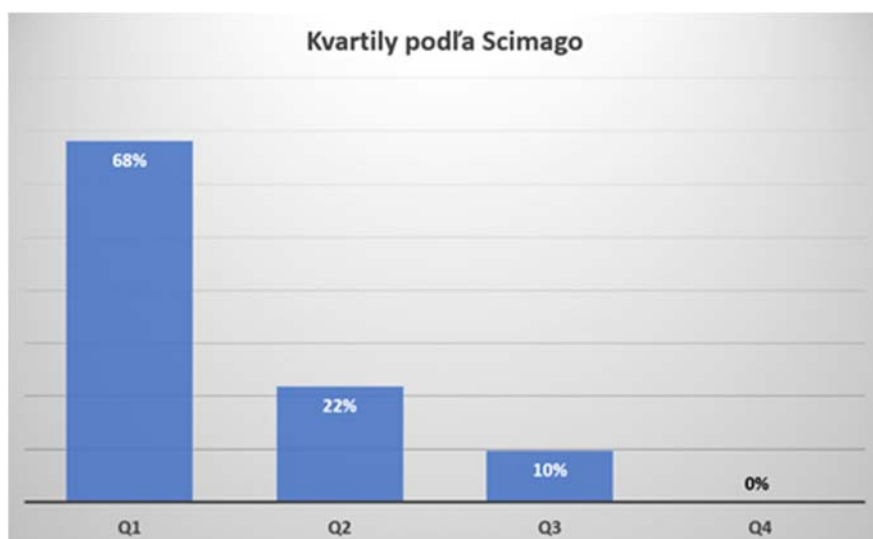
2.11. Iné informácie k vedeckej činnosti.

ÚMB SAV zareagoval na vzniknutú situáciu súvisiacu s príchodom pandémie COVID-19 a zapojil sa do jej riešenia. Skupina Dr. I. Baráka sa začlenila do špecifickej celosvetovej výzvy European XFEL s názvom: New structures to fight COVID-19 solved by liquid jet SFX at the European XFEL. Podaný projekt bol úspešný a bol mu garantovaný “beam time” v apríli 2021. Dr. V. Leksa v spolupráci so skupinou prof. H. Stockingera na Lekárskej fakulte vo Viedni pracuje na vývoji liečiva na COVID-19.

Ústav pokračuje vo svojich medzinárodných vedeckých aktivitách kde je zapojený do Európskeho XFEL-u (X-ray Free Electron Laser) v Hamburgu, ktorý by mal revolucionizovať štruktúrnú biológiu nielen na Slovensku, ale aj vo svete. Pracovníci ústavu pracujú v orgánoch SFX/SPB a XBI konzorcií alebo ako vedeckí pracovníci XFEL-u. Títo pracovníci sa zúčastnili aj na prvých meraniach po spustení prevádzky tohto svetovo unikátneho zariadenia a prvé výsledky boli publikované v prestížnom časopise Nature Communications a Communication Physics - Nature.

Naša organizácia je medzinárodne etablovaná aj vďaka vedeckým databázam vytvoreným a spravovaným naším Oddelením genómiky a biotechnológií. Užitočnosť týchto databáz sa neprejavuje počtom citácií, ale počtom webových prístupov. Naše databázy zaznamenali vysoký počet unikátnych webových návštevníkov – vyše 9 tisíc pre databázu phiSITE, 4 tisíc pre viruSITE a takmer 300 pre phiBIOTICS. Databáza viruSITE bola na začiatku pandémie v marci 2020 doplnená aj o referenčný genóm SARS-CoV-2, čo zvýšilo jej atraktívnosť a využiteľnosť.

Na Ústave molekulárnej biológie sa dlhodobo orientujeme na výskum, ktorý vedie k publikáciám v kvalitných zahraničných periodikách s vyšším IF a so zameraním na lepšiu citovanosť, čo sa premieta do veľmi dobrého medzinárodného postavenia ústavu a do kvalitnej medzinárodnej spolupráce. V roku 2020 vedeckí pracovníci ústavu publikovali celkovo 41 impaktovaných vedeckých publikácií. Novozavedený scientometrický indikátor, kvartily časopisov, potvrdil vysokú kvalitu našich publikácií. Až 90 % je v 1. a 2. kvartile Scimago (68 % z nich spadá do 1. kvartilu a 22 % do 2. kvartilu). V tomto roku bola vysoko hodnotená publikácia skupiny Dr. I. Baráka „Bacterial nanotubes as a manifestation of cell death.” publikovaná v spolupráci Mikrobiologickým ústavom AV ČR v časopise Nature Communication. Snaha publikovať hlavne v kvalitných medzinárodných časopisoch sa rovnako premieta v počte citácií našich prác. Za rok 2019 (vykazované v roku 2020) sme dosiahli 1267 ohlasov (WOS a SCOPUS).



Pokračujeme v realizácii akčného plánu ústavu. Pri hodnotení pracovných skupín a pracovníkov uplatňujeme kritériá minimálnej vedeckej výkonnosti zavedené v predchádzajúcom roku. Podporujeme ako kvalitný základný výskum tak aj výskum s potenciálnym využitím v praxi. Na ústave bola v tomto roku podaná v spolupráci s Prírodovedeckou fakultou UK ďalšia patentová prihláška PP50075-2020 „Antimikrobiálny proteín, antimikrobiálny rekombinantný proteín s lytickými vlastnosťami, expresný vektor, spôsob ich prípravy a použitie.“

Vedeckí pracovníci ústavu vyvíjajú každý rok značné úsilie pri získavaní mimo akademických prostriedkov, každoročne podávajú žiadosti o nové projekty do národných agentúr, vstupujú so žiadosťami do vedeckých programov podporovaných EU a projektov iných agentúr. S tým je spojené aj množstvo časovo náročnej administratívnej práce. Tento rok bola na základe výsledkov 7. rámcového programu podpísaná zmluva s konzorciom zahraničných firiem Nemysis o vzájomnej spolupráci v oblasti biotechnológií, ktorá sa úspešne realizuje a ktorá na základe žiadosti konzorcia podlieha utajeniu.

Bola tiež podpísaná zmluva o spolupráci s Kyoto University a TUBITAK Marmara Research Center a začatá práca na medzinárodnom projekte „Trvalo udržateľná regenerácia vody založená na filtrácii keramickými membránami“ v rámci programu European Interest Group CONCERT-Japonsko. Projekt je zameraný na vývoj keramických membrán na čistenie mikro- a nanoplastov z odpadových vôd. Bude tiež hodnotená antimikrobiálna schopnosť týchto membrán.

V rámci medzinárodného projektu Interreg SK-AT „Budovanie výukových a výskumných kapacít v štruktúrnej a funkčnej analýze biomolekúl pre potreby biomedicíny a biotechnológií“, bolo vybudované prvé automatizované pracovisko štruktúrnej biológie na Slovensku.

Jasným zviditeľnením medzinárodného postavenia ÚMB SAV je aj skutočnosť, že mnohí naši vedeckí pracovníci vystupujú ako akademickí editori renomovaných zahraničných vedeckých časopisov (*Cellular and Molecular Life Sciences*, *Scientific Reports*, *Molecules*, *Microorganisms* a iné), alebo sú oslovení editormi zahraničných vedeckých časopisov ako recenzenti publikácií a ako experti sa zúčastňujú aj hodnotenia medzinárodných projektov (Ministerstvo zdravotníctví České republiky, Dutch Research Council, The Research Council of Norway).

Na národnej úrovni je ústav zapojený do projektu štrukturálnych fondov „Dlhodobý strategický výskum a vývoj zameraný na výskyt Lynchovho syndrómu v populácii SR a možnosti prevencie nádorov spojených s týmto syndrómom, ktorého partnermi sú GENETON s.r.o., Chemický ústav SAV, MEDIREX GROUP ACADEMY n.o., POWERTEC s. r. o., Slovgen s.r.o. a Univerzitná nemocnica s poliklinikou Milosrdní bratia. Projekt sa venuje výskumu a vývoju v oblasti

problematiky dedičných nádorov spôsobených Lynchovým syndrómom a predpokladaného genetického pozadia vyššieho výskytu vybraných typov nádorov v slovenskej populácii. Náš ústav sa bude zaoberať štúdiom črevného mikrobiómu pacientov s kolorektálnym karcinómom a ľudí s Lynchovým syndrómom.

Pracovná skupina Fylogenickej ekológie pod vedením RNDr. Marcela Zámockého, DrSc. publikovala v roku 2020 významné výsledky v časopise *Antioxidants-Basel* týkajúce sa enzýmových antioxidantov. Tieto sú reprezentované predovšetkým peroxidázami a katalázami, u ktorých sa v spolupráci s Universität für Bodenkultur vo Viedni skúma ich reaktivita a stabilita pre aplikáciu v zelených biotechnológiách. V tomto smere sú veľmi zaujímavé najmä termostabilné hémové katalázy a hybridné peroxidázy, ktoré obsahujú cukor viažúce domény. Patentová prihláška na podobný enzým z hypertermofilného archaeóna bola podaná ešte v roku 2019 a mala by byť tento rok prijatá. V spolupráci so synchrotrónom v Barcelone (Španielsko), ktorú zabezpečuje Dr. Carpena skúmame aj 3D štruktúru kryštálov bifunkčných kataláz-peroxidáz, ktoré sme pripravili na našom pracovisku a ktoré poskytnú esenciálne informácie pre ich využitie v ďalších environmentálnych biotechnológiách.

V tomto roku mali naši pracovníci výrazne obmedzenú účasť na konferenciách, pretože väčšina vrátane tých, ktoré boli už zaplatené, boli kvôli situácii spojenej s pandémiou COVID-19 zrušené.

Pri doktorandskom štúdiu sa na ústave kladie dôraz na výber školiteľov, kde dôsledne požadujeme krytie kvalitnými projektami a solídnu publikačnú činnosť školiteľa. Na požiadanie Predsedníctva SAV bol vypracovaný „Vnútorý systém zabezpečenia kvality doktorandského štúdia“, ktorý sa dôsledne uplatňoval pri prijímaní nových doktorandov v tomto roku. Aby sme zabezpečili kariérny rast vedeckých pracovníkov, maximálne podporujeme krátkodobé i dlhodobé pobyty na zahraničných pracoviskách, workshopoch a kurzoch, ktoré by pomohli priniesť na ústav nové vedomosti a praktické skúsenosti, ale aj nadšenie a inšpiráciu. V tomto roku sa tieto aktivity preniesli do videokonferenčných seminárov ústavu ako aj do účastí na zahraničných videokonferenčných seminároch.

3. Doktorandské štúdium, iná pedagogická činnosť a budovanie ľudských zdrojov pre vedu a techniku

3.1. Údaje o doktorandskom štúdiu

Tabuľka 3a Počet doktorandov v roku 2020

Forma	Počet k 31.12.2020				Počet doktorandov po doktorandskej skúške		Počet ukončených doktorantúr v r. 2020					
							Ukončenie z dôvodov					
	celkový počet		z toho novoprijatí				ukončenie úspešnou obhajobou		predčasné ukončenie		neúspešné ukončenie	
M	Ž	M	Ž	M	Ž	M	Ž	M	Ž	M	Ž	
Denná zo zdrojov SAV	3	13	0	4	2	9	0	1	0	0	0	0
Denná z iných zdrojov	0	0	0	0	0	0	0	0	0	0	0	0
Externá	1	0	0	0	0	1	0	1	0	0	0	0
Spolu	4	13	0	4	2	10	0	2	0	0	0	0
Súhrn	17		4		12		2		0		0	

Uvádzajte len doktorandov organizácie ako externej vzdelávacej inštitúcie.

Riadok „Spolu“ je súčtom troch riadkov nad ním. Každá bunka v „Súhrn“ je súčtom dvoch buniek nad ňou. V stĺpci „Počet doktorandov po doktorandskej skúške“ sa uvádza počet doktorandov, ktorí počas roku 2020 boli aspoň 1 deň doktorandami po doktorandskej skúške. Sú číselne zahrnutí aj v predchádzajúcich stĺpcoch.

3.2. Zmena formy doktorandského štúdia

Tabuľka 3b Počty preradení z dennej formy na externú a z externej na dennú

Pôvodná forma	Denná z prostriedkov SAV	Denná z prostriedkov SAV	Denná z iných zdrojov	Denná z iných zdrojov	Externá	Externá
Nová forma	Denná z iných zdrojov	Externá	Denná z prostriedkov SAV	Externá	Denná z prostriedkov SAV	Denná z iných zdrojov
Počet	0	0	0	0	0	0

3.3. Zoznam doktorandov, ktorí ukončili doktorandské štúdium úspešnou obhajobou

Tabuľka 3c Menný zoznam ukončených doktorandov v roku 2020 úspešnou obhajobou

Meno doktoranda	Forma DŠ	Mesiac, rok nástupu na DŠ	Mesiac, rok obhajoby	Číslo a názov študijného odboru	Meno a organizácia školiteľa	Fakulta udeľujúca vedeckú hodnosť
Mgr. Romana Valenčíková	externé štúdium	9 / 2014	12 / 2020	4.2.3 molekulárna biológia	RNDr. Imrich Barák DrSc., Ústav molekulárnej biológie SAV	Prírodovedecká fakulta UK
Mgr. Kristína Vičíková	interné štúdium hrazené z prostriedkov SAV	2 / 2016	8 / 2020	4.2.3 molekulárna biológia	Mgr. Vladimír Leksa PhD., Ústav molekulárnej biológie SAV	Prírodovedecká fakulta UK

3.4. Zoznam doktorandov, ktorí ukončili doktorandské štúdium úspešnou obhajobou v nadštandardnej dĺžke štúdia

Tabuľka 3d Menný zoznam ukončených doktorandov v roku 2020 úspešnou obhajobou v nadštandardnej dĺžke štúdia

Meno doktoranda	Forma DŠ	Mesiac, rok nástupu na DŠ	Mesiac, rok obhajoby	Číslo a názov študijného odboru	Meno a organizácia školiteľa	Fakulta udeľujúca vedeckú hodnosť
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3.5. Uplatnenie absolventov doktorandského štúdia

Tabuľka 3e Prehľad uplatnenia absolventov doktorandského štúdia

Počet absolventov PhD. štúdia v roku 2020 (obhajoba leto 2020)	z toho koľkí sa zamestnali vo výskume (SAV, univerzity, rezortné výskumné ústavy)	z toho koľkí sa zamestnali v praxi mimo výskum, kde využívajú svoju kvalifikáciu	z toho koľkí sa zamestnali v praxi, kde nevyužívajú svoju kvalifikáciu	z toho koľkí boli nejaký čas nezamestnaní
1	1	0	0	0

Zoznam interných a externých doktorandov je uvedený v prílohe A.

3.6. Medzinárodné doktorandské štúdium

Tabuľka 3f Počet študentov v medzinárodných programoch doktorandského štúdia

Cotutelle	Co-direction	Iné	Zahraniční doktorandi štátne občianstvo/počet
0	0	0	BIH/1, SRB/1

Zahraniční doktorandi sú doktorandi v dennej alebo externej forme štúdia, ktorí sú občanmi iných krajín. Doktorandi školení v rámci Cotutelle alebo Co-direction sa do posledného stĺpca nezapočítavajú.

3.7. Zoznam študijných odborov, na ktoré má ústav uzatvorenú rámcovú dohodu, s uvedením VŠ

Tabuľka 3g Zoznam študijných odborov, na ktoré má ústav uzatvorenú rámcovú dohodu, s uvedením univerzity/vysokej školy a fakulty, kde sa doktorandský študijný program uskutočňuje

Názov študijného odboru (ŠO)	Číslo ŠO	Doktorandské štúdium uskutočňované na (univerzita/vysoká škola a fakulta)
biológia		Prírodovedecká fakulta UK
chémia		Prírodovedecká fakulta UK

Tabuľka 3h Účasť na pedagogickom procese

Menný prehľad pracovníkov, ktorí boli menovaní do odborových komisií pre doktorandské štúdium	Menný prehľad pracovníkov, ktorí pôsobili ako členovia vedeckých rád univerzít, správnych rád univerzít a fakúlt	Menný prehľad pracovníkov, ktorí získali vyššiu vedeckú, pedagogickú hodnosť alebo vyšší kvalifikačný stupeň
RNDr. Imrich Barák, DrSc. (mikrobiológia)	Doc. Ing. Štefan Janeček, DrSc. (Fakulta prírodných vied UCM)	Ing. Eva Kutejová, DrSc. (I)
RNDr. Gabriela Bukovská, CSc. (mikrobiológia)		Ing. Juraj Majtán, DrSc. (I)
Doc. Ing. Štefan Janeček, DrSc. (molekulárna biológia)		
RNDr. Ján Kormanec, DrSc. (biochémia)		
RNDr. Ján Kormanec, DrSc. (molekulárna biológia)		
Dr. Domenico Pangallo, DrSc. (molekulárna biológia)		
Mgr. Andrea Puškárová, PhD. (mikrobiológia)		
RNDr. Ľubica Urbániková, CSc. (biochémia)		

3.8. Údaje o pedagogickej činnosti

Tabuľka 3i Prednášky a cvičenia vedené v roku 2020

PEDAGOGICKÁ ČINNOSŤ	Prednášky		Cvičenia a semináre	
	doma	v zahraničí	doma	v zahraničí
Počet prednášateľov alebo vedúcich cvičení	7	0	12	1
Celkový počet hodín v r. 2020	124	0	332	12

Prehľad prednášateľov predmetov a vedúcich cvičení, s uvedením názvu predmetu, úväzku, katedry, fakulty, univerzity/vysokej školy je uvedený v prílohe D.

Tabuľka 3j Aktivity pracovníkov na VŠ

1.	Počet pracovníkov, ktorí pôsobili ako vedúci alebo konzultanti diplomových a bakalárskych prác	12
2.	Počet vedených alebo konzultovaných diplomových a bakalárskych prác	15
3.	Počet pracovníkov, ktorí pôsobili ako školitelia doktorandov (PhD.)	10
4.	Počet školených doktorandov (aj pre iné inštitúcie)	15
5.	Počet oponovaných dizertačných a habilitačných prác	11
6.	Počet pracovníkov, ktorí oponovali dizertačné a habilitačné práce	9
7.	Počet pracovníkov, ktorí pôsobili ako členovia komisií pre obhajoby DrSc. prác	0
8.	Počet pracovníkov, ktorí pôsobili ako členovia komisií pre obhajoby PhD. prác	2
9.	Počet pracovníkov, ktorí pôsobili ako členovia komisií, resp. oponenti v inauguračnom alebo habilitačnom konaní na vysokých školách	1

3.9. Iné dôležité informácie k pedagogickej činnosti

V priebehu roka 2020 sa na Ústave molekulárnej biológie školilo v internej forme štúdia 17 doktorandov financovaných z prostriedkov SAV. Ďalší dvaja doktorandi sa školili v externej forme štúdia. V septembri sme prijali štyri nové doktorandky a dve doktorandky ukončili v tomto roku svoje štúdium úspešnou obhajobou (jedna doktorandka v internej forme a jedna v externej forme štúdia). Doktorandka z Katedry biochémie PríF UK (Eva Petrovčíková), ktorú viedol školiteľ našej organizácie Dr. V. Leksa, rovnako ukončila štúdium v roku 2020 úspešnou obhajobou. V priebehu roka dvaja doktorandi prerušili štúdium z rodinných dôvodov, trom doktorandom bolo na ich žiadosť štúdium predĺžené.

V roku 2020 sa na našom ústave uskutočňovalo doktorandské štúdium v troch študijných programoch: molekulárna biológia a mikrobiológia v odbore Biológia a biochémia v odbore Chémia, všetky v spolupráci s Prírodovedeckou fakultou UK Bratislava. V priebehu roka náš ústav podpísal dohodu s Prírodovedeckou fakultou UK pre získanie akreditácie na školenie v študijnom programe genetika v odbore Biológia a preto sa v nasledujúcom akademickom roku 2021/2022 budú môcť školiť doktorandi aj v tomto študijnom programe.

Naši doktorandi sa aktívne zapájajú do vedeckého a spoločenského života na ústave. Rovnako, ak je to možné, zúčastňujú sa stáží aj na zahraničných pracoviskách (V. Bugárová, Graz, Rakúsko). Mnohí z nich vedú semináre a cvičenia na príslušných katedrách Prírodovedeckej fakulty UK.

Napriek vzniknutej situácii s COVID-19 pokračovali na ústave semináre, na ktorých doktorandi prezentovali výsledky svojej práce a to formou videokonferenčných seminárov a zúčastňovali sa školení pripravených firmami v rámci programu Interreg SK-AT.

Okrem doktorandského štúdia sa viacerí pracovníci ústavu aktívne podieľajú na pedagogickom procese na univerzitách vedením bakalárskych, diplomových prác a preddiplomovej praxe študentov ako aj vedením seminárov, praktických cvičení a prednášok. Na našom ústave dlhodobo školíme poslucháčov Prírodovedeckej fakulty UK najmä z Katedry molekulárnej biológie, Katedry mikrobiológie, Katedry biochémie a Katedry genetiky ako aj z Fakulty prírodných vied UCM v Trnave. Okrem toho sa naši vedeckí pracovníci venujú aj študentom stredných škôl. V roku 2020 Dr. V. Bauerová zorganizovala (videokonferenčnou formou) prednášku "Majú bielkoviny svoju "tvár"?" na viacerých gymnáziách v Bratislave. V prípade záujmu majú stredoškolskí študenti možnosť získavať skúsenosti pri práci v laboratóriu, prípadne sa svojimi výsledkami zúčastňovať aj súťaže SVOČ.

4. Medzinárodná vedecká spolupráca

4.1. Medzinárodné vedecké podujatia

4.1.1. Medzinárodné vedecké podujatia, ktoré organizácia SAV organizovala v roku 2020 alebo sa na ich organizácii podieľala, s vyhodnotením vedeckého a spoločenského prínosu podujatia

4.1.2. Medzinárodné vedecké podujatia, ktoré usporiada organizácia SAV v roku 2021 (anglický a slovenský názov podujatia, miesto a termín konania, meno, telefónne číslo a e-mail zodpovedného pracovníka)

4.1.3. Počet pracovníkov v programových a organizačných výboroch medzinárodných konferencií

Tabuľka 4a Programové a organizačné výbory medzinárodných konferencií

Meno pracovníka	Programový	Organizačný	Programový i organizačný
Kľučár Ľuboš	0	0	1
Spolu	0	0	1

4.2. Členstvo a funkcie v medzinárodných orgánoch

4.2.1. Členstvo a funkcie v medzinárodných vedeckých spoločnostiach, úniách a národných komitétach SR

Pozn.

Značná časť našich vedeckých pracovníkov je členom niektorej česko-slovenskej vedeckej spoločnosti (napr. Československá spoločnosť mikrobiologická, Česká a Slovenská kryštalografická spoločnosť). Tieto členstvá v tomto zozname neuvádzame.

Mgr. Vladena Bauerová, PhD.

Česká společnost pro strukturní biologii (funkcia: člen)

Mgr. Ľuboš Kľučár, PhD.

EMBnet (funkcia: manager Národného uzla, tajomník Executive Board)

Mgr. Vladimír Leksa, PhD.

Rakúska spoločnosť pre alergológiu a imunológiu - OEGAI (funkcia: člen)

Ing. Juraj Majtán, DrSc.

International Honey Commission (funkcia: člen)

RNDr. Ľubica Urbániková, CSc.

Česká a slovenská kryštalografická spoločnosť (funkcia: člen vedeckej rady)

RNDr. Marcel Zámocký, DrSc.

RedoxiBase (funkcia: administrator)

4.3. Účast' expertov na hodnotení medzinárodných projektov (EÚ RP, ESF a iných)

Tabuľka 4b Experti hodnotiaci medzinárodné projekty

Meno pracovníka	Typ programu/projektu/výzvy	Počet hodnotených projektov
Bukovská Gabriela	Ministerstvo zdravotníctví České Republiky / Podprogram 2 - Podpora rozvoje mladých výzkumníků/Panel 05 - Poruchy imunity a infekční choroby	1
Majtán Juraj	Dutch Research Council	1
	The Research Council of Norway	10

4.4. Najvýznamnejšie prínosy MVTS ústavu vyplývajúce z mobility a riešenia medzinárodných projektov a iné informácie k medzinárodnej vedeckej spolupráci

Finančné prostriedky získané v rámci projektu Interreg SK-AT „Budovanie výukových a výskumných kapacít v štruktúrnej a funkčnej analýze biomolekúl pre potreby biomedicíny a biotechnológií“ a významná podpora Predsedníctva SAV vo forme pôžičky umožnili vybudovanie automatizovaného laboratória štruktúrnej biológie, prvého svojho druhu na Slovensku. Vytvorilo sa takto zázemie pre kvalitné vzdelávanie, poskytovanie poradenstva a špičkový výskum v oblasti biomedicíny a biotechnológií <http://www.imb.savba.sk/strubiomol/index.php?id=home&lang=sk>. V rámci projektu sa tiež uskutočnili prednášky pre potenciálnych záujemcov z vysokých škôl a výskumných pracovísk spojené s využívaním týchto prístrojov pripravené dodávateľskými firmami.

Skupina Laboratórium evolúcie proteínov (<http://imb.savba.sk/~janecek/>) vedená Dr. Štefanom Janečkom patrí k popredným svetovým pracoviskám zapojených do štúdia amylolytických enzýmov v najširšom zmysle slova. Laboratórium má dlhodobu etablovanú neformálnu širokú medzinárodnú spoluprácu s renomovanými zahraničnými laboratóriami v Európe aj zámorí, ktorá sa prejavuje najmä v riešení ad hoc rôznych výskumných problémov (napr. 10 spoločných publikácií za posledných 5 rokov). Jednou z najvýznamnejších je viac ako 25-ročná spolupráca s prof. Birte Svenssonovou (Dánska technická univerzita v Kodani, Dánsko), v rámci ktorej bola v roku 2020 (február-marec) realizovaná stáž Filipa Marečka na DTU v Kodani podporená štipendiom SAIA s cieľom experimentálne potvrdiť predikcie získané in silico prístupmi v domacom laboratóriu, týkajúce sa funkcie N-terminálnej domény amylomaltázy z rodiny GH77. Stáž bola síce v dôsledku pandémie s ochorením COVID-19 prerušená, ale je plánované jej dokončenie (naďalej s podporou SAIA) v roku 2021, pričom čiastkové experimentálne výsledky sú sľubné. Z ďalšej spolupráce významnej v roku 2020 možno spomenúť spoločnú publikáciu (Scientific Reports) so skupinou vedenou prof. Evou Nordberg-Karlssonovou (Univerzita v Lunde, Švédsko), detailne popisujúcu kompletný súbor trojice glykozidových hydroláz z rodiny GH3 z baktérie *Rhodothermus marinus*. V závere roku bola úspešne nadviazaná spolupráca s doc. Nicole Koropatkinovou (Michiganská univerzita v Ann Arbor, Michigan, USA), ktorá sa týka detailnej bioinformatickej analýzy škrob-viažucej domény z rodiny CBM74. V závere roku 2020 prebehli prvé kontakty nadviazania spolupráce s doc. Diegom Gomez-Casatim (Národná univerzita v Rosariu, Argentina) ohľadne analýzy doménového usporiadania nového amylolytického enzýmu z morskej baktérie.

Prehľad údajov o medzinárodnej mobilite pracovníkov organizácie je uvedený v Prílohe E.

Prehľad a údaje o medzinárodných projektoch sú uvedené v kapitole 2 a Prílohe B.

5. Koncepcia dlhodobého rozvoja organizácie

5.1. Odporúčania z posledného pravidelného hodnotenia organizácií SAV (akreditácie)

Celkové posúdenie tak ako bolo formulované v správe akreditačnej komisie

Ústav molekulárnej biológie mal v posledných rokoch v priemere okolo 40 výskumných pracovníkov (FTE). V súčasnosti existuje 6 rôznych oddelení, ktoré boli rozdelené do 13 laboratórií. Laboratória sú tematicky celkom dobre prepojené, ich vyšší počet je však pomerne neobvyklý a mohlo by byť rozumné ich počet znížiť.

Pripomienky a odporúčania pre budúce zlepšovanie inštitútu

- Inštitút potrebuje jasnú stratégiu svojho budúceho výskumného programu, aby sa mohli

uprednostniť perspektívne výskumné projekty a aby bolo možné dosiahnuť medzi nimi väčšiu synergiu.

- Štruktúra inštitútu (6 oddelení a 11 laboratórií) je pomerne komplikovaná vzhľadom na to,

že v ústave pracuje 43 vedeckých pracovníkov. MPV odporúča štruktúru ústavu prehodnotiť.

- Chýba politika duševného vlastníctva, ktorú je potrebné začať rozvíjať.

Prínosom by boli viac aplikované výskumné projekty, vrátane medzinárodných

5.2. Hlavné body Akčného plánu organizácie a stav ich plnenia

Vedecká kvalita a produktivita

Naším primárnym cieľom je robiť kvalitný základný výskum a publikovať naše výsledky v prestížnych impaktovaných časopisoch a sme presvedčení, že sa nám to do značnej miery darí plniť. Od akreditácie (2016-2020) máme z celkového počtu 168 impaktovaných publikácií s priemerným IF 3,434, 47 publikácií s IF 4,0 – 12.1, pričom medián IF pre oblasť BIOCHEMISTRY & MOLECULAR BIOLOGY je 3,167 a pre oblasť MICROBIOLOGY 2,945. Okrem toho väčšina našich publikácií (až 87 %) bola publikovaná v časopisoch patriacich do prvých dvoch kvalitatívnych kvartilov Scimago. Citovanosť našich článkov za obdobie (2016-2020) bola tiež na veľmi dobrej úrovni - 5789 citácií WOS a Scopus. V rámci nášho akčného plánu sa budeme snažiť zvýšiť počet publikácií, ale v žiadnom prípade to nechceme robiť na úkor ich kvality.

Navrhovaný spôsob zlepšenia:

Výskum, ktorý sa realizuje na našom pracovisku si vyžaduje veľké množstvo zložitých experimentov, ktoré sú časovo náročné a nie je možné publikovať neúmerne množstvo dobre impaktovaných článkov. V záujme zvýšenia publikačnej činnosti v nasledujúcom období budeme klásť dôraz na to, aby sme pri plánovanom zvyšovaní počtu prác zachovali, resp. zvýšili kvalitu výstupov, motivovali šikovných vedeckých pracovníkov a v neposlednom rade analyzovali príčiny neúspechu tých, ktorých publikačná činnosť zaostáva. Vedecká činnosť bude vyhodnotená každý rok ako priemer hodnotení za posledné tri roky pričom uplatňujeme kritériá minimálnej vedeckej výkonnosti zavedené v predchádzajúcom roku.

Doktorandské štúdium

Doktorandskému štúdiu venujeme na našom ústave veľkú pozornosť, čoho výsledkom je, že úspešnosť ukončenia štúdia za obdobie od poslednej akreditácie organizácie (2016 - 2020) bola vysoká - 15 úspešne ukončených doktorandov a len jedno predčasne ukončené štúdium doktorandky v externej forme štúdia (v r. 2018). Povolený počet doktorandov bol pravidelne naplnený a vo väčšine rokov nám bola udelená výnimka na prijatie ďalšieho študenta, čím sme tento počet často

prekračovali. Doktorandi, ktorí ukončili doktorandské štúdium za hodnotené obdobie boli veľmi úspešní, čo súvisí aj s kvalitnou prácou ich školiteľov a čo sa odrazilo vo vysokom počte ich impaktovaných publikácií. Napriek tomu panel vo svojom veľmi stručnom hodnotení iba uvádza, že ak by to bolo finančne možné, ústav by mohol mať viac doktorandov, a hodnotil túto oblasť kategóriou B. V našom akčnom pláne navrhujeme isté zlepšenia aj v tejto oblasti. Pri výbere školiteľov budeme dôsledne požadovať krytie kvalitnými projektami a solídnu publikačnú činnosť školiteľa, minimálne dve impaktované publikácie za posledné 4 roky. Pri prijímaní doktoranda budeme kontrolovať ich predchádzajúce študijné výsledky a prijmeme len kvalitných uchádzačov. V rámci našich prednášok na vysokých školách budeme aktívne vyhľadávať špičkových študentov a motivovať ich pre doktorandské štúdium na našom ústave. Ponuka vypísaných doktorandských tém bude uvádzaná na našom webe v slovenskom a anglickom jazyku a budú oslovené potenciálne zahraničné univerzitné pracoviská so zámerom získať kvalitných doktorandov aj zo zahraničia. V súčasnosti máme na ústave dvoch zahraničných doktorandov. Budeme tiež podporovať vycestovanie doktorandov na kurzy organizované napr. EMBO a EMBL ako aj ich pobyty na kooperujúcich pracoviskách za využitia cestovných grantov ARA a iných. Pokúsime sa organizovať výmenné pobyty doktorandov v rámci spolupráce so zahraničnými pracoviskami. V spolupráci s relevantnými zahraničnými inštitúciami sa budeme usilovať o realizáciu duálneho doktorandského štúdia, kde by mal doktorand slovenského a navyše aj zahraničného školiteľa a získal by titul PhD. zo slovenskej i zahraničnej univerzity. V neposlednom rade ÚMB SAV motivuje študentov po ich úspešnom ukončení doktorandského štúdia na absolvovanie postdoktorálneho pobytu na zahraničných prestížnych pracoviskách a následne im umožní začleniť sa do pracovných skupín s podporou fondu Š. Schwarza.

Vyhliadky do budúcnosti

Vedenie a Vedecká rada ÚMB SAV sa bude aj naďalej usilovať o napĺňanie opatrení Akčného plánu. Pracovníci ústavu sa každoročne pokúšajú zapojiť do programov ERA a Horizont 2020. Úspech je závislý aj od vypísaných tematických oblastí a veľmi ťažko sa dá ovplyvniť. Ústav bol v hodnotenom období poslednej akreditácie 2012-2015 úspešný v získavaní zahraničných grantov. Podieľali sme sa na riešení jedného 6RP a dvoch 7RP, švajčiarskeho Swiss National Science Foundation grantu, nemeckého HumboldtFoundation grantu a dvoch COST projektov, čo je na 40 FTE značná úspešnosť. Hoci je získanie grantových projektov ERA a Horizont 2020 ovplyvnené vo veľkej miere zahraničnými partnermi, budeme podporovať zapájanie sa pracovníkov do týchto výziev a zohľadňovať v odmeňovaní tých vedúcich pracovníkov, ktorí si podajú žiadosť o takýto projekt. V tomto roku sa pracovníci ústavu zapojili do programu European Interest Group CONCERT-Japonsko (viď vyššie) a dostali nový projekt (Epidemiológia vody/odpadovej vody: Vývoj spoľahlivých molekulárno-biologických detekčných metód pre dohľad nad ohniskami epidémií) v rámci programu SAS-MOST (Taiwan) Joint Research Projects (2021-2023). Aj keď prvotným poslaním Slovenskej akadémie vied je kvalitný základný výskum, je určite veľmi prospešné keď sa získané výsledky, ktorých nositeľom je naše pracovisko, prenesú do praxe.

Na ústave bol iniciovaný projekt Medové laboratórium, ktorého snahou je poskytovať širokej verejnosti možnosť analýzy antibakteriálnej aktivity medov a už v tomto roku zaznamenal značný záujem, hlavne drobných včelárov zo Slovenska ale aj záujem zo zahraničia (Rakúsko a Ruská federácia).

Na ústave budeme podporovať aj výskum s priamou väzbou na výstup do praxe a budeme dbať na to, aby získané výsledky chránené v súlade s platnou legislatívou, našli uplatnenie v spoločnosti. Aj v tomto roku bol k už podaným dvom patentom a prijatému priemyselnému vzoru podaný ďalší patent PP50075-2020 „Antimikrobiálny proteín, antimikrobiálny rekombinantný proteín s lytickými vlastnosťami, expresný vektor, spôsob ich prípravy a použitie.“ Na základe výsledkov 7. rámcového programu bola podpísaná zmluva s konzorciom zahraničných firiem Nemysis o vzájomnej spolupráci v oblasti biotechnológií, ktorá sa úspešne realizuje.

5.3. Aktualizácia Akčného plánu organizácie v roku 2020

Z iniciatívy Predsedníctva SAV bol vypracovaný „Vnútorňý systém zabezpečenia kvality doktorandského štúdia“, ktorý sa dôsledne uplatňoval pri prijímaní nových doktorandov v tomto roku. Princípy zahrnuté v tomto pláne sa na našom ústave uplatňovali dlhodobo a tak jeho napĺňanie pre nás nerobilo ani v budúcnosti nebude robiť problém. Pri prijímaní doktorandov sa kladie dôraz ako na kvalitu samotného vedúceho tak na kvalitu prijímaného doktoranda a zabezpečenie kvalitnými projektami.

Aj tomto roku ako aj v budúcnosti sa v personálnej politike budeme riadiť zásadami hodnotenia pracovných skupín ako aj všetkých vedeckých pracovníkov, ktoré boli prijaté AO v roku 2019. V prípade nízkej výkonnosti výskumnej skupiny bude vedenie ústavu spolu s vedeckou radou analyzovať dôvody a zvážiť možnosť preloženia kvalitných pracovníkov do iných skupín a nepredĺženie pracovnej zmluvy neproduktívnym pracovníkom. Pracovníci budú mať možnosť požiadať o presunutie do inej skupiny, pričom tento presun bude podmienený vyjadrením vedúcich oboch skupín. VR spolu s vedením ústavu budú sledovať aj výstupy všetkých vedeckých pracovníkov za posledných 5 rokov. Kritériá minimálnej vedeckej výkonnosti výskumných pracovníkov boli stanovené na základe priemernej publikačnej výkonnosti pracovníkov za posledné akreditačné obdobie. V prípade nesplnenia minimálnych kritérií prebehne diskusia s vedeckým pracovníkom, jeho vedúcim, vedením ÚMB SAV a VR. Ak toto nebolo spôsobené objektívnymi skutočnosťami (práceschopnosť, materská dovolenka a iné), nebude danému pracovníkovi predĺžená pracovná zmluva.

Vzhľadom na vzniknutú situáciu s COVID-19 časť pracovníkov presunula svoje aktivity na prácu z domu. Reorganizovala sa aj práca v laboratóriách tak, aby sa zabezpečili požadované odstupy a bezpečnosť voči nakazeniu koronavírusom. Táto skutočnosť si vyžiadala veľké úsilie pri koordinácii laboratórnej práce ako aj vzájomnej tolerancie samotných pracovníkov.

6. Spolupráca s univerzitami/vysokými školami a inými subjektmi v oblasti vedy a techniky, okrem aktivít uvedených v kap. 2, 3, 4

6.1. Spoločné pracoviská organizácie

6.1.1. Spolupráca s univerzitami/VŠ (fakultami)

Názov univerzity/vysokej školy a fakulty: Cardiff University, Wales, UK

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2009

Zhodnotenie: Spolupráca je zameraná na charakterizáciu rekombinantne pripravených domén ľudského ryanodínového receptora 2, exprimovaného predovšetkým v srdcovom svale. V rámci spolupráce bolo publikovaných niekoľko publikácií v zahraničných karentovaných časopisoch.

Názov univerzity/vysokej školy a fakulty: Ecole Polytechnique Federale de Lausanne, Švajčiarsko

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2014

Zhodnotenie: Riešenie spoločného projektu FNSNF (SCOPES) týkajúceho sa izolácie a charakterizácie nových kmeňov sporulujúcich Bacilov schopných redukovať chróm v znečistených pôdach.

Názov univerzity/vysokej školy a fakulty: Ecole Polytechnique Federale de Lausanne, Švajčiarsko

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2013

Zhodnotenie: I. Barák pôsobil ako pozvaný profesor na EPFL počas troch mesiacov v roku 2013 a začal spoluprácu s prof. Rizlan Bernier-Latmani týkajúcu sa sporulácie u bacilov a klostrídií.

Názov univerzity/vysokej školy a fakulty: Institute of Organic Synthesis and Photoreactivity, National Research Council, Bologna, Italy

Oblasť spolupráce: Štúdium inhibítorov ľudskej Lon proteázy

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2012

Zhodnotenie: V rámci spolupráce sa vyhľadávajú potenciálne inhibítory ľudskej mitochondriálnej ATP-závislej proteázy Lon.

Názov univerzity/vysokej školy a fakulty: Karlova Univerzita v Prahe, Česká republika

Oblasť spolupráce: elektrónová mikroskopia

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2011

Zhodnotenie: Spolupracujeme s Lekárskou fakultou Karlovej univerzity v Prahe na stanovení štruktúry ATP-závislej proteázy pomocou elektrónovej mikroskopie. Dokončili sa merania EM a určila sa 3D štruktúra ľudskej Lon proteázy.

Názov univerzity/vysokej školy a fakulty: Přírodovědná fakulta, Masarykova Universita Brno

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2011

Zhodnotenie: Charakterizácia vlastností Mgm101 proteínu, MS analýza Lon proteázy, jej produktov a interagujúcich partnerov.

Názov univerzity/vysokej školy a fakulty: Universität Wien, Rakúsko

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2009

Zhodnotenie: Max Perutz Labs: kryštalizácia a X-ray analýza bielkovín Medical University: Charakterizácia proteínov zodpovedných za kontrolu proteolýzy na povrchu bunky.

Názov univerzity/vysokej školy a fakulty: University of Bologna, Taliansko

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2013

Zhodnotenie: Charakterizácia úlohy ATP-závislých proteáz pri starnutí buniek.

Názov univerzity/vysokej školy a fakulty: University of Novi Sad, Srbsko

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2014

Zhodnotenie: Riešenie spoločného projektu FNSNF (SCOPES) týkajúceho sa izolácie a charakterizácie nových kmeňov sporulujúcich Bacilov schopných redukovať chróm v znečistených pôdach.

Názov univerzity/vysokej školy a fakulty: University of York, Veľká Británia

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 1995

Zhodnotenie: V rámci tejto spolupráce bolo niekoľko spoločných grantových projektov a to konkrétne 3 x z The Wellcome Trust a 1 x z The Royal Society. Spolupráca sa dlhodobo týka štúdia základných bunkových procesov u Bacillus subtilis na molekulovej úrovni.

Názov univerzity/vysokej školy a fakulty: Univerzita Komenského v Bratislave

Oblasť spolupráce: základný výskum

Sídlo spoločného pracoviska (ak je vytvorené):

Začiatok spolupráce: 2010

Zhodnotenie: Štúdium mitochondriálnych proteínov

Pozn.: uvádzajte len tie spolupráce, na ktoré má organizácia zmluvu resp. memorandum o zriadení spoločného pracoviska, resp. o vzájomnej spolupráci v konkrétnej oblasti výskumu

6.1.2. Spoločné pracoviská s inými organizáciami SAV

Pozn.: uvádzajte len tie spolupráce, na ktoré má organizácia zmluvu resp. memorandum o zriadení spoločného pracoviska, resp. o vzájomnej spolupráci v konkrétnej oblasti výskumu

6.2. Spoločné pracoviská organizácie s inými inštitúciami mimo SAV a VŠ

Pozn.: uvádzajte len tie spolupráce, na ktoré má organizácia zmluvu resp. memorandum o zriadení spoločného

6.3. Spoločné projekty s univerzitami a ostatnými inštitúciami mimo SAV

Názov projektu: Výskum bórom dopovaných diamantových vrstiev pre vysokoúčinné odstraňovanie liečiv, drog a rezistentných typov mikroorganizmov z vôd

Agentúra: APVV

číslo projektu: APVV-16-0124

Spolupracujúce inštitúcie: Slovenská technická univerzita v Bratislave (STU)

Koordinátor projektu:

Začiatok spolupráce: 2016

Koniec spolupráce: 2020

Zhodnotenie:

Názov projektu: Príprava bakteriofágov na terapiu vaginálnych a močových infekcií

Agentúra: APVV

číslo projektu: APVV-16-0168

Spolupracujúce inštitúcie: Univerzita Komenského Bratislava (Prírodovedecká fakulta, Lekárska fakulta, Vedecký park)

Koordinátor projektu: Prírodovedecká Fakulta UK Bratislava

Začiatok spolupráce: 2017

Koniec spolupráce: 2021

Zhodnotenie:

Názov projektu: Zvýšenie organoleptickej kvality vína aplikáciou nesacharomycetových koštartérov optimalizovanou na základe analýzy mikrobiológie použitím NGS a analýzy arómy

Agentúra: APVV

číslo projektu: APVV-16-0264

Spolupracujúce inštitúcie: Univerzita Komenského v Bratislave, Vedecký park; Národné poľnohospodárske a potravinárske centrum - Výskumný ústav potravinársky

Koordinátor projektu:

Začiatok spolupráce: 2016

Koniec spolupráce: 2020

Zhodnotenie:

Názov projektu: Izolácia a pokročilá charakterizácia nových probiotických mikroorganizmov s potenciálom pre uplatnenie v biomedicíne a biotechnológiách

Agentúra: VEGA

číslo projektu: VEGA 1/0519/18

Spolupracujúce inštitúcie: UPJŠ Košice

Koordinátor projektu: UPJŠ Košice

Začiatok spolupráce: 2018

Koniec spolupráce: 2021

Zhodnotenie:

Názov projektu: Modifikované polyméry z obnoviteľných zdrojov a ich degradácia

Agentúra: APVV

číslo projektu: APVV-15-0528

Spolupracujúce inštitúcie: Ústav polymérov SAV

Koordinátor projektu:

Začiatok spolupráce: 2015

Koniec spolupráce: 2020

Zhodnotenie:

Pozn.: uviesť konkrétne spoločné aj bilaterálne projekty na základe platnej zmluvy o spolupráci

6.4. Iné typy spoločných aktivít s inštitúciami mimo SAV

7. Aplikácia výsledkov výskumu v spoločenskej a hospodárskej praxi

7.1. Výsledky výskumu organizácie aplikované v praxi

7.2. Kontraktový – zmluvný výskum (vrátane zahraničných kontraktov)

7.3. Iné formy aplikácie výsledkov výskumu v spoločenskej a hospodárskej praxi

V tomto roku bol na ústave iniciovaný projekt Medové laboratórium, ktorého snahou je poskytovať širokej verejnosti možnosť analýzy antibakteriálnej aktivity medov. Napriek krátkemu pôsobeniu sme zaznamenali značný záujem, hlavne drobných včelárov zo Slovenska ale aj záujem zo zahraničia (Rakúsko a Ruská federácia).

Pracovná skupina Fylogenickej ekológie dosiahla v roku 2020 významné výsledky týkajúce sa enzýmových antioxidantov. Tieto sú reprezentované predovšetkým peroxidázami a katalázami, u ktorých sa v spolupráci s Universität für Bodenkultur vo Viedni skúma ich reaktivita a stabilita pre aplikáciu v zelených biotechnológiách.

V tomto roku sa začala spolupráca Laboratória environmentálnej a potravinovej mikrobiológie s Kyoto University a TUBITAK Marmara Research Center, ktorá je zameraná na vývoj keramických membrán na čistenie mikro- a nanoplastov z odpadových vôd a aj ich antimikrobiálnu schopnosť.

Pokračuje sa v riešení problematiky biodegradácie predmetov kultúrneho dedičstva, riešená Laboratóriom environmentálnej a potravinovej mikrobiológie v spolupráci s viacerými inštitúciami ako napríklad Slovenský národný archív (Bratislava), Slovenské národné múzeum (Bratislava a Betliar) a Slovenská národná knižnica (Martin). Spolu s Fyzikálnym ústavom SAV sa optimalizujú kombinácie nanočastíc a esenciálnych olejov na zmiernenie biologického poškodenia rôznych typov stavebných materiálov (pieskovec, drevo a papier).

Pokračovalo sa v spolupráci Laboratória environmentálnej a potravinovej mikrobiológie so skupinou Ing. Tomáša Mackuľáka, PhD. z Ústavu chemického a environmentálneho inžinierstva z FCHTP STU Bratislava na zefektívnení biologickej degradácie liečiv (karbamazepín, diklofenak a kofeín) nachádzajúcich sa v odpadových vodách a tiež na dezinfekcii odpadových vôd.

Na základe výsledkov 7. rámcového programu bola podpísaná zmluva s konzorciom zahraničných firiem Nemysis o vzájomnej spolupráci v oblasti biotechnológií, ktorá sa úspešne realizuje.

8. Aktivity pre Národnú radu SR, vládu SR, ústredné orgány štátnej správy SR a iné organizácie

8.1. Členstvo v poradných zboroch vlády SR, Národnej rady SR, ministerstiev SR, orgánoch EÚ, EP, NATO a pod.

Tabuľka 8a Členstvo v poradných zboroch Národnej rady SR, vlády SR, ministerstiev SR, orgánoch EÚ, EP, NATO a pod.

Meno pracovníka	Názov orgánu	Funkcia
RNDr. Imrich Barák, DrSc.	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore mikrobiológia	predseda
	Komisia pre koordináciu aktivít SR v projektoch ESFRI orientovaných na materiály, fyzikálne vedy, s aplikačným potenciálom v biologických a medicínskych vedách, v chemických vedách a IT	člen
	XBI "Management Board at European XFEL (X-ray Free Electron Laser)" v Hamburgu, Nemecko	člen
	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore biochémia	člen
	SFX Management Board at European XFEL (X-ray Free Electron Laser) in Hamburg, Germany	člen
RNDr. Peter Ferianc, CSc.	Zbor expertov pre biologickú bezpečnosť Ministerstva životného prostredia SR	člen
Doc. Ing. Štefan Janeček, DrSc.	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore molekulárna biológia	člen
Mgr. Ľuboš Kľučár, PhD.	Pracovné skupiny pre oblasti špecializácie RIS3 z pohľadu dostupných vedeckých a výskumných kapacít (Pracovná skupina pre Informačno-komunikačné technológie)	člen
RNDr. Ján Kormanec, DrSc.	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore mikrobiológia	člen
	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore virológia	člen
	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore molekulárna biológia	člen
Ing. Juraj Majtán, DrSc.	Odborná pracovná skupina pre farmakoekonomiku, klinické výstupy a hodnotenie zdravotníckych technológií	člen

	MZ SR	
RNDr. Vladimír Pevala, PhD.	Komisia pre biologickú bezpečnosť	člen

8.2. Expertízna činnosť a iné služby pre štátnu správu a samosprávu

Názov expertízy: PROGRAM REFORIEM V OBLASTI VEDY A VÝSKUMU NA PODKLADE PROGRAMOVÉHO VYHLÁSENIA VLÁDY

Adresát expertízy: MŠVVŠ

Spracoval: RNDr. Imrich Barák, DrSc.

Stručný opis: Člen poradnej skupiny Ľudovíta Paulisa, štátneho tajomníka MŠVVŠ na vypracovanie materiálu.

8.3. Členstvo v radách štátnych programov a podprogramov ŠPVV a ŠO

Tabuľka 8b Členstvo v radách štátnych programov a podprogramov ŠPVV a ŠO

Meno pracovníka	Názov orgánu	Funkcia
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8.4. Prehľad aktuálnych spoločenských problémov, ktoré riešilo pracovisko v spolupráci s Kanceláriou prezidenta SR, s vládnyimi a parlamentnými orgánmi alebo pre ich potrebu

RNDr. I. Barák, DrSc. - Expertízna činnosť pre štátnu správu. Člen poradnej skupiny Ľudovíta Paulisa, štátneho tajomníka MŠVVŠ na vypracovanie materiálu - PROGRAM REFORIEM V OBLASTI VEDY A VÝSKUMU NA PODKLADE PROGRAMOVÉHO VYHLÁSENIA VLÁDY

RNDr. I. Barák, DrSc. – Nezávislý pozorovateľ pre oponentské konania pre 27 projektov Stimulov pre výskum a vývoj. 1.11.-30.11.2020

9. Vedecko-organizačné a popularizačné aktivity

9.1. Vedecko-popularizačná činnosť

Tabuľka 9a Súhrnné počty vedecko-popularizačných činností organizácie SAV

Typ	Počet	Typ	Počet	Typ	Počet
prednášky/besedy	4	tlač	20	TV	4
rozhlas	3	internet	7	exkurzie	0
publikácie	0	multimediálne nosiče	0	dokumentárne filmy	0
iné	0				

9.2. Vedecko-organizačná činnosť

Tabuľka 9b Vedecko-organizačná činnosť

Názov podujatia	Domáca/ medzinárodná	Miesto	Dátum konania	Počet účastníkov
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9.3. Účasť na výstavách

Názov výstavy: Európska noc výskumníkov 2020 (27.11.2020)

Miesto konania: videokonferenčná prezentácia ÚMB SAV, Bratislava

Dátum: 25.11.2020

Zhodnotenie účasti: Jednu časť Európskej noci výskumníkov 2020 tvorilo podujatie „Navštív svoju školu – Spoznaj svojho vedca“, ktorého cieľom bolo prepojiť školy a vedcov na Slovensku. Vedci prostredníctvom online prezentácií mali možnosť pripomenúť si svoje študentské časy, predstaviť svoju prácu, čomu sa vo svojom výskumu venujú. Prezentácie prebiehali formou distančných prednášok pre ZŠ alebo SŠ. Naše pracovisko sa zapojilo do podujatia videokonferenčnou prednáškou s názvom „Majú bielkoviny svoju tvár?“, ktorú prezentovala Mgr. Vladena Bauerová, PhD.. Táto prednáška bola prezentovaná dvakrát: 26.11.2020 od 14-15.00 hod. pre žiakov Spojenej školy sv. Františka z Assisi z Bratislavy a 25.11.2020 od 9:50-10:50 hod. pre žiakov Gymnázia z Varšavskej cesty zo Žiliny.

Názov výstavy: Týždeň vedy a techniky 2020 (9.-15.11.2020)

Miesto konania: videokonferenčná prezentácia ÚMB SAV, Bratislava

Dátum: 10.11.2020

Zhodnotenie účasti: V rámci Týždňa vedy a techniky na Slovensku 2020, usporiadalo naše pracovisko videokonferenčný Deň otvorených dverí, ktorého súčasťou boli dve prednášky - 10:30 - 11.00 „Majú bielkoviny svoju tvár?“ Mgr. V. Bauerová, PhD. a prednáška: 11:00-11:30 „Kód života“ Mgr. L. Kľučár, PhD. Všetky prednášky sa stretli s veľmi pozitívnym ohlasom učiteľov a študentov.

9.4. Účasť v programových a organizačných výboroch národných konferencií

Tabuľka 9c Programové a organizačné výbory národných konferencií

Meno pracovníka	Programový	Organizačný	Programový i organizačný
Spolu			

9.5. Členstvo v redakčných radách časopisov

RNDr. Imrich Barák, DrSc.

Frontiers in Microbiology (funkcia: Associate Editor)
Microorganisms (funkcia: Editor of special issue)

Doc. Ing. Štefan Janeček, DrSc.

3Biotech (funkcia: Associate Editor)
Amylase (funkcia: Editor-in-Chief)
Biologia (funkcia: Managing Editor, section Cellular and Molecular Biology)
Enzyme and Microbial Technology (funkcia: Editorial Board member)
Journal of Applied Glycoscience (funkcia: Editorial Board member)
Molecules, section Bioorganic Chemistry (funkcia: Editorial Board member)
Nova Biotechnologica et Chimica (funkcia: Editorial Board member)

RNDr. František Jurský, CSc.

Frontiers in Molecular Neuroscience (funkcia: Review editor)

Mgr. Ľuboš Kľučár, PhD.

Embnet.journal (funkcia: člen Executive Editorial Board)

RNDr. Ján Kormanec, DrSc.

International Journal of Molecular Sciences (funkcia: member of Editorial board)

Ing. Juraj Majtán, DrSc.

Asian Pacific Journal of Tropical Biomedicine (funkcia: člen edičnej rady)
Evidence-Based Complementary and Alternative Medicine (funkcia: člen edičnej rady)
Heliyon (funkcia: člen edičnej rady)
Molecules (funkcia: člen edičnej rady)
Scientific Reports (funkcia: člen edičnej rady)

RNDr. Marcel Zámocký, DrSc.

Antioxidants Basel (MDPI) (funkcia: topic editor)
Biology Basel (MDPI) (funkcia: guest editor)
The Open Biochemistry Journal (funkcia: člen)

9.6. Činnosť v domácich vedeckých spoločnostiach

Pozn.

Značná časť našich vedeckých pracovníkov je členom niektorej slovenskej vedeckej spoločnosti (napr. Slovenská spoločnosť pre biochémiu a molekulárnu biológiu, Slovenská biofyzikálna spoločnosť). Tieto členstvá v tomto zozname uvádzame.

RNDr. Gabriela Bukovská, CSc.

Československá spoločnosť mikrobiologická (funkcia: člen kontrolnej komisie)

RNDr. Ján Kormanec, DrSc.

Slovenská spoločnosť pre biochémiu a molekulárnu biológiu (funkcia: člen výboru)

Ing. Juraj Majtán, DrSc.

Slovenská apiterapeutická spoločnosť (funkcia: člen výboru spoločnosti)

9.7. Iné dôležité informácie o vedecko-organizačných a popularizačných aktivitách

Dr. E. Kutejová bola členkou poroty v súťaži *L'Oréal - UNESCO Pre ženy vo vede (For women in science)* uskutočnenej v termíne od 1. 1. 2020 do 30. 6. 2020.

10. Činnosť knižnično-informačného pracoviska

10.1. Knižničný fond

Tabuľka 10a Knižničný fond

Knižničné jednotky spolu		4577
z toho	knihy a zviazané periodiká	4577
	audiovizuálne dokumenty	0
	elektronické dokumenty (vrátane digitálnych)	0
	mikroformy	0
	iné špeciálne dokumenty - dizertácie, výskumné správy	0
	Rukopisy, vzácne tlače	0
Počet titulov dochádzajúcich periodík		0
z toho zahraničné periodiká		
Ročný prírastok knižničných jednotiek		0
v tom	kúpou	
	darom	
	výmenou	
	bezodplatným prevodom	
	náhradou	
Úbytky knižničných jednotiek		
Knižničné jednotky spracované automatizovane		

Výraz „**v tom**“ označuje úplné (vyčerpávajúce) údaje, ktorých súčet sa musí rovnať údaju v riadku „spolu“, čiže nadradenému riadku.

Výraz „**z toho**“ označuje neúplné (výberové) údaje, ktorých súčet sa nemusí rovnať údaju v riadku „spolu“.

10.2. Výpožičky a služby

Tabuľka 10b Výpožičky a služby

Výpožičky spolu (riadok 1)		0
v tom z r. 1	prezenčné výpožičky	
	absenčné výpožičky	
v tom z r. 1	odborná literatúra pre dospelých	
	výpožičky periodík	
MVS iným knižniciam		0
MVS z iných knižníc		0
MMVS iným knižniciam		0
MMVS z iných knižníc		0
Počet vypracovaných bibliografií		0

Počet vypracovaných rešerší	0
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10.3. Používatelia

Tabuľka 10c Používatelia

Registrovaní používatelia	0
Návštevníci knižnice spolu (bez návštevníkov podujatí)	0

10.4. Iné údaje

Tabuľka 10d Iné údaje

On-line katalóg knižnice na internete (1=áno, 0=nie)	0
Náklady na nákup knižničného fondu v €	0

10.5. Iné informácie o knižničnej činnosti

Od roku 2009 je výpožičná služba knižnice pozastavená.

11. Aktivity v orgánoch SAV

11.1. Členstvo vo Výbore Snemu SAV

Mgr. Ľuboš Kľučár, PhD.

- člen
- predseda II. komory

11.2. Členstvo v Predsedníctve SAV a vo Vedeckej rade SAV

11.3. Členstvo vo vedeckých kolégiách SAV

RNDr. Imrich Barák, DrSc.

- VK SAV pre molekulárnu biológiu a genetiku (člen)

RNDr. Ján Kormanec, DrSc.

- VK SAV pre biologicko-ekologické vedy (predseda)

11.4. Členstvo v komisiách SAV

RNDr. Imrich Barák, DrSc.

- Komisia SAV pre medzinárodnú vedecko-technickú spoluprácu (člen)

RNDr. Peter Ferianc, CSc.

- Komisia SAV pre životné prostredie (Člen)

Mgr. Ľuboš Kľučár, PhD.

- Akreditačná komisia SAV (člen)
- Knižničná rada SAV (člen)
- Komisia pre transformáciu SAV (člen)
- Komisia SAV pre informačné a komunikačné technológie (člen)
- Komisia SAV pre infraštruktúru a štrukturálne fondy (člen)

RNDr. Ján Kormanec, DrSc.

- Komisia SAV pre posudzovanie vedeckej kvalifikácie zamestnancov (člen)

RNDr. Katarína Muchová, CSc.

- Komisia SAV pre životné prostredie (tajomníčka)

Mgr. Renáta Nováková, CSc.

- Etická komisia SAV (člen)

11.5. Členstvo v orgánoch VEGA

RNDr. Imrich Barák, DrSc.

- Komisia VEGA č. 4 pre biologické vedy (člen)

12. Hospodárenie organizácie

12.1. Výdavky organizácie

Tabuľka 12a Výdavky organizácie (skutočnosť k 31. 12. 2020 v €)

Typ organizácie (RO,PO)		Zdroje, z ktorých sa kryli jednotlivé výdavky			
Výdavky	Spolu	kapitola SAV (111)	iné štátne a verejné zdroje	ostatné zdroje	% krytia z kapitoly SAV
1. Bežné výdavky	1 967 726	1 639 159	315 614	12 953	83,3
z toho: mzdy (610)	1 030 649	968 249	55 069	7 331	93,95
vedecká výchova štipendiá (640)	128 667	128 667			
poistné a príspevok do poisťovní (620)	351 979	330 422	18 865	2 692	93,87
tovary a služby (630)	369 129	210 805	155 395	2 929	57,11
transfery partnerom projektov (640)	86 285		86 285		
2. Kapitálové výdavky	671 703	654 565		17 138	97,45
z toho: obstarávanie kapitálových aktív	671 703	654 565		17 138	97,45
kapitálové transfery					

12.2. Zdroje financovania organizácie

Tabuľka 12b Zdroje financovania organizácie (skutočnosť k 31. 12. 2020 v €)

Typ organizácie (RO,PO)		Z toho kategórie			
Zdroje	Spolu	Kapitálové zdroje	zdroje na mzdy (610)	zdroje na odvody do poisťovní (620)	zdroje na transfery partnero m projektov
1. kapitola SAV (111)	2 310 725	654 565	968 249	330 422	
z toho: VEGA	124 983	6 221			
MVTS výskumné projekty	11 000	3 000		449	
MVTS podpora					
SASPRO/MOREPRO					
Vydávanie časopisov	5 165			456	
Vedecká výchova	128 667				

(štipendiá)					
OTAS (630)					
2. ŠF EÚ vr. fin. zo ŠR	788 987				35 746
3. medzinárodné grantové projekty	21 087		4 400	1 420	
z toho: H2020					
4. iné štátne a verejné zdroje (spolu)	279 868				50 539
z toho: APVV	279 868				50 539
podpora z kapitoly MŠVVaŠ SR (stimuly)					
5. ostatné zdroje	12 923				
z toho: príjmy z prenájmu	6 255				
príjmy z podnikateľskej činnosti					
príjmy z expertnej činnosti a služieb	5 679				

13. Nadácie a fondy pri organizácii SAV

14. Iné významné činnosti organizácie SAV

ÚMB SAV vykonáva od roku 1999 s mandátom MŠVVaŠ SR funkciu Národného uzla organizácie EMBnet (The Global Bioinformatics Network). Táto organizácia vznikla v roku 1988 za účelom spojiť jednotlivé európske pracoviská, ktoré sa zaoberajú využitím bioinformatiky a *in silico* analýzy. Hlavnou náplňou činnosti Národného uzla je administrácia rozsiahleho biologického výpočtového systému, školenia a kurzy zamerané na ich využitie, ako aj spolupráca s inými vedeckými projektmi v oblasti bioinformatiky. Národný uzol je jediným slovenským centrom, ktoré udržiava a poskytuje analyzačné balíky Galaxy a Chipster určené na analýzu high-throughput dát (DNA čipy, NGS) pre potreby národnej vedeckej komunity. Naše pracovisko sa priamo podieľa aj na tvorbe medzinárodného peer-review časopisu EMBnet.journal (journal.embnet.org), zameraného hlavne na praktickú bioinformatiku a v tomto roku bolo aj jedným z hlavných organizátorov videokonferenčnej konferencie *EMBnet Conference 2020 - Bioinformatics Approaches to Precision Research*.

ÚMB SAV je sídlom redakcie medzinárodného časopisu *Biológia* (Botany, Zoology and Cellular and Molecular Biology) evidovaného v Current Contents a Web of Science s IF 2019: 0,811, ktorý je od roku 2018 pod vydavateľstvom Springer.

Ústav molekulárnej biológie sa aktívne zúčastňuje činností iniciatívy „Veda chce žiť!“ (www.vedachcezit.sk), ktorú založili vedecí pracovníci v roku 2014. Táto nezávislá iniciatíva vznikla s cieľom upozorňovať na problémy vedy, výskumu a vzdelávania na Slovensku a podporovať pozitívne zmeny v týchto oblastiach. K iniciatíve sa rýchlo pripojila veľká časť vedeckej komunity na SAV, ale aj zástupcovia univerzít a širokej verejnosti. V roku 2020 sa členovia iniciatívy zúčastnili v priebehu mesiaca november ako pozorovatelia pri oponentúrach 27 projektov z tzv. Stimuly na podporu vedy a výskumu. I. Barák bol členom poradnej skupiny Ľudovíta Paulisa, štátneho tajomníka MŠVVŠ na vypracovanie materiálu: Program reforiem v oblasti vedy a výskumu na podklade programového vyhlásenia vlády.

15. Vyznamenania, ocenenia a ceny udelené pracovníkom organizácie v roku 2020

15.1. Domáce ocenenia

15.1.1. Ocenenia SAV

15.1.2. Iné domáce ocenenia

Barák Imrich

Cena Dr. Ludmily Sedlárovej Rabanovej za rok 2020

Oceňovateľ: Natura, občianske združenie, Prírodovedecká fakulta Univerzity Komenského v Bratislave

Opis: Cena za uznanie zásluh v oblasti genetiky a evolučnej biológie. Za prácu publikovanú v Nature Communications. Pospíšil J, Vítovská D, Kofroňová O, Muchová K, Šanderová H, Hubálek M, Šíková M, Modrák M, Benada O, Barák I*, Krásný L*. (2020) Bacterial nanotubes as a manifestation of cell death. Nature Communications 11(1):4963. doi: 10.1038/s41467-020-18800-2. * - korešpondujúci autori*

Majtán Juraj

Prémia za trojročný vedecký ohlas

Oceňovateľ: Literárny fond

Opis: 1. miesto v kategórii prírodné a lekárske vedy

15.2. Medzinárodné ocenenia

16. Poskytovanie informácií v súlade so zákonom č. 211/2000 Z. z. o slobodnom prístupe k informáciám v znení neskorších predpisov (Zákon o slobode informácií)

ÚMB SAV prijal dve žiadosti o prístup k informáciám. Obe sa týkali testu medov, výsledky ktorého boli zverejnené v slovenských médiách. Prvá požiadavka bola postúpená z Úradu SAV 9. decembra 2020, odpoveď bola zaslaná 16. decembra 2020. Druhá požiadavka bola prijatá 21. decembra 2020 a odpoveď bola zaslaná 2. januára 2021.

17. Problémy a podnety pre činnosť SAV

Hoci sa v tomto roku podarilo ústavu získať z prostriedkov INTERREG významné prostriedky na zakúpenie niekoľkých finančne náročných prístrojov a tak čiastočne zlepšiť infraštruktúru ústavu, domnievame sa, že nemožnosť získania kapitálových prostriedkov mimo štrukturálnych fondov významne zasahuje naše pracovisko, pretože jeho vedecké zameranie kladie vysoké nároky na vybavenie laboratórií. Nedostatok kapitálových prostriedkov znemožňuje obnovu základného technického vybavenia a rekonštrukcie laboratórií. Domnievame sa, že s podobnými problémami sa stretávajú aj iné ústavy, ktoré sídlia v starších budovách a potrebujú zrekonštruovať a zmodernizovať priestory a zariadenia pracoviska.

ÚMB SAV opäť dáva podnet na zváženie, aby P SAV spolu s vedením jednotlivých ústavov hľadalo riešenie pre efektívnejšie využívanie špičkových prístrojov, ktoré ústavy či centrá získali zo štrukturálnych fondov a ktoré by mali záujem využívať aj iní pracovníci, všeobecná dostupnosť a prípadne odborný servis tu neexistuje. Doterajší systém, založený na zverejnení informácií o prístrojoch na webových stránkach ústavov nie je úplne vyhovujúci, údaje sú často neúplné, bez potrebných detailov. Koordinácia využívania vysoko sofistikovaných, špičkových prístrojov by určite viedla k zlepšeniu spolupráce medzi jednotlivými ústavmi, ich vedeckých výstupov a hodnotenia SAV ako vedeckej inštitúcie.

Ocenili by sme aj iniciatívu predsedníctva pri podpore zaviesť v rámci APVV projektov možnosť získavania finančných prostriedkov na zamestnanie šikovných mladých vedeckých pracovníkov.

Správu o činnosti organizácie SAV spracoval(i):

Mgr. Ľuboš Kľučár, PhD., 02 5930 7413

Správu o činnosti Ústavu molekulárnej biológie SAV za rok 2020 schvália Vedecká rada ÚMB SAV na svojom zasadnutí 27. januára 2021.

Riaditeľ organizácie SAV

Predseda vedeckej rady

.....
Ing. Eva Kutejová, DrSc.

.....
RNDr. Imrich Barák, DrSc.

Prílohy

Príloha A

Zoznam zamestnancov a doktorandov organizácie k 31.12.2020

Zoznam zamestnancov podľa štruktúry

	Meno s titulmi	Úväzok (v %)	Ročný prepočítaný úväzok
Vedúci vedeckí pracovníci DrSc.			
1.	RNDr. Imrich Barák, DrSc.	100	1.00
2.	Doc. Ing. Štefan Janeček, DrSc.	100	1.00
3.	RNDr. Ján Kormanec, DrSc.	100	1.00
4.	Ing. Eva Kutejová, DrSc.	100	1.00
5.	Ing. Juraj Majtán, DrSc.	100	1.00
6.	Dr. Domenico Pangallo, DrSc.	100	1.00
7.	RNDr. Marcel Zámocký, DrSc.	50	0.50
Samostatní vedeckí pracovníci			
1.	Mgr. Martina Baliová, PhD.	100	1.00
2.	Jacob Bauer, PhD.	100	0.17
3.	Mgr. Vladena Bauerová, PhD.	100	1.00
4.	RNDr. Mária Bučková, PhD.	100	1.00
5.	RNDr. Gabriela Bukovská, CSc.	100	1.00
6.	RNDr. Jarmila Farkašovská, CSc.	100	1.00
7.	RNDr. Marian Farkašovský, CSc.	100	1.00
8.	RNDr. Peter Ferianc, CSc.	100	1.00
9.	RNDr. Nora Halgašová, PhD.	100	1.00
10.	RNDr. Dagmar Homerová, CSc.	100	1.00
11.	RNDr. Katarína Chovanová, PhD.	100	1.00
12.	RNDr. František Jurský, CSc.	100	1.00
13.	Mgr. Ľuboš Kľučár, PhD.	100	1.00
14.	Ing. Daniela Krajčíková, CSc.	100	1.00
15.	Mgr. Lucia Kraková, PhD.	100	0.17
16.	Mgr. Vladimír Leksa, PhD.	100	1.00
17.	RNDr. Katarína Muchová, CSc.	100	1.00
18.	Mgr. Renáta Nováková, CSc.	100	1.00
19.	Ing. Gabriela Ondrovičová, PhD.	100	1.00
20.	RNDr. Vladimír Pevala, PhD.	100	1.00

21.	Mgr. Andrea Puškárová, PhD.	100	1.00
22.	RNDr. Ľubica Urbániková, CSc.	100	1.00
Vedeckí pracovníci			
1.	Mgr. Gábor Beke, PhD.	100	1.00
2.	RNDr. Lucia Bocánová, PhD.	100	1.00
3.	Mgr. Marcela Bučeková, PhD.	100	0.58
4.	Mgr. Marek Gabriško, PhD.	100	1.00
5.	RNDr. Romana Chovanová, PhD.	100	1.00
6.	Mgr. Zuzana Chromiková, PhD.	100	1.00
7.	RNDr. Mária Kajsiková, PhD.	100	1.00
8.	RNDr. Andrea Kuchtová, PhD.	50	0.00
9.	Mgr. Nina Kunová, PhD.	100	1.00
10.	Mgr. Naďa Labajová, PhD.	100	1.00
11.	Mgr. Matej Planý, PhD.	100	1.00
12.	Mgr. Matej Stano, PhD.	10	0.10
13.	RNDr. Zuzana Šramková, PhD.	50	0.21
Odborní pracovníci s VŠ vzdelaním (výskumní a vývojoví zamestnanci)			
1.	RNDr. Ľubomíra Fecková	100	1.00
2.	Ing. Jana Godočiková	100	1.00
3.	Ing. Janka Harichová	100	1.00
4.	Mgr. Zuzana Janíčková	25	0.25
5.	Mgr. Barbora Keresztesová	10	0.10
6.	Mgr. Veronika Kotrasová	100	0.22
7.	Mgr. Filip Mareček	25	0.25
8.	Mgr. Lucia Martináková	100	1.00
9.	Ing. Bronislava Řežuchová	100	1.00
10.	RNDr. Beatrice Ševčíková	100	1.00
Odborní pracovníci s VŠ vzdelaním (ostatní zamestnanci)			
1.	Ing. Michal Bakaj	100	1.00
2.	Ing. Alžbeta Janečková	50	0.50
3.	Ing. Dana Rybárová	100	1.00
4.	Mgr. Simona Štrbová	100	0.21
5.	Ing. Anna Varcholová	100	1.00
Odborní pracovníci ÚSV			
1.	Renáta Knirschová	100	1.00

2.	Katarína Kválová	100	1.00
3.	Erika Poleková	100	1.00
4.	Katarína Semešová Pírová	100	1.00
Ostatní pracovníci			
1.	Miroslav Buran	70	0.70
2.	Valéria Csonková	100	1.00
3.	Andrea Dávidová	100	1.00
4.	Martin Goliaš	130	1.30
5.	Marieta Hronská	100	1.00
6.	Emília Chovancová	70	0.92
7.	Dáša Jašková	100	1.00
8.	Karol Ondrovič	100	1.00

Zoznam zamestnancov, ktorí odišli v priebehu roka

	Meno s titulmi	Dátum odchodu	Ročný prepočítaný úväzok
Odborní pracovníci s VŠ vzdelaním (výskumní a vývojoví zamestnanci)			
1.	Mgr. Eva Petrovčíková	29.2.2020	0.11
Odborní pracovníci s VŠ vzdelaním (ostatní zamestnanci)			
1.	Ing. Michal Bakaj	31.12.2020	1.00
2.	Ing. Alžbeta Lidáková	15.10.2020	0.38

Zoznam doktorandov

	Meno s titulmi	Škola/fakulta	Študijný odbor
Interní doktorandi hradení z prostriedkov SAV			
1.	Mgr. Veronika Bugárová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
2.	Mgr. Dominika Csölleiová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
3.	Mgr. Dominik Hadžega	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
4.	Mgr. Henrieta Havalová	Prírodovedecká fakulta UK	4.1.22 biochémia
5.	Mgr. Iveta Jahodová	Prírodovedecká fakulta UK	4.1.22 biochémia
6.	Mgr. Rachel Javorová	Prírodovedecká fakulta UK	4.2.7 mikrobiológia
7.	Ing. Evelína Kalocsaiová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
8.	Mgr. Magdaléna Kapustová	Prírodovedecká fakulta UK	4.2.7 mikrobiológia
9.	Mgr. Lenka Kerényiová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
10.	Mgr. Barbora Keresztesová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
11.	Mgr. Zuzana Kisová	Prírodovedecká fakulta UK	4.2.7 mikrobiológia

12.	Mgr. Veronika Kotrasová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
13.	Mgr. Maroš Laho	Prírodovedecká fakulta UK	4.2.7 mikrobiológia
14.	Mgr. Kristína Papayová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
15.	MSc. Jelena Pavlović	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
16.	Mgr. Andrej Poljovka	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
Interní doktorandi hradení z iných zdrojov			
<i>organizácia nemá interných doktorandov hradených z iných zdrojov</i>			
Externí doktorandi			
1.	Mgr. Matúš Hajduk	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia

Zoznam zamestnancov prijatých do jedného roka od získania PhD.

	Meno s titulmi	Dátum obhajoby	Dátum prijatia	Úväzok (v %)
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Zoznam emeritných vedeckých zamestnancov

	Meno s titulmi
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Príloha B

Projekty riešené v organizácii

Medzinárodné projekty

Programy: INTERREG

1.) Budovanie výukových a výskumných kapacít v štruktúrnej a funkčnej analýze biomolekúl pre potreby biomedicíny a biotechnológií (*Building learning and research capacities in the structure and functional analysis of biomolecules for the needs of biomedicine and biotechnology*)

Zodpovedný riešiteľ:	Eva Kutejová
Trvanie projektu:	1.5.2019 / 30.4.2022
Evidenčné číslo projektu:	305011X666
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	2 - Rakúsko: 1, Slovensko: 1
Čerpané financie:	Interreg Slovakia-Austria, European Regional Development Fund: 746040 €

Dosiahnuté výsledky:

Interreg StruBioMol 2020

Najdôležitejším výsledkom projektu v tomto roku bolo vybudovanie automatizovaného laboratória štruktúrnej biológie na Ústave molekulárnej biológie SAV v Bratislave, prvého svojho druhu na Slovensku. V rámci projektu boli obstarané a zakúpené výskumné „state of the art“ prístroje, ktoré v takomto zložení nie sú dostupné u rakúskeho partnera, a preto budú pre výskumné a vzdelávacie účely využívané aj študentami a vedeckými pracovníkmi z Viedne. V júli a v septembri boli dodané a inštalované zakúpené prístroje: nano-diferenčný skenovací fluorimeter Prometheus NT.48 (NanoTemper), preparatívna ultracentrifúga OPTIMA XPN90 (Beckman Coulter), zobrazovač kryštalizačných kvapiek (Formulatrix - ROCK IMAGER 54), robotický kvapkač na kryštalizáciu proteínov (Formulatrix - NT8) a robot pre prípravu kryštalizačných skrinov (Formulatrix - FORMULATOR). Zároveň boli organizované prednášky k ovládaniu jednotlivých prístrojov a možnostiach ich využitia, konkrétne:

- Prednáška „Vyberte si nový zlatý štandard v charakterizácii stability proteínov“, Piotr Wardega (NanoTemper). Prednáška obsahovala všeobecné informácie o diferenciálnej skenovacej fluorimetrii a princípoch práce s prístrojom Prometheus NT.48 od firmy NanoTemper.
- Inštruktážna prednáška k ultracentrifúge od firmy Beckman Coulter. Obsahom školenia bolo zoznámenie sa so všeobecnými postupmi fungovania ultracentrifúg, zásadami práce s rotormi, centrifugačnými tubami a praktická ukážka novo-inštalovanej sálovej ultracentrifúgy Optima XPN90.
- Prednáška firmy FORMULATRIX, Thomas Gohl, PhD. a Mayank Aggarwal, PhD., ktorá bola zameraná na praktické využitie nových prístrojov ROCK IMAGER 54, NT8 a FORMULATOR na kryštalizáciu proteínov.

V rámci projektu bola tiež zorganizovaná prednáška zahraničného experta Dr. Kvida Strišovského z ÚOCHB AV ČR s názvom „Kontrola kvality membránových proteínov a intramembránová proteolýza“.

Všetky aktivity projektu boli priebežne aktualizované na webovej stránke <http://www.imb.savba.sk/strubiomol/> a sociálnych sieťach.

Programy: Bilaterálne - iné

2.) Štruktúra, funkcia a evolúcia amylolytických enzýmov (*Structure/function and evolution of amylolytic enzymes*)

Zodpovedný riešiteľ: Štefan Janeček
Trvanie projektu: 1.1.2016 / 31.12.2020
Evidenčné číslo projektu:
Organizácia je áno
koordinátorom projektu:
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských 2 - Holandsko: 1, Slovensko: 1
inštitúcií:
Čerpané financie: -

Dosiahnuté výsledky:

V dôsledku dlhotrvajúcej spolupráce bola dokončená in silico štúdia venovaná identifikácii proteínových homológov k enzýmom z tzv. druhej alfa-amylázovej rodiny GH57 - alfa-glukán vetviacemu enzýmu a 4-alfa-glukanotransferáze. Homológy daných enzýmov sú proteíny klasifikované v rodine GH57, t.j. tieto proteíny sú sekvenčne jednoznačne podobné k ich enzýmovým náprotivkom, avšak z hľadiska katalytickej mašínérie im chýba jeden, prípadne oba katalytické zvyšky, typické pre enzýmy z rodiny GH57.

Publikácia:

Janecek, S. & Martinovicova, M. (2020) New groups of protein homologues in the alpha-amylase family GH57 closely related to alpha-glucan branching enzymes and 4-alpha-glucanotransferases. *Genetica* 148: 77-86. <https://doi.org/10.1007/s10709-020-00089-0>

3.) Trvalo udržateľná regenerácia vody založená na filtrácii keramickými membránami (*Sustainable Water Reclamation Based on Ceramic Membrane Filtration*)

Zodpovedný riešiteľ: Domenico Pangallo
Trvanie projektu: 1.4.2020 / 31.3.2023
Evidenčné číslo projektu: EIG_JC2019-058
Organizácia je nie
koordinátorom projektu:
Koordinátor: TUBITAK, Marmara Research Center (TUBITAK MRC)
Počet spoluriešiteľských 6 - Japonsko: 2, Slovensko: 2, Turecko: 2
inštitúcií:
Čerpané financie: EIG Concert Japan: 11000 €

Dosiahnuté výsledky:

Začali sme optimalizovať mikroskopický prístup zobrazených baktérií na povrchu mikroplastov. Mikroplastové častice možno považovať za ostrovy, ktoré môžu prenášať patogény, ako sú multirezistentné baktérie. Začali sme vyvíjať niekoľko PCR testov na detekciu multirezistentných baktérií prichytených na povrchu mikroplastov.

Domáce projekty

Programy: VEGA

1.) Úloha PDZ interakcií v regulácii transportérov neurotransmiterov

Zodpovedný riešiteľ: Martina Baliová
Trvanie projektu: 1.1.2017 / 31.12.2020
Evidenčné číslo projektu: 2/0066/17
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 3354 €

Dosiahnuté výsledky:

Dosiahnuté výsledky:

Naše posledné výsledky ukázali, že fosforylácia PDZ motívu glycinového transportéra GlyT1 reguluje jeho PDZ interakciu s postsynaptickým PDZ proteínom PSD95. Keďže GlyT1 a PSD95 tvoria regulačný komplex s NMDA receptorom, regulujúcim vyššiu nervovú činnosť, cielené ovplyvňovanie tejto regulácie môže mať farmaceutický význam pre liečbu ochorení akým je aj schizofrénia. Druhým významným výsledkom projektu je identifikácia viacnásobnej interakcie PDZ proteínu MUPP1 so synaptickým adhéznym proteínom SynCAM1. Význam tejto interakcie v spektre autistického syndrómu už predtým naznačili niektoré štúdie. Naše výsledky poukázali že okrem už identifikovanej MUPP1 domény 2 interagujú s PDZ motívom SynCAM1 tiež domény 1, 3-5, 7 a 11. Výsledky boli potvrdené viacerými nezávislými postupmi a tieto domény by mohli byť predmetom genetického skríningu jedincov vykazujúcich autizmus.

Publikácie:

Baliova, M., Jursky, F.: Phosphomimetic Mutation of Glycine Transporter GlyT1 C-Terminal PDZ Binding Motif Inhibits its Interactions with PSD95. *Journal of Molecular Neuroscience* (2020) 70:488–493 [IF2019 2.678].

Baliova, M., Jursky, F.: Comparison of SynCAM1/CADM1 PDZ interactions with MUPP1 using mammalian and bacterial pull-down systems. *Brain and Behaviour* (2020) 70: e01587. [IF2019 2.091].

2.) Mechanizmy asymetrického bunkového delenia počas sporulácie *Bacillus subtilis*

*(Mechanisms of asymmetric cell division during sporulation of *Bacillus subtilis*)*

Zodpovedný riešiteľ: Imrich Barák
Trvanie projektu: 1.1.2017 / 30.12.2020
Evidenčné číslo projektu: VEGA 2/0007/17
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 12874 €

Dosiahnuté výsledky:

DivIVA je proteín pôvodne identifikovaný ako regulátor miesta bunkového delenia v *Bacillus subtilis* a jeho homológy sú prítomné v mnohých ďalších grampozitívnych baktériách. Okrem

svojej úlohy ako topologického regulátora Min systému počas delenia buniek sa DivIVA podieľa na segregácii chromozómov počas sporulácie, genetickej kompetencie a syntézy bunkovej steny. DivIVA sa lokalizuje do oblastí s vysokým zakrivením membrány, ako sú napríklad póly bunky a miesto delenia, kde viaže ďalšie proteíny. Predtým sa predpokladalo, že rozoznávanie negatívneho zakrivenia je hlavným mechanizmom, ktorým DivIVA sa viaže na tieto špecifické oblasti v bunke. V našom projekte sme preukázali, že sa DivIVA viaže prednostne na membrány obsahujúce kardiopolipín. Prekvapením bolo, že po naviazaní DivIVA modifikuje distribúciu lipidov. Naše pozorovania naznačujú, že DivIVA môže hrať zložitejšiu a doteraz neznámu aktívnu úlohu pri tvorbe membrány septa počas delenia buniek.

Publikácie:

1. Wollman A., Muchová K., Z. Chromíková, A.J. Wilkinson, I. Barák, M. Leake (2020) Single-molecule optical microscopy of protein dynamics and computational analysis of images to determine cell structure development in differentiating *Bacillus subtilis*. *Computational and Structural Biotechnology Journal* 18, 1474-1486 (IF = 6.02) (Q1 JCR2019; Q1 SJR2019)
2. K. Muchová, Z. Chromíková and I. Barák (2020) Linking peptidoglycan synthesis protein complex with asymmetric cell division during *Bacillus subtilis* sporulation. *Int.J. Mol. Science* 21, 4513; doi:10.3390/ijms21124513 (IF = 4.56) (Q1 JCR2019; Q1 SJR2019)
3. J. Pospíšil, D. Vítovská, O. Kofroňová, K. Muchová, H. Šanderová, M. Hubálek, M. Šíková, O. Benada, I. Barák, and L. Krásný (2020) Bacterial nanotubes are a manifestation of cell death. *Nature Communications* 11: 4963. doi: 10.1038 / s41467-020-18800-2 (IF = 12.12) (Q1 JCR2019; Q1 SJR2019)
4. Gacek-Matthews A., Chromikova Z., Sulyok M., Lücking G., Barak I., Ehling-Schulz M. (2020) Beyond toxin transport: Novel role of ABC transporter for enzymatic machinery of cereulide NRPS assembly line. *mBio* 11: e01577-20 (IF = 6.78) (Q1 JCR2019; Q1 SJR2019)

3.) Štúdium vplyvu mutácií asociovaných so srdcovými arytmiami na štruktúru a funkciu ľudského ryanodínového receptora 2 (*Study of the effect of cardiac arrhythmia-associated mutations on the structure and function of the human ryanodine receptor 2*)

Zodpovedný riešiteľ:	Vladena Bauerová
Trvanie projektu:	1.1.2020 / 31.12.2023
Evidenčné číslo projektu:	2/0131/20
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 7062 €

Dosiahnuté výsledky:

Vzhľadom k situácii v prvom roku riešenia projektu sme sa zamerali na "in silico" analýzu vybraných mutácií v N-terminálnej oblasti ľudského ryanodínového receptora 2, ich vplyvu na molekulovú dynamiku a publikovanie dosiahnutých výsledkov. Výsledky boli publikované v renomovaných vedeckých zahraničných časopisoch. Taktiež sme publikovali dve kapitoly vo vedeckých monografiách vydaných zahraničným vydavateľom (uvedené nižšie). V spolupráci s Katedrou mikrobiológie a virológie PriFUK sme vydali prvý diel odbornej monografie "Proteíny-

Štruktúra a Funkcia".

Structure and Function of the Human Ryanodine Receptors and Their Association with Myopathies—Present State, Challenges, and Perspectives.

By: Bauerová-Hlinková Vladena, Hajdúchová Dominika, Jacob A. Bauer. Molecules. 2020-09-04 | journal-article, DOI: 10.3390/molecules25184040

Disease-associated mutations alter the dynamic motion of the N-terminal domain of the human cardiac ryanodine receptor.

By: Bauer, Jacob A.; Borko, L'ubomir; Pavlovic, Jelena; et al.
JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS.
2020-03-03 | journal-article, DOI: 10.1080/07391102.2019.1600027

RADKA ŠEBOVÁ, VLADENA BAUEROVÁ-HLINKOVÁ, KONRAD BECK, IVANA NEMČOVIČOVÁ, JACOB BAUER AND MARCELA KÚDELOVÁ. Residue Mutations in Murine Herpesvirus 68 Immunomodulatory Protein M3 Reveal Specific Modulation of Chemokine Binding. Prime Archives in Microbiology. Ed. by A. Morrot. Vide Leaf, Telangana, India. 2020 | book-chapter. Part of ISBN: 978-81-945175-0-4

JACOB A. BAUER, JELENA PAVLOVIĆ AND VLADENA BAUEROVÁ-HLINKOVÁ: Normal Mode Analysis as a Routine Part of a Structural Investigation. Prime Archives in Molecular Sciences. Ed. By S. Lach. Vide Leaf, Telangana, India. 2020 | book-chapter. Part of ISBN: 978-93-90014-20-0

BAUEROVÁ-HLINKOVÁ, V., KABÁT P., BAUER, J. PROTEÍNY - ŠTRUKTÚRA A FUNKCIA. 1. DIEL: ŠTRUKTÚRA PROTEÍNOV. Vydavateľstvo UK, Bratislava, Slovakia. 2020-09 | book, 109 p. ISBN: 978-80-223-4524-8

4.) Kombinácia nanočastíc a esenciálnych olejov na zmiernenie biologického poškodenia rôznych typov stavebných materiálov (*Combination of nanoparticles and essential oils for mitigating the biodeterioration on various types of building materials*)

Zodpovedný riešiteľ:	Monika Benkovičová
Zodpovedný riešiteľ v organizácii SAV:	Mária Bučková
Trvanie projektu:	1.1.2019 / 31.12.2021
Evidenčné číslo projektu:	2/0059/19
Organizácia je koordinátorom projektu:	nie
Koordinátor:	Fyzikálny ústav SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	-

Dosiahnuté výsledky:

V tomto roku sme skúmali génovú expresiu vláknitej huby *Penicillium rubens* pôsobením výparov ôsmich éterických olejov. Tento výskum nám poskytol dôležité údaje týkajúce sa pôsobenia éterických olejov proti mikroskopickým vláknitým hubám. Skúmal sa tiež antifungálny účinok derivátu tymolu (kubicín). Možno by sa v budúcnosti mohla takáto zmes použiť na ochranu povrchov rôznych materiálov.

Kisová, Z., Šoltýsová, A., Bučková, M., Beke, G., Puškárová, A. and Pangallo, D., 2020. Studying

the Gene Expression of *Penicillium rubens* Under the Effect of Eight Essential Oils. *Antibiotics*, 9(6), p.343.

Kubinec, R., Blaško, J., Galbavá, P., Jurdáková, H., Sadecká, J., Pangallo, D., Bučková, M. and Puškárová, A., 2020. The antifungal activity of vapour phase of odourless thymol derivate. *PeerJ*, 8, p.e9601.

5.) Štúdium replikačných proteínov modelových bakteriofágov v systéme bakteriofág – hostiteľ (*The study of model bacteriophages' replication proteins in system bacteriophage - host*)

Zodpovedný riešiteľ: Gabriela Bukovská
Trvanie projektu: 1.1.2018 / 31.12.2021
Evidenčné číslo projektu: 2/0139/18
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 5876 €

Dosiahnuté výsledky:

Zamerali sme sa na spracovanie výsledkov získaných pri charakterizácii delečných mutantov replikačného proteínu gp43 z bakteriofága BFK20, ktorý sa vyznačuje helikázovou aktivitou. Pripravené mutanty obsahovali helikázové jadro s konzervovanými motívmi helikáz z rodiny SF4 a príslušné oblasti rôznej dĺžky. Výsledky z ATPázovej, helikázovej aktivity, oligomérneho stavu delečných mutantov a testovanie ich väzby na ssDNA a dsDNA sme spracovali do publikácie zaslanej do vedeckého časopisu.

Ďalej sme pokračovali v práci s proteínom gp41 - helikázou z rodiny SF2 fága BFK20. Pripravili sme sedem bodových mutantov s mutáciami v krajnej C-koncovnej oblasti a plánujeme testovať ich enzýmovú aktivitu a väzbu na rôzne DNA substráty. Pokračovali sme v charakterizácii dvoch replikačných proteínov bakteriofága phiBP (*Paenibacillus polymyxa*): organizátora fágového replizómu a nakladača helikázy. Testovali sme ich oligomérny stav pomocou FPLC gélovej filtrácie na kolóne Superdex 200 Increase. Zistili sme, že organizátor replizómu (iniciačný replikačný proteín) vytvára oligomérny komplex s pravdepodobným počtom podjednotiek 12 a nakladač helikázy sa vyskytuje vo forme dimérov.

6.) Skladanie septínového komplexu do štruktúr vyššieho poriadku. (*Assembly of Septin Complex to Higher Order Structures.*)

Zodpovedný riešiteľ: Marian Farkašovský
Trvanie projektu: 1.1.2019 / 31.12.2022
Evidenčné číslo projektu: 2/0003/19
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 5539 €

Dosiahnuté výsledky:

Ako sme v minulosti ukázali, fosforylácia septínov s CDK/G1 cyklínom je jedným z mechanizmov,

ktorým sa indukuje depolymerizáciu septínových filamentov po skončení cytokinézy. Na určenie fosforylovaných serínových a treonínových zvyškov sme izolovali septínový komplex, označený pomocou TAP (tandem affinity purification) kotvy, z kvasiniek zastavených v G1 fáze (pomocou alfa faktoru), v S fáze (pomocou hydroxymočoviny), v G2/M fáze (pomocou nocodazolu) a v neskorej M fáze (pomocou cdc15-2 ts mutantu pri restriktívnej teplote). Septíny boli oddelené pomocou denaturačnej polyakrylamidovej elektroforézy, jednotlivé proteíny poštičené trypsinom a fosforylované aminokyselinové zvyšky identifikované v peptidovej zmesi pomocou hmotnostnej spektrometrie. In vitro fosforylované, heterológne exprimované, septíny boli spracované podobne. Niektoré z fosforylovaných zvyškov boli nájdené len v septínoch izolovaných priamo z kvasiniek, niektoré boli nájdené len v septínoch fosforylovaných in vitro, niekoľko fosforylovaných zvyškov bolo identifikovaných v oboch prípadoch. Nešpecifická in vitro fosforylácia bola už skôr popísaná v literatúre a je pravdepodobne spôsobená neoptimálnou koncentráciou použitej proteín kinázy. Preto budeme ešte optimalizovať podmienky pre in vitro fosforyláciu. Veľmi zaujímavým zistením bolo, že niektoré zvyšky boli fosforylované in vivo počas celého bunkového cyklu, najmä v NC rozhraní Cdc11, ktorá predstavuje koncovú jednotku, cez ktorú sa realizuje tvorba filamentu. Predpokladáme, že fosforylácia určitých aminokyselinových zvyškov udržiava septínový komplex v cytoplazme v nepolymerizovanej forme a tvorba filamentov je indukovaná určitými proteínmi (napr. Gic1) na lipidovej membrane. Identifikované fosforylované zvyšky slúžili ďalej na vytvorenie fosfomimetických a nefosforylovateľných mutantov. Tieto mutácie boli zavedené v kvasinkových bunkách a septínový kortex pozorovaný pomocou fluorescenčnej mikroskopie. Obedve mutácie spôsobujú vážne defekty v cytokinéze. Heterológne exprimované mutantné proteíny budú tiež testované in vitro.

Farkašovský, M. (2020) Septin architecture and function in budding yeast. Biol Chem. 401: 903-919. doi: 10.1515/hsz-2019-0401.

7.) Evolúcia amylolytických enzýmov (*Evolution of amylolytic enzymes*)

Zodpovedný riešiteľ:	Štefan Janeček
Trvanie projektu:	1.1.2017 / 31.12.2020
Evidenčné číslo projektu:	2/0146/17
Organizácia je	áno
koordinátorom projektu:	
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 8691 €

Dosiahnuté výsledky:

S ohľadom na hlavnú alfa-amylázovú rodinu GH13, bola navrhnutá nová podrodina reprezentovaná alfa-amylázou z halofilného archeóna *Haloarcula hispanica*, ktorá už bola etablovaná aj v rámci databázy CAZy (<http://www.cazy.org/>) ako podrodina GH13_43 [1]. Tiež boli preskúvané sekvenčno-štruktúrne črty a evolučné vzťahy fungálnych alfa-amyláz z rodiny GH13, patriacich do troch podrodín GH13_1, GH13_5 a GH13_32 [2]. V ďalšom výskume bola po prvý raz spracovaná detailná bioinformatická analýza potenciálne novej alfa-amylázovej rodiny GH126 so zameraním sa na jej možnú evolučnú príbuznosť s rodinou GH76 [3], ako aj na prítomnosť N- a C-koncových extra domén u členov tejto rodiny [4]. V ďalšej alfa-amylázovej rodine GH57 boli identifikované homologické proteíny k enzýmom 4-alfa-glukanotransferáza a alfa-glukán vetviaci enzým [5]. V štúdiu venovanej alfa-glukozidázam z príbuznej rodiny GH31 bola popísaná evolúcia neutrálnej alfa-glukozidázy C (tzv. GANC proteín) z proteínu GANAB [6]. V rámci medzinárodnej spolupráce pokračoval výskum zameraný in silico charakterizáciu enzýmov z rodiny GH3, ktoré sú

prítomné v genóme baktérie *Rhodothermus marinus* [7].

[1] Janecek, S. & Zamocka B. (2020) A new GH13 subfamily represented by the alpha-amylase from the halophilic archaeon *Haloarcula hispanica*. *Extremophiles* 24: 207-217. <https://doi.org/10.1007/s00792-019-01147-y>

[2] Janickova, Z. & Janecek, S. (2020) Fungal alpha-amylases from three GH13 subfamilies: their sequence-structural features and evolutionary relationships. *International Journal of Biological Macromolecules* 159: 763-772. <https://doi.org/10.1016/j.ijbiomac.2020.05.069>

[3] Kerenyiova, L. & Janecek, S. (2020) A detailed in silico analysis of the amylolytic family GH126 and its possible relatedness to family GH76. *Carbohydrate Research* 494: 108082. <https://doi.org/10.1016/j.carres.2020.108082>

[4] Kerenyiova, L. & Janecek, S. (2020) Extension of the taxonomic coverage of the family GH126 outside Firmicutes and in silico characterization of its non-catalytic terminal domains. *3 Biotech* 10: 420. <https://doi.org/10.1007/s13205-020-02415-x>

[5] Janecek, S. & Martinovicova, M. (2020) New groups of protein homologues in the alpha-amylase family GH57 closely related to alpha-glucan branching enzymes and 4-alpha-glucanotransferases. *Genetica* 148: 77-86. <https://doi.org/10.1007/s10709-020-00089-0>

[6] Gabrisko, M. (2020) The in silico characterization of neutral alpha-glucosidase C (GANC) and its evolution from GANAB. *Gene* 726: 144192. <https://doi.org/10.1016/j.gene.2019.144192>

[7] Ara, K.Z.G., Manberger, A., Gabrisko, M., Linares-Pasten, J.A., Jasilionis, A., Fridjonsson, O.H., Hreggvidsson, G.O., Janecek, S. & Nordberg Karlsson, E. (2020) Characterization and diversity of the complete set of GH family 3 enzymes from *Rhodothermus marinus* DSM 4253. *Scientific Reports* 10: 1329. <https://doi.org/10.1038/s41598-020-58015-5>

8.) Úloha kalpainom vytváraných degrónov v regulácii transportérov neurotransmiterov

Zodpovedný riešiteľ:	František Jurský
Trvanie projektu:	1.1.2017 / 31.12.2020
Evidenčné číslo projektu:	2/0064/17
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 5893 €

Dosiahnuté výsledky:

Dosiahnuté výsledky:

N-terminálny región glycinového transportéra 2 (rGlyT2, SLC6A5) je štiepený proteázou kalpain in vitro, čo nastoľuje otázku akým spôsobom je toto štiepenie regulované in vivo. S použitím fosfomimetického a ortogonálneho fosfoserínového translačného prístupu sa nám podarilo dokázať, že fosforylácia serínu 157 v N-terminálnom konci GlyT2 blokuje štiepenie obidvoch M156/S157 a G164/T165 kalpainových štiepných miest. Blokovanie štiepenia viedlo ku upregulácii GlyT2 v neuroblastomových bunkách, čo naznačuje, že fosforyláciou regulované štiepenie GlyT2N kalpainom prispieva k regulácii turnoveru GlyT2.

Publikácie:

Baliova, M., Jursky, F.: Phosphorylation of Serine 157 Protects the Rat Glycine Transporter GlyT2 from Calpain Cleavage. *Journal of Molecular Neuroscience* (2020) 70:1216–1224 [IF2019 2.678].

9.) Signálne kaskády regulácie sigma faktorov RNA polymerázy pri odozve na stres, bunkovej a fyziologickej diferenciácii u pôdných baktérií rodu *Streptomyces* (*Signal cascades of regulation of sigma factors of RNA polymerase in response to stress, cell and physiological differentiation in soil bacteria of the genus Streptomyces*)

Zodpovedný riešiteľ:	Ján Kormanec
Trvanie projektu:	1.1.2020 / 31.12.2023
Evidenčné číslo projektu:	2/0026/20
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 15096 €

Dosiahnuté výsledky:

V svojom prirodzenom prostredí sú baktérie vystavené rôznym stresom, pričom odozva na tieto stresy je regulovaná najmä sigma faktormi RNA polymerázy, ktoré riadia expresiu génov potrebných na prekonanie týchto nepriaznivých podmienok. V jednobunkovom modeli Gram-pozitívnej baktérie *Bacillus subtilis* je to stresový sigma faktor SigB, ktorý je regulovaný fosforylačným mechanizmom prostredníctvom anti-sigma faktora RsbW, anti-anti-sigma faktora RsbV, a dvoch PP2C fosfatáz, RsbP a RsbU. SigB je v neprítomnosti stresu blokovaný v komplexe s RsbW. Po strese je táto väzba uvoľnená defosforylovaným anti-anti-sigma faktorom RsbV, prostredníctvom fosfatáz RsbP/RsbU. Po odoznení stresu, je RsbV opäť fosforylovaný kinázovou HATPase_c doménou RsbW a dochádza opäť k interakcii a inhibícii SigB s RsbW.

Gram-pozitívne myceliálne pôdne baktérie rodu *Streptomyces* podliehajú výnimočnému procesu morfolologickej diferenciácie sprevádzanej produkciou mnohých antibiotík. Na rozdiel od *B. subtilis*, modelový organizmus, *Streptomyces coelicolor* obsahuje až 9 homologov tohto stresového sigma faktora SigB z *B. subtilis*, 45 homologov anti-sigma faktora RsbW, 17 homologov anti-anti-sigma faktora RsbV a 44 homologov aktivačných PP2C fosfatáz RsbU/RsbP. Tieto homology (SigB, SigF, SigG, SigH, SigI, SigK, SigL, SigM, SigN) hrajú dominantnú úlohu najmä v kontrole morfolologickej diferenciácie a v odozve na osmotický stres.

Regulácia aktivácie sigma faktora SigH je sprostredkovaná anti-sigma faktorom UshX, ktorý blokuje SigH. Špecifická aktivácia SigH je pri osmotickom strese zabezpečená prostredníctvom odblokovania tohto komplexu SigH/UshX defosforylovaným pleiotropickým anti-anti-sigma faktorom BldG, ktorý hrá úlohu v morfolologickej diferenciácii a produkcii antibiotík. Okrem UshX, BldG špecificky interaguje s ďalším anti-sigma faktorom ApgA. Avšak, ani jeden z týchto anti-sigma faktorov nie je schopný špecificky fosforylovať BldG. Táto fosforylácia je zabezpečená ďalším anti-sigma faktorom RsfA, ktorý je špecifický pre ďalší sporulačný sigma faktor SigF. Takže, BldG aktivuje dva sigma faktory, SigH a SigF, ktoré hrajú úlohu v dvoch odlišných štádiách diferenciácie *S. coelicolor*. BldG obsahuje konzervovaný serín (Ser57), ktorý je in vivo fosforylovaný a táto fosforylácia je potrebná pre morfologickú a fyziologickú diferenciáciu. Avšak v mutante pre *rsfA* dochádzalo k fosforylácii BldG, čo naznačuje, že okrem RsfA, niektorý z ďalších homologov RsbW zabezpečujú túto fosforyláciu. Pomocou bakteriálneho dvojhybridného systému sa vyšetrovali interakciu BldG s 27 selektovanými anti-sigma faktormi homologickými k

RsbW, ktoré obsahovali kinázovú HATPase c doménu. BldG interagoval až s 15-timi RsbW homológmi (SCO1241, SCO1980, SCO3423, SCO3548/ApgA, SCO3930, SCO4412, SCO4677/RsfA, SCO5244/UshX, SCO5460, SCO6237, SCO6628, SCO6749, SCO7277, SCO7328, SCO7614). Pomocou dvoch komplementárnych prístupov (radioaktívnej fosforylácie s gama-32P-ATP a analýze interakcie BldG a mutantného Ser57Ala-BldG pomocou natívnej PAGE) sme po nadprodukcii a izolácii všetkých 15-tich proteínov dokázali špecifickú interakciu na konzervovanom Ser57 zvyšku BldG okrem RsfA u siedmich ďalších RsbW homológov (SCO1241, SCO1980, SCO3423, SCO4412, SCO6628, SCO7328, SCO7614). Pomocou bakteriálneho dvojhybridného systému sa vyšetrovali interakciu týchto siedmich RsbW homológov so všetkými deviatimi sigma faktormi (SigB, SigF, SigG, SigH, SigI, SigK, SigL, SigM, SigN). Zo všetkých analyzovaných homológov, iba SCO7328 interagoval s tromi sigma faktormi (SigG, SigK, SigM). Pripravili sme mutant s deletovaným génom SCO7328 v *S. coelicolor*, avšak nemal žiaden špecifický fenotyp v diferenciácii, raste a odozve na stres. Tieto výsledky naznačujú unikátny fosforylačný mechanizmus regulácie anti-anti-sigma faktora BldG pri aktivácii až piatich sigma faktorov, SigF, SigG, SigH, SigK, SigM, prostredníctvom viacerých anti-sigma faktorov rodiny RsbW. Toto naznačuje komplexnú reguláciu odozvy na stres a diferenciácie v *S. coelicolor* prostredníctvom tohto pleiotropického anti-anti-sigma faktora.

Publikácie

1, Sevcikova, B., Rezuchova, B., Mingyar, E., Homerova, D., Novakova, R., Feckova, L., Kormanec, J.: Pleiotropic anti-anti-sigma factor BldG is phosphorylated by several anti-sigma factor kinases in the process of activating multiple sigma factors in *Streptomyces coelicolor* A3(2). *Gene* 755 (2020) 144883.

10.) Tvorba proteínového obalu spór *Bacillus subtilis*– štúdium proteín-proteínových interakcií a samo-organizujúcich sa vlastností obalových proteínov. (*Formation of proteinaceous shell of Bacillus subtilis spores– studies of protein-protein interactions and self-assembly of coat proteins.*)

Zodpovedný riešiteľ:	Daniela Krajčíková
Trvanie projektu:	1.1.2018 / 31.1.2020
Evidenčné číslo projektu:	2/0133/18
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 5153 €

Dosiahnuté výsledky:

V poslednej etape projektu sme sa zamerali na štúdium detailov interakcie obalových proteínov *B. subtilis* a proteínov syntetizujúcich peptidoglykánovú ochrannú vrstvu, kortex. Zistili sme, že SpoVM a SpoIVA, ktoré sú kľúčovými morfogenetickými proteínmi nielen pre spórový obal, ale aj kortex, kontrolujú ich tvorbu prostredníctvom priamych proteínových interakcií. Pozorovali sme, že v mutantnom kmeni *B. subtilis* s deletovaným génom SpoVM sa SpoVD proteín, ktorý je esenciálny pre tvorbu kortexu, nelokalizuje na povrchu spóry, ale hybridný SpoVD-mCherry vytvára zhluky proteínu v cytoplazme materskej bunky. V prípade YncD, alanín racemázy, ktorá je súčasťou spórového obalu, sme za bežných podmienok nepozorovali závislosť tvorby kortexu na jej prítomnosti, zistili sme však, že tento proteín pravdepodobne bráni predčasnej germinácii spór. Spóry s deletovaným yncD génom boli schopné, na rozdiel od divokého typu, germinovať už v prítomnosti mikromolárnej koncentrácie L-alanínu.

Okrem toho sme pokračovali vo funkcionalizácii spórového obalu, pričom sme sa zamerali na proteín CotY. CotY, ktorý vytvára vysokoorganizované makromolekulové oligoméry, sme fúzovali s amylázou. Gén amylázy sme vložili do niekoľkých pozícií v rámci CotY molekuly tak, aby nebola narušená sekundárna štruktúra CotY proteínu. V ďalšom kroku budeme študovať, či schopnosť samo-organizácie CotY do pravidelných oligomérnych štruktúr zostáva zachovaná.

Bodík, K., Krajčíková, D., Hagara, J., Majková, E., Barák, I., Šiffalovič, P. Diffraction pattern of *Bacillus subtilis* CotY spore coat protein 2D crystals. *Colloids and Surfaces B: Biointerfaces* 197 (2021) 111425. doi: 10.1016/j.colsurfb.2020.111425.

11.) Faktory ovplyvňujúce dynamiku mitochondriálneho nukleoidu (*Factors that influence mitochondrial nucleoid dynamics*)

Zodpovedný riešiteľ:	Eva Kutejová
Trvanie projektu:	1.1.2018 / 31.12.2021
Evidenčné číslo projektu:	2/0075/18
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 11868 €

Dosiahnuté výsledky:

V spolupráci so skupinou prof. Ľubomíra Tomášku (Katedra genetiky UK v Bratislave) sme študovali vplyv sukcinylácie proteínu mitochondriálneho nukleoidu Abf2 v kvasinke *Saccharomyces cerevisiae* na jeho schopnosť väzby na mtDNA, ako aj rozpoznávanie a štiepenie Abf2 kvasinkovou ATP-závislou proteázou LON (ScLon). Výsledkom aktívnej spolupráce je publikácia:

Vozarikova, V., Kunova, N., Bauer, J.A., Frankovsky, J., Kotrasova, V., Prochazkova, K., Dzugasova, V., Kutejova, E., Pevala, V., Nosek, J., Tomaska, L. Mitochondrial HMG-Box Containing Proteins: From Biochemical Properties to the Roles in Human Diseases. (2020) *Biomolecules* 10: 1193

Okrem toho sme pripravili ďalšie fosfomimikujúce mutanty mitochondriálneho proteínu TFAM, zbaľovacieho proteínu ľudskej mtDNA, čím sme študovali vplyv fosforylácie na ich stabilitu, schopnosť väzby na DNA a rozpoznávanie ľudskou LON proteázou.

Ďalej sme pripravili vzorky ľudskej LON proteázy a jej fosfomimikujúcich mutantov pre štúdium vplyvu fosfomimikujúcich mutácií na jej štruktúru a väzbu na DNA. Obe vlastnosti sme sledovali pomocou elektrónovej mikroskopie (EM) v spolupráci s 1. lekárskou fakultou Karlovej Univerzity v Prahe (Dr. Sami Kereiche). V dôsledku problémov spôsobených pandémiou COVID-19 je potrebné tieto pokusy zopakovať, keďže pripravené a otestované gridy pre EM boli najskôr znehodnotené počas skladovania a následne aj novo pripravené a otestované gridy počas transportu na EM pracovisko CEITEC v Brne.

V spolupráci s Univerzitou v Bologni (Taliansko) sme podrobne študovali vplyv dvoch inhibítorov na vlastnosti ľudskej LON proteázy. Na naše prekvapenie po dodaní novej dávky inhibítorov, ktoré sa po dôkladnej predchádzajúcej analýze ukázali ako látky bez akýchkoľvek prímiesí, sme zistili, že nedochádza k inhibícii LON proteázy. V súčasnosti sa v spolupráci s Mikrobiologickým ústavom AV ČR v Prahe pokúšame zistiť, ktorá z kontaminujúcich látok v pôvodnej vzorke inhibítora môže byť zodpovedná za sledovanú inhibíciu LON. Aj túto prácu komplikuje pandémia koronavírusu, COVID-19.

12.) Ľudský mliečny bioaktívny glykoproteín laktoferín ako regulátor homeostázy (*Human milk bioactive glycoprotein lactoferrin as a regulator of homeostasis.*)

Zodpovedný riešiteľ: Vladimír Leksa
Zodpovedný riešiteľ v organizácii SAV: Vladimír Leksa
Trvanie projektu: 1.1.2017 / 31.12.2020
Evidenčné číslo projektu: 2/0020/17
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 8662 €

Dosiahnuté výsledky:

V tomto roku sme naplno rozbehli špecifickú líniu štúdia laktoferínu a jeho úlohy pri regulácii imunity pri vírusových nákazách, zvlášť pri infekcii SARS-CoV-2. Konkrétne výstupy plánujeme na budúci rok.

13.) Vplyv včelieho enzýmu glukózooxidáza na antibakteriálne vlastnosti medu a charakterizácia jeho produkcie a aktivity v podhltanových žľazách včely medonosnej (*Apis mellifera*) (*Effect of honeybee glucose oxidase on honey antibacterial properties and characterisation its production and activity in hypopharyngeal glands of honeybee (Apis mellifera)*)

Zodpovedný riešiteľ: Juraj Majtán
Trvanie projektu: 1.1.2018 / 31.12.2021
Evidenčné číslo projektu: 2/0004/18
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 8054 €

Dosiahnuté výsledky:

Antibakteriálna aktivita je jednou z najdôležitejších biologických vlastností medu a výrazne tým charakterizuje aj funkčnosť medu a jeho využitie v humánnej a veterinárnej medicíne. Zvyšovanie antibakteriálnej, prípadne anti-biofilmovej aktivity medu je jednou z atraktívnych oblastí vedeckého výskumu. V rámci riešenia projektu, sme po fortifikácii rôznych druhov medov kyselinou askorbovou (vitamín C) charakterizovali antibakteriálny a antibiofilmový potenciál upravených medov. Zistili sme, že vitamín C v sub-inhibičných koncentráciách signifikantne zvyšuje antibakteriálny potenciál medu predovšetkým voči *Pseudomonas aeruginosa*. Je pravdepodobné, že vitamín C v prítomnosti zložiek medu spúšťa v bakteriálnych bunkách produkciu reaktívnych foriem kyslíka a tým pôsobí prooxidačne. Medy obohatené o vitamín C (100 mg/g) výrazne eliminovali viabilitu v biofilme viazaných bakteriálnych patogénov. Vitamín C, ako lacná a medu vlastná molekula, sa stáva vhodným kandidátom na potencovanie antibakteriálneho účinku medu a jeho širšie využitie v medicíne.

Výstupy:

BUČEKOVÁ, Marcela - BUGÁROVÁ, Veronika - GODOČÍKOVÁ, Jana - MAJTÁN, Juraj.

Demanding new honey qualitative standard based on antibacterial activity. In Foods, 2020, vol. 9, no. 1263.

GODOČÍKOVÁ, Jana - BUGÁROVÁ, Veronika - KAST, C. - MAJTÁN, Viktor - MAJTÁN, Juraj. Antibacterial potential of Swiss honeys and characterisation of their bee-derived bioactive compounds. In Journal of the Science of Food and Agriculture, 2020, vol. 100, p. 335-342.

MAJTÁN, Juraj - SOJKA, M. - PÁLENÍKOVÁ, Helena - BUČEKOVÁ, Marcela - MAJTAN, V. Vitamin C enhances the antibacterial activity of honey against planktonic and biofilm-embedded bacteria. In Molecules, 2020, vol. 25, no. 992.

14.) Inovatívne stratégie dezinfekcie: vplyv esenciálnych olejov na mikroflóru a materiály objektov kultúrneho dedičstva (*Innovative disinfection strategies: the essential oils effect on microflora and materials of cultural heritage objects*)

Zodpovedný riešiteľ: Domenico Pangallo
Trvanie projektu: 1.1.2017 / 31.12.2020
Evidenčné číslo projektu: 2/0061/17
Organizácia je áno
koordinátorom projektu:
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských 0
inštitúcií:
Čerpané financie: VEGA SAV: 9937 €

Dosiahnuté výsledky:

V tomto roku sme optimalizovali analýzu mikrobiálnych komunit vo vzorkách kultúrneho dedičstva pomocou metódy masívneho paralelného sekvenovania tretej generácie (MinION - Oxford Nanopore Technologies). Študovali sme génovú expresiu vláknitej huby *Penicillium rubens* pôsobením výparov ôsmich éterických olejov. Boli vyhodnotené antifungálne vlastnosti derivátu tymol (trimetylsilyléter tymolu). Tento derivát sa môže využiť na inhibíciu vláknitých húb vo vnútornom prostredí.

Šoltys, K., Planý, M., Biocca, P., Vianello, V., Bučková, M., Puškárová, A., Sclocchi, M.C., Colaizzi, P., Bicchieri, M., Pangallo, D. and Pinzari, F., 2020. Lead soaps formation and biodiversity in a XVIII Century wax seal coloured with minium. *Environmental Microbiology*, 22(4), pp.1517-1534.

Kisová, Z., Šoltýsová, A., Bučková, M., Beke, G., Puškárová, A. and Pangallo, D., 2020. Studying the Gene Expression of *Penicillium rubens* Under the Effect of Eight Essential Oils. *Antibiotics*, 9(6), p.343.

Kubinec, R., Blaško, J., Galbavá, P., Jurdáková, H., Sadecká, J., Pangallo, D., Bučková, M. and Puškárová, A., 2020. The antifungal activity of vapour phase of odourless thymol derivate. *PeerJ*, 8, p.e9601.

15.) Izolácia a pokročilá charakterizácia nových probiotických mikroorganizmov s potenciálom pre uplatnenie v biomedicíne a biotechnológiách (*Isolation and advanced characterization of new probiotic microorganisms with potential for use in biomedicine and*

biotechnology)

Zodpovedný riešiteľ: Vladimír Pevala
Trvanie projektu: 1.1.2018 / 31.12.2021
Evidenčné číslo projektu: 1/0519/18
Organizácia je koordinátorom projektu: nie
Koordinátor: Lekárska fakulta UPJŠ, Košice
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 1110 €

Dosiahnuté výsledky:

Počas roka 2020 bola dokončená genomická analýza probiotického kmeňa *Lactobacillus plantarum* LS/07 - skladanie a anotácia plazmidov a tieto dáta boli uložené do databázy genómov portálu NCBI GenBank. Uskutočnili sa optimalizované proteomické analýzy študovaného kmeňa, pričom sa v jeho sekretóme identifikovali proteíny s využitím online dostupných a našich unikátnych genomických dát. Okrem uvedeného pokračoval odber biologického materiálu pre izoláciu laktobacilov a rozšírila sa séria nových izolátov laktobacilov.

16.) Hybridné, lignolytické a verzatilné hémové peroxidázy z askomycétnych a bazidiomycétnych húb (*Hybrid, lignolytic and versatile heme peroxidases from Ascomycetes and Basidiomycetes*)

Zodpovedný riešiteľ: Marcel Zámocký
Trvanie projektu: 1.1.2018 / 31.12.2021
Evidenčné číslo projektu: 2/0061/18
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 2 - Rakúsko: 1, Holandsko: 1
Čerpané financie: VEGA SAV: 11245 €

Dosiahnuté výsledky:

Analyzovali sme biotechnologicky zaujímavé sekvencie enzýmových antioxidantov so zameraním na termofilné huby pričom výsledky boli publikované v prestížnom švajčiarskom časopise: Chovanová K., Bohmer M., Poljovka A., Budiš J., Harichová J., Szemeš T., Zámocký M. (2020) Parallel Molecular Evolution of Catalases and Superoxide Dismutases - Focus on Thermophilic Fungal Genomes. *Antioxidants* 9:1047. Ďalej sme sa zamerali na vysoko špecifické unikátne peroxidázy, ktoré ako jediné známe v celej superrodine obsahujú extra cukry viažucu doménu s neznámou funkciou. Výsledky boli publikované v: Zámocký M., Kamlárová A., Maresch D., Chovanová K., Harichová J., Furtmueller P.G. (2020) Hybrid Heme Peroxidases from Rice Blast Fungus *Magnaporthe oryzae* Involved in Defence against Oxidative Stress. *Antioxidants* 9: 655. Získané výsledky bude možné využiť pri plánovaní biotechnologického využitia.

Programy: APVV

17.) Asymetrické bunkové delenie počas tvorby bakteriálnej endospóry (*Asymmetric cell division during bacterial endospore formation*)

Zodpovedný riešiteľ: Imrich Barák

Trvanie projektu: 1.7.2019 / 30.6.2023
Evidenčné číslo projektu: APVV-18-0104
Organizácia je áno
koordinátorom projektu:
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských 0
inštitúcií:
Čerpané financie: APVV: 41465 €

Dosiahnuté výsledky:

Projekt v tomto roku pomohol pochopiť rozhodujúcu úlohu proteínu SpoIIE v sporulujúcej bunke *Bacillus subtilis*. Použili sme optickú proteomiku s jednou molekulou proteínu a výpočtovú analýzu obrazov živých buniek pomocou milisekundového superrozlíšenia, sledovania a kvantifikácie fluorescenčne značeného SpoIIE. Náš objav ukazuje, že informácie zachytené v kvartérnej organizácii SpoIIE umožňuje jednému proteínu vykonávať viac funkcií, čo rozširuje dôležitú paradigmu pre regulačné proteíny v bunkách. Naše výsledky tiež ukázali, že biosyntéza peptidoglykánu je spojená s mechanizmom bunkového delenia počas tvorby sporulačného septa. Zistili sme priamu interakciu medzi SpoIIE a GpsB a zistili sme, že oba proteíny sa lokalizujú v počiatočných štádiách tvorby asymetrickej septa.

Publikácie:

1. Wollman A., Muchová K., Z. Chromíková, A.J. Wilkinson, I. Barák, M. Leake (2020) Single-molecule optical microscopy of protein dynamics and computational analysis of images to determine cell structure development in differentiating *Bacillus subtilis*. ?Computational and Structural Biotechnology Journal 18, 1474-1486 (IF = 6.02) (Q1 JCR2019; Q1 SJR2019)
2. K. Muchová, Z. Chromiková and I. Barák (2020) Linking peptidoglycan synthesis protein complex with asymmetric cell division during *Bacillus subtilis* sporulation. Int.J. Mol. Science 21, 4513; doi:10.3390/ijms21124513 (IF = 4.56) (Q1 JCR2019; Q1 SJR2019)
3. J. Pospíšil, D. Vítovská, O. Kofroňová, K. Muchová, H. Šanderová, M. Hubálek, M. Šíková, O. Benada, I. Barák, and L. Krásný (2020) Bacterial nanotubes are a manifestation of cell death. Nature Communications 11: 4963. doi: 10.1038 / s41467-020-18800-2 (IF = 12.12) (Q1 JCR2019; Q1 SJR2019)
4. Gacek-Matthews A., Chromikova Z., Sulyok M., Lücking G., Barak I., Ehling-Schulz M. (2020) Beyond toxin transport: Novel role of ABC transporter for enzymatic machinery of cereulide NRPS assembly line. mBio 11: e01577-20 (IF = 6.78) (Q1 JCR2019; Q1 SJR2019)
5. E. Sobolev, S. Zolotarev, K. Giewekemeyer, J. Bielecki, K. Okamoto, H.K.N. Reddy, J. Andreasson, K. Ayyer, Imrich Barak et al. (2020) Megahertz single-particle imaging at the European XFEL. Communications Physics – Nature 3: 97 (DOI: 10.1038/s42005-020-0362-y) (IF = 4.68) (Q1 JCR2019; Q1 SJR2019)

18.) Farebné škvrny na historických papieroch: biologická a chemická charakterizácia spojená s ich odstraňovaním (*Colored stains on historical papers: biological and chemical characterization coupled with removal solutions*)

Zodpovedný riešiteľ: Mária Bučková
Trvanie projektu: 1.7.2020 / 30.6.2023

Evidenčné číslo projektu: APVV-19-0059
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 2 - Slovensko: 2
Čerpané financie: APVV: 10000 €

Dosiahnuté výsledky:

Náš výskum bol v tomto polroku zameraný na výber mikroorganizmov, najmä vláknitých húb, z rôznych kultúrnych pamiatok. Tieto mikroorganizmy boli schopné produkovať rôzne extracelulárne enzýmy a niekoľko druhov húb dokázalo na povrch papiera uvoľniť farbu.

Kisová, Z., Planý, M., Pavlovič, J., Bučková, M., Puškárová, A., Kraková, L., Kapustová, M., Pangallo, D. and Šoltys, K., 2020. Biodeteriogens characterization and molecular analyses of diverse funeral accessories from XVII Century. Applied Sciences, 10(16), p.5451.

19.) Príprava bakteriofágov na terapiu vaginálnych a močových infekcií (*Bacteriophage preparations for therapy of vaginal and urinary infection*)

Zodpovedný riešiteľ: Gabriela Bukovská
Trvanie projektu: 1.7.2017 / 30.6.2021
Evidenčné číslo projektu: APVV-16-0168
Organizácia je koordinátorom projektu: nie
Koordinátor: Univerzita Komenského v Bratislave
Počet spoluriešiteľských inštitúcií: 3 - Slovensko: 3
Čerpané financie: APVV: 17500 €

Dosiahnuté výsledky:

Projekt APVV je na našom pracovisku zameraný na štúdium lytických proteínov bakteriofágov degradujúcich peptidoglykán bunkových stien baktérií. Pokračovali sme v charakterizácii lytickej domény génového produktu gp15 bakteriofága BFK20 a venovali sme sa ďalšej charakterizácii endolyzínov EN534-C, EN533-N a EN572-25 z profágov kmeňov *Streptococcus agalactiae*. Na štruktúrnom proteíne gp15 bola bioinformatickou analýzou predikovaná prítomnosť lytickej transglykozylázovej (SLT) domény. Navrhli sme sériu primérov pre prípravu konštruktov pre expresiu odpovedajúcich proteínov s SLT doménou o veľkosti 12 – 14 kDa. Doterajšie výsledky zahŕňajú PCR amplifikáciu fragmentov všetkých 6 úsekov tejto domény na overenie navrhnutých primérov. Následne sme pripravili dva konštrukty vo vektore pET28, z ktorých sme exprimovali cieľové proteíny v dostatočnom množstve na ich izoláciu a použitie pri počiatočnom štúdiu ich lytických vlastností. Porovnaním vzoriek z exprese týchto dvoch konštruktov sme pozorovali mierne odlišný proteínový profil, pravdepodobne kvôli predpokladanému post-translačnému štiepeniu proteínu.

Pokračovali sme v charakterizácii endolyzínu EN534-C pôvodom z temperovaného bakteriofága (profág 3) z genómu kmeňa *Streptococcus agalactiae* KMB-534 (GBS). Pomocou afinitnej chromatografie sa rekombinantný endolyzín pri optimalizovaných podmienkach (izolácia pri RT a elučný tlmivý roztok pH 8,0) izoluje v rozpustnej forme, v dostatočnom množstve (3 mg/μL) a aktivite. Na základe metód stanovenia lytickej aktivity EN534-C na spektre substrátov sa potvrdilo špecifické pôsobenie enzýmu voči kmeňom streptokokov, najmä voči patogénnej baktérii *S.agalactiae* GBS. Rekombinantný proteín EN534-C má pH optimum od 5,0 do 8,0. Pomocou drop test analýzy sme dokázali pozitívny vplyv dvojmocných iónov CaCl₂ na lytickú aktivitu

endolyzínu. Zvýšenie lytickej aktivity endolyzínu EN534-C sme dosiahli správnou synergiou koncentrácií NaCl a CaCl₂. Výsledky sme potvrdili pomocou optickej metódy. Pripravili sme optimálne zloženie tlmivého roztoku pre stanovenie lytickej aktivity endolyzínu EN534-C v reakčnej zmesi. Lytickú aktivitu endolyzínu EN534-C sme potvrdili aj pomocou mikroskopie, kde dochádza k rozrušeniu/lýze bakteriálnej bunky testovaného referenčného bakteriálneho kmeňa *S. agalactiae* CCM 6187 a jeho následnej smrti.

Ďalším charakterizovaným endolyzínom je EN533 z profága kmeňa *S. agalactiae* KMB 533. Endolyzín obsahuje domény FlgJ, MurNAc-LAA, LysM; a má veľkosť 53,98KDa. Z konštruktu pET28a-KMB-533-E/H sme exprimovali rekombinantný endolyzín EN533-N. Proteín sme izolovali pomocou IMAC a o verili sme jeho lytickú aktivitu na bunkových substrátoch zbierkového kmeňa *S. agalactiae* CCM 6187 pomocou difúznej a optickej metódy pri rôznych podmienkach. V prípade difúznej metódy sme sledovali číru zónu už po 3 h v 10 mmol.l-1 CaCl₂. Optickou metódou sme zaznamenali najlepší účinok pri koncentrácii proteínu 2,8 uM endolyzín v prostredí s 20 mmol.l-1 CaCl₂. Opakovanou expresiou sme získali už len proteín o veľkosti približne 30KDa. Sekvenovaním sme zistili prítomnosť bodovej mutácie, ktorá viedla k vzniku STOP kodónu v doméne pre MurNAc-LAA, čo zodpovedalo aj veľkosti exprimovaného proteínu. Zaoberali sme sa aj expresiou a stanovením lytickej aktivity rekombinantného endolyzínu EN572_25, obsahujúci doménu N-acetylmuramoyl-L-alanine amidase; o veľkosti 51,37 kDa. Lytickú aktivitu izolovaného rekombinantného proteínu sme stanovili optickou metódou a zistili sme približne 2,5 násobnú vyššiu lytickú aktivitu endolyzínu KMB-572_25 na izolátoch *S. agalactiae* KMB 548 a KMB 572 v porovnaní so zbierkovým kmeňom *S. agalactiae* CCM 6187.

Výstupy:

- 1.Lichvarikova, A., Szemes, T., Slobodnikova, L., Bukovska, G., Turna, J., Drahovska, H. Characterization of Clinical and Carrier Streptococcus agalactiae and Prophage Contribution to the Strain Variability. *Viruses-Basel* 12 (2020): 1-15 [IF2019 3.816]
- 2.Nová patentová prihláška č. PP 50075-2020 v Slovenskej republike, Prihlasovatelia: Ústav molekulárnej biológie SAV, Univerzita Komenského v Bratislave, Názov: "Antimikrobiálny proteín, antimikrobiálny rekombinantný proteín s lytickými vlastnosťami, expresný vektor, spôsob ich prípravy a použitie".

20.) Úloha medziorganelových interakcií v lipidovej homeostáze (*The role of organelle interactions in lipid homeostasis*)

Zodpovedný riešiteľ: Ivan Hapala
Zodpovedný riešiteľ v organizácii SAV: Vladimír Pevala
Trvanie projektu: 1.7.2016 / 30.6.2020
Evidenčné číslo projektu: APVV-15-0654
Organizácia je koordinátorom projektu: nie
Koordinátor: Centrum biovied SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 5000 €

Dosiahnuté výsledky:

V rámci analýzy štruktúry Pdr17p sme pokračovali v kryštalizácii novej verzie metylovaného fúzneho proteínu Pdr17 s MBP proteínom. Kryštalizáciu tohto proteínu sme optimalizovali s viacerými aditívami a podarilo sa nám po dlhšom čase kryštalizácie pripraviť väčšie kryštály, ale u

týchto nevieme či ide o proteín alebo soľ, čo bude potrebné otestovať na difraktometri vo Viedni. Z dôvodu epidémie SARS-CoV-2 vírusu nie je možné cestovať do Viedne, čo ovplyvnilo/znemožnilo aj samotnú kryštalizáciu proteínu a meranie difrakcií na difraktometri/synchrotróne. Kryštalizáciu môžeme teraz obnoviť potom ako nám boli v laboratóriu nainštalované nové kryštalizačné roboty a nanoDSF prístroj pre meranie proteínovej stability pre testovanie vplyvu rôznych aditív na stabilitu proteínu, čo by mohlo uľahčiť jeho kryštalizáciu. V kryštalizácii proteínu Pdr17 budeme pokračovať už na našom pracovisku bez potreby cestovať do Viedne, aj po skočení riešenia projektu.

21.) Modifikované polyméry z obnoviteľných zdrojov a ich degradácia (*Modified polymers from renewable resources and their degradation*)

Zodpovedný riešiteľ: Štefan Chmela
Zodpovedný riešiteľ v organizácii SAV: Domenico Pangallo
Trvanie projektu: 1.7.2016 / 1.4.2020
Evidenčné číslo projektu: APVV-15-0528
Organizácia je koordinátorom projektu: nie
Koordinátor: Ústav polymérov SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 7502 €

Dosiahnuté výsledky:

V tejto etape boli testované biodegradačné vlastnosti kompozitov PLA/PHB/ATBC/keratínu s obsahom keratínu v rozmedzí od 1 do 10% pomocou environmentálnych mikrobiálnych izolátov. Biodegradačné testy boli realizované pomocou izolátov mikroskopických vláknitých húb (*Hormodendrum pyri*, *Cladosporium herbarum*) a bakteriálnych izolátov (*Bacillus flexus* a *Pseudomonas aeruginosa*). V prípade testovania bakteriálnych ako aj fungálnych izolátov v tekutom minimálnom médiu s obsahom kompozitných zmesí nebol pozorovaný žiadny nárast, čím by sa dal vysvetliť aj slabý degradačný potenciál vybraných izolátov.

22.) Využitie imunologických mechanizmov v rôznych subtypoch B-bunkových lymfómov (*Harnessing the immunological mechanisms in various subtypes of B cell lymphoma*)

Zodpovedný riešiteľ: Dana Choluiová
Zodpovedný riešiteľ v organizácii SAV: Ľuboš Kľučár
Trvanie projektu: 1.7.2020 / 30.6.2024
Evidenčné číslo projektu: APVV-19-0212
Organizácia je koordinátorom projektu: nie
Koordinátor: Biomedicínske centrum SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 4152 €

Dosiahnuté výsledky:

Malígne B-bunkové lymfómy sú agresívne nádorové ochorenia krvi, ktoré vznikajú z B-lymfocytov v rôznom štádiu zrenia. Vplyvom na okolité bunky kostnej drene sú schopné potlačiť imunitnú reakciu pacienta. Vzorky pochádzali od pacientov s rôznymi B-bunkovými lymfómami v rôznych

štádiách, ktoré boli analyzované pomocou hmotnostnej cytometrie (CyTOF). CyTOF dáta sme spracovali pomocou SPADE algoritmu, ktorý umožňuje odlíšiť fenotypové rozdiely medzi jednotlivými štádiami a typmi B-bunkových lymfómov. Tieto rozdiely pomáhajú pochopiť patogenézu B-bunkových malígnit, čo povedie k návrhu nových terapeutických stratégií.

23.) Zhodnotenie imunitných kontrolných bodov u B bunkových malígnit (*Assessing immune-checkpoints in B cell malignancies*)

Zodpovedný riešiteľ: Jana Jakubíková
Zodpovedný riešiteľ v organizácii SAV: Ľuboš Kľučár
Trvanie projektu: 1.7.2017 / 30.6.2021
Evidenčné číslo projektu: APVV-16-0484
Organizácia je koordinátorom projektu: nie
Koordinátor: Biomedicínske centrum SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 4831 €

Dosiahnuté výsledky:

Cieľom imunoterapie je vyvolať imunitnú odpoveď v tele pacienta namiesto priameho zásahu nádorových buniek. Avšak nádorové bunky dokážu potlačiť reakciu imunitného systému aktiváciou špecifických inhibičných signálnych dráh, ktoré sú známe ako imunitné kontrolné body. Mnohopočetný myelóm (MM) a Waldenströмова makroglobulinémia (WM) sú dve veľmi podobné B-bunkové malígnitidy. Mikroprostredie nádoru tvoria bunky kostnej drene a imunitného systému, ktoré interagujú s nádorovými bunkami. Vzorky pacientov s malígnymi štádiami MM a WM sme analyzovali pomocou SPADE algoritmu. Na základe výsledkov SPADE analýz sme identifikovali zmeny počtu imunitných buniek a buniek nádorového mikroprostredia MM a WM. Pomocou ďalších metadát, ako napr. predchádzajúca liečba nádorovými terapeutikami a ich reakcie, sme rozdelili vzorky pacientov do rôznych skupín, ktoré sme porovnávali so skupinou zdravých ľudí. Výsledky pomôžu lepšie porozumieť tvorbe B-bunkových malígnit, čo poskytuje základ pre nové stratégie liečebných postupov založených na imunoterapii.

24.) Identifikácia a validácia signálnych dráh asociovaných s cirkulujúcimi nádorovými bunkami pri karcinóme prsníka (*Identification and validation of signalling pathways associated with circulating tumor cells in breast cancer.*)

Zodpovedný riešiteľ: Ľuboš Kľučár
Trvanie projektu: 1.7.2017 / 30.6.2021
Evidenčné číslo projektu: APVV-16-0010
Organizácia je koordinátorom projektu: nie
Koordinátor: Univerzita Komenského v Bratislave Lekárska fakulta
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 3990 €

Dosiahnuté výsledky:

Vykonalí sme analýzu dát z RNA-seq vzoriek 23 pacientov s rakovinou prsníka. Za účelom identifikácie markerov typických pre fenotypovú skupinu pacientov, ktorým bolo možné v krvi detegovať CTC (cirkulujúcimi nádorovými bunkami) mezenchymálneho charakteru, boli

identifikované odlišne exprimované gény, podobne ako predošlý rok na dátach z DNA mikročipov. Výsledkom bolo (na základe adjusted p-value <0,1) 14 signifikantných výsledkov, resp. potenciálne deregulovaných génov. Medzi najlepšie hity patria napríklad gény z rodiny keratínov. Výsledky boli porovnávané s analýzou DNA mikročipov na rovnakých vzorkách a boli porovnávané výsledky získané pomocou rozdielnych štatistických metód, pričom vo výsledkoch boli pozorované rozdiely. Okrem týchto analýz sme sa venovali analýze odlišností na úrovni sekvencií RNA, metagenomickej analýze RNA sekvenovania a analýze alternatívneho splicingu, pričom výsledky z týchto analýz budú finalizované v nasledujúcom roku.

25.) Príprava nových antibiotík a protinádorových látok manipuláciami génov sekundárnych metabolitov a metódami syntetickej biológie (*Preparation of new antibiotics and antitumor agents by manipulations of secondary metabolite genes and synthetic biology methods*)

Zodpovedný riešiteľ: Ján Kormanec
Trvanie projektu: 1.7.2020 / 30.6.2024
Evidenčné číslo projektu: APVV-19-0009
Organizácia je áno
koordinátorom projektu:
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských 0
inštitúcií:
Čerpané financie: APVV: 15267 €

Dosiahnuté výsledky:

Za účelom aktivácie silentných biosyntetických génových klastrov (BGC) v našom modelovom kmeni *S. lavendulae* subsp. *lavendulae* CCM 3239, ktorého genóm a transkriptóm sme charakterizovali v predchádzajúcom období, sme pripravili indukčnú antibiotickú rezistenčnú kazetu so silným promótorom *kasOp* a s reverzne orientovaným génom rezistencia na apramycín, za tvorby plazmidu *pKasOpAmRb*. Za účelom verifikácie tejto kazety sme ju použili pri aktivácii známeho silentného génového klastra pre antibiotikum aktinorhodín v *Streptomyces lividans* TK24 po jej integrácii pred gén *SLIV_12960* (*actII-4*), kódujúci pozitívny regulátor rodiny SARP, ktorý by mal aktivovať všetky biosyntetické gény pre aktinorhodín. Pomocou PCR sme amplifikovali oblasti pred génom *SLIV_12960* (*actII-4*) a za týmto génom a klonovali ich v plazmide *pKasOpAmRb*, za tvorby plazmidu *pKasOp-actUD*. Následne sme klonovali celú oblasť v integračnom vektore *pAMR24A*, ktorý umožňuje pozitívnu selekciu dvojitého crossoveru po homologickej rekombinácii v genóme *S. lividans* TK24, za tvorby vektora *pAMR24A-DactII*. Po konjugácii tohto vektora do *S. lividans* TK24 dôjde po správnej integrácii k tvorbe kmeňa *S. lividans*, *kasOp::actII-4*, kde by malo dôjsť k aktivácii regulačného génu *SLIV_12960* (*actII-4*) pod kontrolou silného promótoru *kasOp*. Následne jeho vysoká hladina by mala aktivovať všetky biosyntetické gény tohto silentného aktinorhodínového klastra.

Pomocou programu ANTISMASH sme uskutočnili detailnú bioinformatickú analýzu silentných biosyntetických génových klastrov (BGC) v genóme *S. lavendulae* subsp. *lavendulae* CCM 3239, ktorý sme v predchádzajúcom období sekvenovali (GenBank pod Acc. No. CP024985). V genóme sme identifikovali 27 BGCs pre rôzne reprezentatívne typy sekundárnych metabolitov. Dva klastre (BGC2, 9) kodovali biosyntetické gény pre polyketid syntetázu prvého typu (PKSI), sedem klastrov (BGC1, 10, 11, 14, 15, 20, 27) kodovali biosyntetické gény pre neribozomálnu peptidovú syntetázu (NRPS), tri pre siderofory (BGC4, 16, 19), štyri pre melaníny (BGC5, 6, 23, 25), štyri pre terpény (BGC7, 8, 12, 22), jeden pre aminoglykozidové antibiotikum streptotricín (BGC26), jeden pre butyrolaktóny (BGC18), dva pre lantipeptidy (BGC3, 21), jeden pre bakteriocíny (BGC13), jeden pre CDPS (BGC17) a jeden (BGC24) pre polyketid syntetázu druhého typu (PKSII), kódujúci spórový polyketidový pigment.

Detailnou bioinformatickou analýzou sme identifikovali v každom BGC potenciálne gény pre

dráhovo-špecifické pozitívne a negatívne regulátory viacerých rodín (SARP, TetR, MarR, DegU, MprA, LAL, LiaR, CynR, AfsR, DpiA, MhqR, MalT, VraR, RhaR, LuxR, CsoR, McbR, KdpE, MrdR, MtrR, KstR2, SlyA, NreC, pUUR, YtrA, BetI, ArsR, ComR). Analýzou RNAseq transkriptómu s celkovou RNA a fragmentovanou a upravenou RNA pre identifikáciu príslušných promótorov sme charakterizovali expresiu a operónové usporiadanie všetkých 27 BGC. Väčšina identifikovaných BGC bola veľmi slabo transkribovaná.

Pomocou metódy REDIRECT sme deletovali viaceré potenciálne biosyntetické gény auricinového klastra v genóme *S. lavendulae* subsp. *lavendulae* CCM 3239. Uvedenou metódou REDIRECT sme v príslušných kozmidoch deletovali viaceré biosyntetické gény a nahradili ich génom pre rezistenciu na apramycín. Verifikované mutantné kozmidy sme následne konjugovali do *S. lavendulae* subsp. *lavendulae* CCM 3239 so selekciou na apramycín. Dvojité crossovery sme u všetkých mutantov následne verifikovali Southern blot hybridizáciou a pripravili spórové konzervy z verifikovaných mutantov na fenotypickú charakterizáciu.

Pomocou PCR sme amplifikovali viaceré kľúčové biosyntetické gény pre aromatické polyketidové antibiotiká landomycín, auricin, mithramycín a aktinorhodín a klonovali ich pod kontrolou silného RBS miesta za účelom vytvorenia operónu pod kontrolou silného kasOp promótoru. Obdobne sme amplifikovali tieto gény pre nový systém pozostávajúci z monocistronických jednotiek (kasOp-gén-fdT terminátor), umožňujúcom ich postupné pripájanie. Pripravili sme si plazmidové vektory umožňujúce takéto postupne pripájanie s fdT terminátorom. Pripravili sme si aj ďalšie štyri takého vektory so silnými obojstrannými terminátormi z genómu *S. lavendulae* subsp. *lavendulae* CCM 3239, ktoré sme vyseletovali na základe transkriptómu RNAseq analýzy a následne amplifikovali pomocou PCR a klonovali v príslušných plazmidoch. Pripravili sme tri nové integračné vektory, umožňujúce integráciu takýchto kaziet a operónov do troch odlišných fágových attB integračných miest (PhiC31, PhiBT1, VWB) v chromozóme heterologického kmeňa *S. coelicolor* M1146.

Publikácie

1, Kormanec J, Novakova R, Csolléiová D, Fecková L, Rezuchová B, Sevciková B, Homerová D: The antitumor antibiotic mithramycin: new advanced approaches in modification and production. *Appl. Microbiol. Biotechnol.* 104 (2020) 7701-7721.

2, Kormanec J: Interesting structural properties of auricin and its biosynthetic gene cluster. *Atlas of Science* (2020) November 4. <https://atlasofscience.org/interesting-structural-properties-of-auricin-and-its-biosynthetic-gene-cluster/>

26.) Posttranslačné modifikácie v mitochondriách a ich úloha v patologických procesoch

(Post-translation modifications in mitochondria and their role in pathological processes)

Zodpovedný riešiteľ:	Eva Kutejová
Trvanie projektu:	1.7.2016 / 30.6.2020
Evidenčné číslo projektu:	APVV-15-0375
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	APVV: 20000 €

Dosiahnuté výsledky:

Venovali sme sa príprave ďalších fosfomimikujúcich mutantov ľudského proteínu TFAM, zbaľovacieho proteínu ľudskej mtDNA, a tým sme študovali vplyv fosforylácie na ich stabilitu,

schopnosť väzby na DNA a rozpoznávanie LON protázou.

Ďalej sme pomocou proteomickej analýzy v spolupráci s Dr. Petrom Baráthom (Chemický ústav SAV) študovali zastúpenie mitochondriálnych proteínov štandardného kmeňa kvasinky *S. cerevisiae*, ako aj jej mutantných kmeňov (delečný kmeň v géne kódujúcom mitochondriálnu LON proteázu a mutantné kmene v proteolytickom a ATP-ázovom mieste LON proteázy). Zamerali sme sa na charakterizáciu úlohy LON proteázy pre stabilitu a funkciu zložiek dýchacieho reťazca mitochondrií.

V spolupráci so skupinou prof. Ľubomíra Tomášku (Katedra genetiky UK v Bratislave) sme sa podieľali na príprave a publikovaní prehľadného článku:

Vozarikova, V., Kunova, N., Bauer, J., Frankovsky, J., Kotrasova, V., Prochazkova, K., Dzugasova, V., Kutejova, E., Pevala, V., Nosek, J., Tomaska, L., Mitochondrial HMG-Box Containing Proteins: From Biochemical Properties to the Roles in Human Diseases. (2020) *Biomolecules* 10: 1193.

27.) Vzájomná inerakcia proteáz, šaperónov a kináz v mitochondriách pri strese spôsobenom patologickými stavmi. (*Interaction between proteases, chaperones and kinases in stress condition cause by pathological conditions.*)

Zodpovedný riešiteľ: Eva Kutejová
Trvanie projektu: 1.7.2020 / 30.6.2024
Evidenčné číslo projektu: APVV-19-0298
Organizácia je áno
koordinátorom projektu:
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 20000 €

Dosiahnuté výsledky:

Klonovali, exprimovali a izolovali sme vybrané ľudské mitochondriálne proteín kinázy a študovali sme ich schopnosť fosforylovať zbaľovací proteín ľudského mitochondriálneho nukleoidu TFAM.

V spolupráci so skupinou prof. Ľubomíra Tomášku (Katedra genetiky UK v Bratislave) sme sa podieľali na príprave a publikovaní prehľadného článku:

Vozarikova, V., Kunova, N., Bauer, J., Frankovsky, J., Kotrasova, V., Prochazkova, K., Dzugasova, V., Kutejova, E., Pevala, V., Nosek, J., Tomaska, L., Mitochondrial HMG-Box Containing Proteins: From Biochemical Properties to the Roles in Human Diseases. (2020) *Biomolecules* 10: 1193.

Okrem toho bol na vyžiadanie pripravený a podaný do tlače prehľadný článok "Mitochondrial Kinases and the Role of Mitochondrial Protein Phosphorylation in Health and Disease." do časopisu MDPI Life sekcia Physiology and Pathology.

28.) Regulácia pericelulárnej proteolýzy: od molekulárnych mechanizmov k novým subsetom imunitných buniek a terapeutickým nástrojom (*Regulation of Pericellular Proteolysis: From Molecular Mechanisms To Novel Immune Cell Subsets and Therapeutic tools*)

Zodpovedný riešiteľ: Vladimír Leksa
Trvanie projektu: 1.7.2017 / 30.6.2021
Evidenčné číslo projektu: APVV-16-0452
Organizácia je áno
koordinátorom projektu:
Koordinátor: Ústav molekulárnej biológie SAV
Počet spoluriešiteľských 0

inštitúcií:

Čerpané financie: APVV: 40158 €

Dosiahnuté výsledky:

V tomto roku sme ukončili prípravu knockoutových myšacích kmeňov a naplno sa venovali ich fenotypizácii v rámci imunitného systému. Konkrétne výstupy plánujeme na budúci rok.

29.) Mikrobiálne kontaminanty v tradičných slovenských syroch: ich eliminácia vedeckými nástrojmi založenými na kvantitatívnej analýze a matematickom modelovaní (*Microbial contaminants in traditional Slovakian cheeses: their elimination by scientific tools based on quantitative analysis and mathematical modelling*)

Zodpovedný riešiteľ: Domenico Pangallo

Trvanie projektu: 1.7.2020 / 30.6.2023

Evidenčné číslo projektu: APVV-19-0031

Organizácia je nie

koordinátorom projektu:

Koordinátor: Slovenská technická univerzita v Bratislave Fakulta chemickej a potravinárskej technológie

Počet spoluriešiteľských 1 - Slovensko: 1

inštitúcií:

Čerpané financie: APVV: 10000 €

Dosiahnuté výsledky:

Náš výskum sa zameriava na kmene *Mucor circinelloides*. Predmetom výskumu bude charakterizácia povrchového rastu vybraných kmeňov *Mucor circinelloides* so zameraním na rozdiely v rýchlosti ich rastu na živnom médiu a na modelovom syrovom médiu v závislosti od podmienok (teploty, pH, atď). Na získanie kvantitatívnych údajov sa použijú mikrobiologické metódy a výsledky sa vyhodnotia technikami prediktívnej mikrobiológie a matematického modelovania.

30.) Výskum bórom dopovaných diamantových vrstiev pre vysokoúčinné odstraňovanie liečiv, drog a rezistentných typov mikroorganizmov z vôd (*Research of boron doped diamond films for highly effective removal of pharmaceuticals, drugs and resistant types of microorganisms from waters*)

Zodpovedný riešiteľ: Domenico Pangallo

Trvanie projektu: 1.7.2017 / 30.6.2020

Evidenčné číslo projektu: APVV-16-0124

Organizácia je nie

koordinátorom projektu:

Koordinátor: Slovenská technická univerzita v Bratislave Fakulta elektrotechniky a informatiky

Počet spoluriešiteľských 0

inštitúcií:

Čerpané financie: APVV: 10000 €

Dosiahnuté výsledky:

V rámci projektu sme vyvinuli a optimalizovali citlivú a spoľahlivú metódu molekulárnej biológie na hodnotenie účinnosti diamantových elektród dopovaných bórom na dezinfekciu odpadových vôd. Analyzovali sme prítomnosť mikrobiálneho spoločenstva a jeho identifikáciu pred a po aplikácii bórom dopovaných diamantových elektród. Analýza RNA nám dáva reálny obraz na

účinnosť dezinfekčnej metódy, pretože podľa tejto analýzy vieme, či máme žijúce mikroorganizmy, a teda či elektródy mali vplyv na prežívanie mikroorganizmov v odpadových vodách.

Mackuľák, T., Medvecká, E., Staňová, A.V., Brandeburová, P., Grabic, R., Golovko, O., Marton, M., Bodík, I., Medved'ová, A., Gál, M. and Planý, M., 2020. Boron doped diamond electrode–The elimination of psychoactive drugs and resistant bacteria from wastewater. *Vacuum*, 171, p.108957.

31.) Zvýšenie organoleptickej kvality vína aplikáciou nesacharomycetových koštartérov optimalizovanou na základe analýzy mikrobiológie použitím NGS a analýzy arómy (*Improvement of organoleptic quality of wine by application of non- Saccharomyces co-starters optimized on the basis of microflora profiling using NGS and aroma profiling*)

Zodpovedný riešiteľ: Domenico Pangallo
Trvanie projektu: 1.7.2017 / 30.6.2020
Evidenčné číslo projektu: APVV-16-0264
Organizácia je koordinátorom projektu: nie
Koordinátor: Univerzita Komenského v Bratislave, Vedecký park
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 13600 €

Dosiahnuté výsledky:

Porovnali sme dva vinifikáčne prístupy, a to spontánnu fermentáciu a fermentáciu riadenú štandardným komerčným štartérom *S. cerevisiae*, z hľadiska dynamiky mikrobioty a chemických vlastností vyrábaných vín. Dynamika mikrobiálnych populácií sa určovala počas fermentačného procesu pomocou 16S a 28S rRNA sekvenovania novej generácie. Profil prchavých zlúčenín počas týchto fermentačných procesov sa identifikoval mikroextrakciou na pevnej fáze (SPME) spojenou s plynovou chromatografiou a hmotnostnou spektrometriou (GC-MS).

Budiš, J., Šoltýs, K. and Rusňáková, D., 2020. Comparison of microbial diversity during two different wine fermentation processes. *FEMS Microbiology Letters*, 367(18), p.fnaa150.

32.) Výskum a vývoj efektívnych procesov prípravy vanilínu a iných prírodných aróm s využitím oxidačného a protektívneho účinku rekombinantnej katalázy a peroxidázy (*Research & development of effective processes for the preparation of vanillin and other natural flavors using the oxidative and protective effect of recombinant catalase and peroxidase*)

Zodpovedný riešiteľ: Marcel Zámocký
Trvanie projektu: 1.8.2018 / 30.6.2022
Evidenčné číslo projektu: APVV-17-0333
Organizácia je koordinátorom projektu: nie
Koordinátor: Univerzita Komenského Bratislava
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 5864 €

Dosiahnuté výsledky:

Analyzovali sme také enzýmové antioxidanty, ktoré by mohli byť využité svojím protekčným účinkom v technológii vyvíjanej v tomto aplikovanom projekte. Zistili sme že najvýhodnejšie sú

katalázy z termofilných húb pričom výsledky boli publikované v prestížnom švajčiarskom časopise: Chovanová K., Bohmer M., Poljovka A., Budiš J., Harichová J., Szemeš T., Zámocký M. (2020) Parallel Molecular Evolution of Catalases and Superoxide Dismutases - Focus on Thermophilic Fungal Genomes. *Antioxidants* 9:1047. Zamerali sme sa tiež na optimalizáciu heterológnej expresie rekombinantnej katalázy-peroxidázy z *Chaetomium thermophilum* var. *dissitum* ktorá by mohla vzhľadom na lepší profil nahradiť AfKatG, ktorá sa v tomto projekte doteraz používala. Výsledky boli prezentované formou posteru na VIBes in Biosciences ktorá sa uskutočnila v Leuven v Belgicku.

Príloha C

Publikačná činnosť organizácie (generovaná z ARL)

ABC Kapitoly vo vedeckých monografiách vydané v zahraničných vydavateľstvách

- ABC01 SOJKA, M. - HORNIAČKOVÁ, M. - BUČEKOVÁ, Marcela - MAJTÁN, V. - MAJTÁN, Juraj**. Antibiofilm efficacy of honeybee products against wound biofilm. In Biofilm, pilonidal cysts and sinuses. - Springer, Cham, 2020, p. 89-108. ISBN 978-3-030-03076-6.

ACB Vysokoškolské učebnice vydané v domácich vydavateľstvách

- ACB01 BAUEROVÁ-HLINKOVÁ, Vladena - KABÁT, Peter - BAUER, Jacob. Proteíny štruktúra a funkcia. 1. diel. štruktúra proteínov. 1. vyd. Bratislava : Vydavateľstvo Univerzity Komenského v Bratislave, 2020. 109 s. ISBN 978-80-223-4524-8

ADCA Vedecké práce v zahraničných karentovaných časopisoch – impaktovaných

- ADCA01 ARA, K.Z.G.** - MÅNBERGER, A. - GABRIŠKO, Marek - LINARES-PASTÉN, J.A. - JASILIONIS, A. - FRIÐJÓNSSON, O.H. - HREGGVIÐSSON, G.O. - JANEČEK, Štefan - KARLSSON, E.N.**. Characterization and diversity of the complete set of GH family 3 enzymes from *Rhodothermus marinus* DSM 4253. In Scientific Reports, 2020, vol. 10, no. 1329. (2019: 3.998 - IF, Q1 - JCR, 1.341 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents, WOS, SCOPUS). ISSN 2045-2322. Dostupné na: <https://doi.org/10.1038/s41598-020-58015-5>
- ADCA02 BALIOVÁ, Martina** - JURSKÝ, František**. Phosphomimetic mutation of glycine transporter glyT1 C-terminal PDZ binding motif inhibits its interactions with PSD95. In Journal of Molecular Neuroscience, 2020, vol. 70, p. 488–493. (2019: 2.678 - IF, Q3 - JCR, 0.861 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 0895-8696. Dostupné na: <https://doi.org/10.1007/s12031-019-01435-4>
- ADCA03 BALIOVÁ, Martina - JURSKÝ, František**. Phosphorylation of Serine 157 protects the rat glycine transporter GlyT2 from calpain cleavage. In Journal of Molecular Neuroscience, 2020, vol. 70, p. 1216–1224. (2019: 2.678 - IF, Q3 - JCR, 0.861 - SJR, Q1 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 0895-8696. Dostupné na: <https://doi.org/10.1007/s12031-020-01529-4>
- ADCA04 BALIOVÁ, Martina** - JURSKÝ, František**. Comparison of SynCAM1/CADM1 PDZ interactions with MUPP1 using mammalian and bacterial pull-down systems. In Brain and behavior, 2020, vol. 10, no. 4, no. e01587. (2019: 2.091 - IF, Q3 - JCR, 0.873 - SJR, Q2 - SJR, karentované - CCC). (2020 - Current Contents). ISSN 2162-3279. Dostupné na: <https://doi.org/10.1002/brb3.1587>
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2. [1.1] KAILA, Pallavi - MEHTA, Gurkaran Singh - DHAUNTA, Neeraj - GUPTASARMA, Purnananda. Structure-guided mutational evidence and postulates explaining how a glycohydrolase from *Pyrococcus furiosus* functions simultaneously as an amylase and as a 4-alpha-glucanotransferase. In *BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS*. ISSN 0006-291X, 2019, vol. 509, no. 4, pp. 892-897., Registrované v: WOS
3. [1.1] PANG, Bo - ZHOU, Li - CUI, Wenjing - LIU, Zhongmei - ZHOU, Shengmin - XU, Jun - ZHOU, Zheming. A Hyperthermostable Type II Pullulanase from a Deep-Sea Microorganism *Pyrococcus yayanosii* CH1. In *JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY*. ISSN 0021-8561, 2019, vol. 67, no. 34, pp. 9611-9617., Registrované v: WOS
4. [1.1] PLAZA-VINUESA, Laura - HERNANDEZ-HERNANDEZ, Oswaldo - JAVIER MORENO, F. - DE LAS RIVAS, Blanca - MUNOZ, Rosario. Unravelling the diversity of glycoside hydrolase family 13 alpha-amylases from *Lactobacillus plantarum* WCFS1. In *MICROBIAL CELL FACTORIES*, 2019, vol. 18, no. 1, pp. 183, Registrované v: WOS

ADMB03

SADIAN, Y. - GATSOGIANNIS, C. - PATASI, Csilla - HOFNAGEL, O. - GOODY, R.S. - FARKAŠOVSKÝ, Marian - RAUNSER, S. The role of Cdc42 and Gic1 in the regulation of septin filament formation and dissociation. In *eLife*, 2013, vol. 2, e01085. (2013 - SCOPUS). ISSN 2050-084X. Dostupné na: <https://doi.org/10.7554/eLife.01085>

Citácie:

1. [1.1] CANNON, Kevin S. - WOODS, Benjamin L. - CRUTCHLEY, John M. - GLADFELTER, Amy S. An amphipathic helix enables septins to sense micrometer-scale membrane curvature. In *JOURNAL OF CELL BIOLOGY*. ISSN 0021-9525, 2019, vol. 218, no. 4, pp. 1128-1137., Registrované v: WOS
2. [1.1] MARQUARDT, Joseph - CHEN, Xi - BI, Erfei. Architecture, remodeling, and functions of the septin cytoskeleton. In *CYTOSKELETON*. ISSN 1949-3584, 2019, vol. 76, no. 1, pp. 7-14., Registrované v: WOS

AFE Abstrakty pozvaných príspevkov zo zahraničných konferencií

AFE01

URZI, C. - DE LEO, F. - BRUNO, L. - KRAKOVÁ, Lucia - PANGALLO, Domenico - ALBERTANO, P. How to control biodeterioration of cultural heritage: an integrated methodological approach for the diagnosis and treatment of affected monuments. In *Symposium on Works of Art & Conservation Science Today : book of abstracts*. - Thessaloniki, 2010, p. 1-9.

Citácie:

1. [1.1] FIDANZA, M.R. - CANEVA, G. *Natural biocides for the conservation of stone cultural heritage: A review. In JOURNAL OF CULTURAL HERITAGE. ISSN 1296-2074, JUL-AUG 2019, vol. 38, p. 271-286., Registrované v: WOS*

AFG Abstrakty príspevkov zo zahraničných konferencií

AFG01 TOMAS-BARBERAN, F.A. - TRUCHADO, P. - ALLENDE, A. - BORTOLOTTI, L. - SABATINI, A.G. - BÍLIKOVÁ, Katarína - ŠIMÚTH, Jozef. Phytochemicals as markers of the floral origin of honey. In Apimondia 2009 : 41st Congress. Book of Abstracts. - Montpellier, 2009, p. 95.

Citácie:

1. [1.1] ACAR, R. - KOC, N. - SUMIAHADI, A. *Investigation of yield, yield components and nutrient contents of wild rocket (Diplotaxis tenuifolia (L.) DC.). In ARABIAN JOURNAL OF GEOSCIENCES. ISSN 1866-7511, DEC 2019, vol. 12, no. 23., Registrované v: WOS*

GII Rôzne publikácie a dokumenty, ktoré nemožno zaradiť do žiadnej z predchádzajúcich kategórií

GII01 ŠEVČÍK, Jozef - URBÁNIKOVÁ, Ľubica - DAUTER, Z. - WILSON, K.S. Ribonuclease sa complex with barstar. In RCSB Protein Data Bank, iD 1AY7. Dostupné na internete: <<https://www.rcsb.org/structure/1AY7>>

Citácie:

1. [3.1] Jayashree S, Murugavel P, Sowdhamini R, Srinivasan N. *Interface residues of transient protein-protein complexes have extensive intra-protein interactions apart from inter-protein interactions. Biol. Direct 14 1 (2019)*

Príloha D

Údaje o pedagogickej činnosti organizácie

Semestrálne prednášky:

Mgr. Vladena Bauerová, PhD.

Názov semestr. predmetu: Štruktúra a funkcia bioaktívnych proteínov

Počet hodín za semester: 2

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra mikrobiológie a virológie

RNDr. Lucia Bocánová, PhD.

Názov semestr. predmetu: Molekulárna biológia - základy

Počet hodín za semester: 10

Názov katedry a vysokej školy: Univerzita sv. Cyrila a Metoda v Trnave, Aplikovaná biológia

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 13

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Funkčná analýza proteínov a modelovanie

Počet hodín za semester: 13

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Proteínový dizajn

Počet hodín za semester: 26

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Mgr. Ľuboš Klůčár, PhD.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

Mgr. Ľuboš Klůčár, PhD.

Názov semestr. predmetu: Výpočtová genomika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

Semestrálne cvičenia:

Mgr. Vladena Bauerová, PhD.

Názov semestr. predmetu: Štruktúra a funkcia bioaktívnych proteínov

Počet hodín za semester: 2

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra mikrobiológie a virológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biotechnológií

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Funkčná analýza proteínov a modelovanie

Počet hodín za semester: 13

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Molekulárno-biologické databázy

Počet hodín za semester: 26

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Pokročilá bioinformatika

Počet hodín za semester: 13

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Pokročilá bioinformatika

Počet hodín za semester: 13

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Doc. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Proteínový dizajn

Počet hodín za semester: 13

Názov katedry a vysokej školy: Fakulta prírodných vied UCM, Katedra biológie

Mgr. Ráchel Javorová

Názov semestr. predmetu: Cvičenie z mikrobiológie

Počet hodín za semester: 4

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra mikrobiológie a virológie

Mgr. Magdaléna Kapustová

Názov semestr. predmetu: Základné cvičenia z mikrobiológie

Počet hodín za semester: 12

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra mikrobiológie a virológie

Mgr. Magdaléna Kapustová

Názov semestr. predmetu: Základné cvičenia z mikrobiológie

Počet hodín za semester: 12

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra mikrobiológie a virológie

Mgr. Barbora Keresztesová

Názov semestr. predmetu: Cvičenia z molekulárnej biológie

Počet hodín za semester: 26

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

Mgr. Zuzana Kisová

Názov semestr. predmetu: Cvičenia z mikrobiológie

Počet hodín za semester: 18

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra mikrobiológie a virológie

Mgr. Zuzana Kisová

Názov semestr. predmetu: Cvičenia z mikrobiológie

Počet hodín za semester: 12

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra mikrobiológie a virológie

Mgr. Ľuboš Ključár, PhD.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

Mgr. Ľuboš Ključár, PhD.

Názov semestr. predmetu: Výpočtová genomika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

Mgr. Andrej Poljovka

Názov semestr. predmetu: Cvičenie zo základnej molekulárnej biológie

Počet hodín za semester: 14

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Molekulárna biológia

Semináre:

Jacob Bauer, PhD.

Názov semestr. predmetu: Pokroky v molekulárnej biológii

Počet hodín za semester: 2

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

Mgr. Vladena Bauerová, PhD.

Názov semestr. predmetu: Pokroky v molekulárnej biológii

Počet hodín za semester: 2

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra molekulárnej biológie

RNDr. Lucia Bocánová, PhD.

Názov semestr. predmetu: Molekulárna biológia - základy

Počet hodín za semester: 10

Názov katedry a vysokej školy: Univerzita sv. Cyrila a Metoda v Trnave, Aplikovaná biológia

Mgr. Vladimír Leksa, PhD.

Názov semestr. predmetu: Immunology

Počet hodín za semester: 12

Názov katedry a vysokej školy: Medizinische Universität Wien, Austria, CePII, HAI

Mgr. Vladimír Leksa, PhD.

Názov semestr. predmetu: Základy molekulárnej imunológie

Počet hodín za semester: 12

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra Biochémie

RNDr. Ľubica Urbániková, CSc.

Názov semestr. predmetu: Štruktúrna biológia - Kryštalografia proteínov a nukleových kyselín

Počet hodín za semester: 24

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra biochémie

Terénne cvičenia:

Individuálne prednášky:

RNDr. Imrich Barák, DrSc.

Názov semestr. predmetu: Pokročilé prednášky z molekulárnej biológie

Počet hodín za semester: 2

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra genetiky

RNDr. Imrich Barák, DrSc.

Názov semestr. predmetu: Pokročilé prednášky z molekulárnej biológie

Počet hodín za semester: 2

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra biochémie

Ing. Eva Kutejová, DrSc.

Názov semestr. predmetu: Mitochondriálne proteázy a proteíny mitochondriálneho nukleoidu - štruktúra, funkcia a úloha homeostázy mitochondrií

Počet hodín za semester: 2

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Katedra genetiky PriF UK

Ing. Juraj Majtán, DrSc.

Názov semestr. predmetu: Klinické skúšanie jedľového medovicového medu

Počet hodín za semester: 2

Názov katedry a vysokej školy: Slovenská technická univerzita v Bratislave, Inštitút celoživotného vzdelávania, Univerzita tretieho veku

Príloha E**Medzinárodná mobilita organizácie****(A) Vyslanie vedeckých pracovníkov do zahraničia na základe dohôd:**

Krajina	D r u h d o h o d y					
	MAD, KD, VTS		Medziústavná		Ostatné	
	Meno pracovníka	Počet dní	Meno pracovníka	Počet dní	Meno pracovníka	Počet dní
Česko					Eva Kutejová	2
Dánsko					Filip Mareček	34
Rakúsko	Veronika Bugárová	90	Nad'a Labajová	4		
Počet vyslaní spolu	1	90	1	4	2	36

(B) Prijatie vedeckých pracovníkov zo zahraničia na základe dohôd:

Krajina	D r u h d o h o d y					
	MAD, KD, VTS		Medziústavná		Ostatné	
	Meno pracovníka	Počet dní	Meno pracovníka	Počet dní	Meno pracovníka	Počet dní
Belgicko					Gatien Tielemans	50
Počet prijatí spolu					1	50

(C) Účast' pracovníkov pracoviska na konferenciách v zahraničí (nezahrnutých v "A"):

Krajina	Názov konferencie	Meno pracovníka	Počet dní
Nemecko	XFEL 2020	Imrich Barák	4
Spolu	1	1	4

Vysvetlivky: MAD - medziakademické dohody, KD - kultúrne dohody, VTS - vedecko-technická spolupráca v rámci vládných dohôd

Skratky použité v tabuľke C:

XFEL 2020 - User meeting XFEL 2020

Príloha F**Vedecko-popularizačná činnosť pracovníkov organizácie SAV**

Meno	Spoluautori	Typ¹	Názov	Miesto zverejnenia	Dátum alebo počet za rok
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	TL	Bakteriálne nanotrubice	HTTPS://GLOB.ZOZ NAM.SK/SLOVENS KI-A-CESKI-VEDCI- POPISALI-JAV-KU- KTOREMU- DOCHADZA-PRI- SMRTI- BAKTERIALNEJ- BUNKY/	16.10.2020
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	TL	Bakteriálne nanotrubice	https://sciencemag.cz/ umirajici-bakterie- vystreluji- nanotrubicky/	6.10.2020
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	TL	Bakteriálne nanotrubice	https://techfocus.cz/ve da-vesmir/2409- umirajici-bakterie- podle-vedcu- vystreluje-do-sveho- okoli- nanotrubicky.html	15.10.2020
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	IN	Bakteriálne nanotrubice	https://vedanadosah.cv tsr.sk/slovenski-a- ceski-vedci-vyvratili- staru-paradigmu- opisali-ako-v-pripade- bakterialnej-bunky- vznikaju- nanotrubice?fbclid=I	19.10.2020
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	TL	Bakteriálne nanotrubice	https://www.interez.sk /velky-uspech- slovenskych-vedcov- popisali-jav-ku- ktoremu-dochadza-pri- smrti-bakterialnej- bunky/?fbclid=IwAR2 P6j09aqLWEkjmrgRP Ki9o	16.10.2020
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	TL	Bakteriálne nanotrubice	https://www.teraz.sk/sl ovensko/vedci- popisali-jav-ku- ktoremu- dochad/500470- clanok.html	15.10.2020
RNDr. Imrich Barák, DrSc.	Jirka Pospíšil, Katarína Muchová, Libor Krásny	TL	Bakteriálne nanotrubice	Spravy SAV 6/2020	14.12.2020
RNDr. Imrich Barák,	Libor Krasny	TL	Bakteriálne		8.10.2020

DrSc.			nanotrubice	https://www.dalito.sk/slovaci-a-cesi-zistili-ako-umieraju-bakterie-pri-strielani/	
RNDr. Imrich Barák, DrSc.	Libor Krasny, Jirka Pospíšil, Katarína Muchová	TV	Bakteriálne nanotrubice	https://ct24.ceska-televize.cz/veda/3200811-cesti-a-slovenski-vedci-popsali-jak-umiraji-bakterie-vystreluji-nanotrubicky?fbclid=IwAR3s3rW-A6G0sazEIS1FB	14.10.2020
Jacob Bauer, PhD.	Vladena Bauerová-Hlinková	TL	Článok v denníku Pravda	https://vat.pravda.sk/clanok/clanok/572215-bielkoviny-maju-svoju-tvar/	19.12.2020
Jacob Bauer, PhD.	Vladena Bauerová-Hlinková, Peter Kabát	IN	Informácia o vydaní 1. dielu monografie "Proteíny-Štruktúra a Funkcia"	https://vedanadosah.cvtsir.sk/slovenski-vedci-vydavaju-knihu-o-proteinoch-a-ich-funkcii	16.9.2020
Mgr. Vladena Bauerová, PhD.		IN	prednáška o zraku	https://www.youtube.com/watch?v=9DkAWaGfcHo	23.4.2020
Mgr. Vladena Bauerová, PhD.		IN	Rozhovor pre portál Edutech	https://www.edutech.sk/novinky/ak-chcete-dostat-bielkoviny-dotela-proteinove-tycinky-nestacia/	13.11.2020
Mgr. Vladena Bauerová, PhD.	Jacob Bauer	TL	Článok v denníku Pravda	https://vat.pravda.sk/clanok/clanok/572215-bielkoviny-maju-svoju-tvar/	19.12.2020
Mgr. Vladena Bauerová, PhD.	Peter Kabát, Jacob Bauer	IN	Informácia o vydaní 1. dielu monografie "Proteíny-Štruktúra a Funkcia"	https://vedanadosah.cvtsir.sk/slovenski-vedci-vydavaju-knihu-o-proteinoch-a-ich-funkcii	16.9.2020
Mgr. Marcela Bučková, PhD.		IN	Dokument o starobyľom spôsobe včelárstva ukazuje, čo sa stane, ak porušíme pravidlá prírody	Denník N	25.8.2020
Mgr. Marcela Bučková, PhD.		TL	Na med si baktérie nevytvoria rezistenciu	HN Magazin 22(6)	12.6.2020
Mgr. Marcela Bučková, PhD.		PB	Premiéra filmu Krajina medu	Nová Cvernovka (Bratislava)	27.8.2020
Mgr. Veronika Bugárová		TL	Článok Miau magazín	http://www.miaumagazin.sk/home/vedkyne-mlada-krv/	3.4.2020
Mgr. Veronika Bugárová		PB	Science Slam SAV	Nová Cvernovka	26.2.2020

Mgr. Veronika Bugárová		PB	Večer zVEDAvých	online	8.4.2020
Mgr. Veronika Bugárová	Ing. Juraj Majtán, DrSc.	TL	Článok do časopisu Dymák	https://www.dymak.online/antibakterialny-potencial-komerčných-medov-produkovaných-na-slovensku/	1.3.2020
RNDr. Ján Kormanec, DrSc.		RO	Rozhovor o nových trendoch pri vývoji antibiotík v relácii Akadémie na stanici Devín	Rádio Devín	6.6.2020
Ing. Eva Kutejová, DrSc.		RO	Rozhovor o mitochondriách v relácii Akadémie na stanici Devín	https://www.rtvs.sk/radio/archiv/11309/1332479	9.5.2020
Ing. Juraj Majtán, DrSc.		TL	Lietajúce inekcie	Téma 35/20	28.8.2020
Ing. Juraj Majtán, DrSc.		TV	Máme najlepšie med v Európe	Experiment RTVS1	8.10.2020
Ing. Juraj Majtán, DrSc.		TL	Molekulárny biológ: Chceme dostať med do každej domácej lekárničky	DenníkN	4.6.2020
Ing. Juraj Majtán, DrSc.		PB	Nové pohľady na kvalitu medu	SPP a.s., Mlynské Nivy, Bratislava	24.9.2020
Ing. Juraj Majtán, DrSc.		TV	Správy RTVS z regiónov	RTVS1	22.1.2020
Ing. Juraj Majtán, DrSc.		TL	Test medov z lokálnych obchodov: tretina bola na úrovni cukorného roztoku	DenníkN	2.5.2020
Ing. Juraj Majtán, DrSc.	MUDr. Miroslava Horniačková, PhD.	TL	Stabilita antibakteriálnej aktivity medu	Dymák 6/2020	1.6.2020
Mgr. Marcela Bučková, PhD.	Ing. Juraj Majtán, DrSc.	TL	Med a jeho liečivé účinky (1)	Dymák 8 (2020)	0
Mgr. Marcela Bučková, PhD.	Ing. Juraj Majtán, DrSc.	TL	Med a jeho liečivé účinky (2)	Dymák 9 (2020)	0
RNDr. Gabriela Bukovská, CSc.		IN	Bakteriofágové lytické proteíny	Aktuality SAV https://www.sav.sk/index.php?lang=sk&doc=services-news&source_no=20&news_no=9251	0
Mgr. Vladimír Leksa, PhD.		TL	články	https://dennikn.sk/auto/r/vladimir-leksa/	30
Mgr. Vladimír Leksa, PhD.		RO	rozhovory pre rádio	https://www.youtube.com/watch?v=89JKjbJJ0TE	10
Mgr. Vladimír Leksa, PhD.		TV	rozhovory pre televízie	https://www.noviny.sk/koronavirus/572377-	10

				budu-vakciny-ucinne- a-bezpecne-pozreli- sme-sa-na-ne-zblizka- s-nasimi-odbornikmi- a-vedcami; https://www.ta3.co	
Ing. Juraj Majtán, DrSc.	Mgr. Marcela Bučeková, PhD., Mgr. Veronika Bugárová, Ing. Jana Godočiková	TL	Med a jeho liečivé účinky	Dymák	3

¹ PB - prednáška/beseda, TL - tlač, TV - televízia, RO - rozhlas, IN - internet, EX - exkurzia, PU - publikácia, MM - multimédiá, DO - dokumentárny film