

Ústav molekulárnej biológie SAV, v. v. i.



**Správa o činnosti organizácie SAV
za rok 2021**

Bratislava
január 2022

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1. Základné údaje o organizácii

1.1. Kontaktné údaje

Názov: Ústav molekulárnej biológie SAV, v. v. i.
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.
Adresa: Dúbravská cesta 21, 845 51 Bratislava 45

<http://www.imb.savba.sk/>

Tel.: +421 2 5930 7411

E-mail: umbidir@savba.sk

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	66	21	45	2	6	62	61.89	48.99	4
Vedeckí pracovníci	44	17	27	1	6	40	40.35	38.35	0
Odborní pracovníci VŠ (výskumní a vývojoví zamestnanci ¹)	8	1	7	1	0	8	7.22	7.22	0
Odborní pracovníci VŠ (ostatní zamestnanci ²)	3	0	3	0	0	3	2.9	0	0
Odborní pracovníci ÚS	4	0	4	0	0	4	4	3	3
Ostatní pracovníci	7	3	4	0	0	7	7.42	0.42	1

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 31.12.2021 (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 31.12.2021 (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 31.12.2021)

Rodová skladba	Pracovníci s hodnosťou				Vedeckí pracovníci v stupňoch		
	DrSc.	CSc./PhD.	prof.	doc.	I.	II.a.	II.b.
Muži	6	12	1	0	6	7	4
Ženy	1	26	0	0	1	15	11

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	1	0.1	3	3.0	2	2.0	2	2.0	3	2.5	3	3.0	0	0.0
Ženy	2	2.0	4	4.0	2	2.0	6	6.0	1	1.0	1	1.0	7	7.0	6	6.0	3	3.0

A - Prepočet bez zohľadnenia úväzkov zamestnancov

B - Prepočet so zohľadnením úväzkov zamestnancov

Tabuľka 1d Priemerný vek zamestnancov organizácie k 31.12.2021

	Kmeňoví zamestnanci	Vedeckí pracovníci	Riešitelia projektov
Muži	50.1	49.5	48.5
Ženy	50.2	47.1	50.6
Spolu	50.2	48.0	49.9

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

V roku 2021 sa nezmenila organizačná štruktúra ÚMB, ani nedošlo k signifikantným zmenám vo vedeckom zameraní ústavu. V tomto roku sme prijali štyroch doktorandov, z toho jedného doktoranda nám bolo umožnené prijať mimo počtu povolených novoprijatých doktorandov (3). V rámci riešenia projektu Interreg V-A SK – AT 2014 – 2020 „Budovanie výukových a výskumných kapacít v štruktúrnej a funkčnej analýze biomolekúl pre potreby biomedicíny a biotechnológií“ boli prijaté dve

mladé vedecké pracovníčky Mgr. Nina Kunová, PhD. a Mgr. Barbora Stojkovičová a v rámci riešenia projektu štrukturálnych fondov „Dlhodobý strategický výskum a vývoj zameraný na výskyt Lynchovho syndrómu v populácii SR a možnosti prevencie nádorov spojených s týmto syndrómom“ bola prijatá Mgr. Zuzana Kisová, PhD. po obhájení jej dizertačnej práce na ÚMB SAV.

V rámci medzinárodného projektu Interreg SK-AT „Budovanie výukových a výskumných kapacít v štruktúrnej a funkčnej analýze biomolekúl pre potreby biomedicíny a biotechnológií“ sme pokračovali vo formovaní automatizovaného laboratória štruktúrnej biológie, prvého svojho druhu na Slovensku. Vytvára 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. pokračovala v projekte Medové laboratórium, ktorého snahou je poskytovať širokej verejnosti možnosť analýzy antibakteriálnej aktivity medov a v tomto roku zaznamenala zvyšujúci sa záujem, hlavne drobných včelárov.

Od 1.1. 2021 je ÚMB SAV školiacim pracoviskom študijného programu Genetika v rámci študijného odboru Biológia (aj pre lekárske, farmaceutické, veterinárne, poľnohospodárske a lesnícke vedy), ktorého garantom je RNDr. Imrich Barák, DrSc.

Významný podiel na aktivitách vedeckej rady a vedenia ústavu predstavovala príprava všetkých relevantných dokumentov súvisiacich s prechodom na v.v.i..

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.

V roku 2021 sa podarilo uskutočniť rekonštrukciu sociálnej miestnosti a kuchynky v budove A ÚMB. Tieto práce boli financované z vlastných zdrojov.

2. Vedecká činnosť

2.1. Domáce projekty

Tabuľka 2a Domáce projekty riešené v roku 2021

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	12	2	100164	100164	9437	9437	1380	3900
2. Projekty APVV	9	10	20827	9529	235615	195945	10230	67553
3. Projekty EŠIF/OP ŠF	0	1	-	-	-	-	-	74505
4. Projekty SASPRO, MoRePro	0	0	-	-	-	-	-	-
5. Iné projekty (FM EHP, Vedecko-technické projekty, 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 2021

Štruktúra projektov	Miesto podania	Organizácia je nositeľom projektu	Organizácia sa zmluvne podieľa na riešení projektu
1. Účasť na nových výzvach APVV r. 2021	-	1	1
2. Projekty výziev EŠIF podané r. 2021	Bratislava		
	Regióny		

2.2. Medzinárodné projekty

2.2.1. Medzinárodné projekty riešené v roku 2021

Tabuľka 2c Medzinárodné projekty riešené v roku 2021

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 Horizont 2020 a Horizont Európa	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	-	-	51863	51863	-	-
5. Projekty v rámci medzivládnych dohôd	0	0	-	-	-	-	-	-
6. Bilaterálne projekty MAD, Mobility, Open Mobility	0	0	-	-	-	-	-	-
7. Bilaterálne projekty ostatné	1	1	-	-	-	24996	-	17000
8. Podpora MVTS z národných zdrojov okrem SAV (APVV a iné)	0	0	-	-	-	-	-	-
9. SAS-UPJŠ ERC Visiting Fellowship Grants	0	0	-	-	-	-	-	-
10. Iné projekty	0	0	-	-	-	-	-	-

A - organizácia je nositeľom projektu

B - organizácia sa zmluvne podieľa na riešení projektu

2.2.2. Medzinárodné projekty Horizont Európa podané v roku 2021

Tabuľka 2d Počet projektov Horizont Európa v roku 2021

	A	B
Počet podaných projektov Horizont Európa		2

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 Európskych štrukturálnych a investičných fondov v ďalších výzvach

2.3. Výber najvýznamnejších výsledkov vedeckej práce organizácie v roku 2021

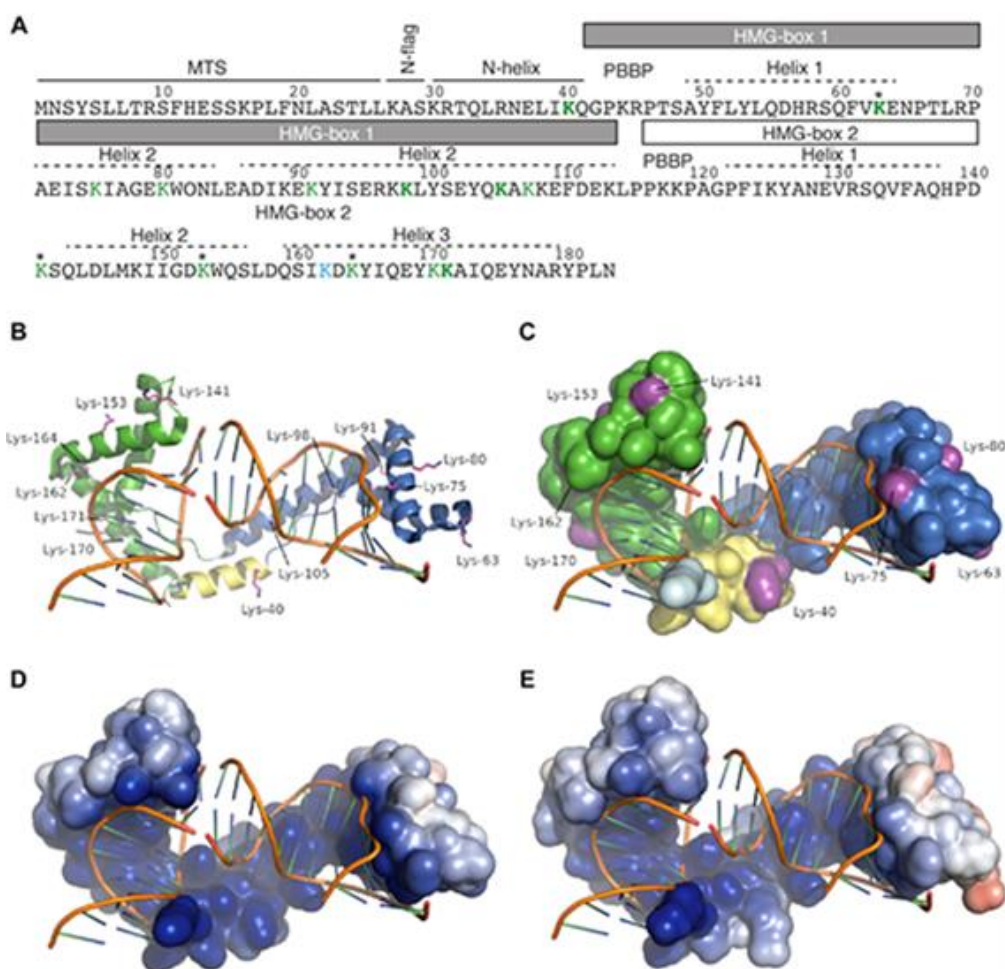
Slúži aj na výber výsledkov do výročnej správy SAV. Každý výsledok má byť charakterizovaný stručným, všeobecne zrozumiteľným popisom – maximálne 1000 znakov + 1 obrázok; bibliografický údaj uvádzajte rovnako ako v zozname publikačnej činnosti, vrátane IF. Nadpis by mal vystihnúť prínos a význam výsledku – podľa možnosti by nemal byť zredukovaný na názov/nadpis publikačného výstupu.

2.3.1. Výsledky na báze základného výskumu

A. Vplyv post-translačných modifikácií proteínov na funkciu mitochondrií

Autori (za ÚMB SAV): Keresztesová, B., Kunová, N., Bauer, J., Ondrovičová, G., Pevala, V., Kutejová, E.

Post-translačné modifikácie proteínov predstavujú účinný spôsob, ako sa bunky prispôbujú zmenám prostredia, a významne modulujú vlastnosti proteínov. Sukcinylácia lyzínu má veľký vplyv na funkciu proteínu, pretože dramaticky mení jeho náboj. V eukaryotoch ovplyvňuje najmä mitochondriálne proteíny, keďže donor sukcinátu, sukcinyl-CoA, sa primárne tvorí v Krebsovom cykle. V spolupráci s Katedrou genetiky PriF UK a Chemickým ústavom SAV sme urobili komplexnú proteomickú analýzu kvasinkových mitochondrií a detegovali 314 sukcinylovaných mitochondriálnych proteínov obsahujúcich 1763 nových sukcinylačných miest. Mitochondriálny nukleoid, komplex mtDNA a proteínov, je štruktúra, ktorej proteíny ovplyvňuje sukcinylácia. Zistili sme, že Abf2, hlavná zložka nukleoidu *S. cerevisiae* zodpovedná za zbaľovanie mtDNA, sa môže sukcinylovať na 13 lyzínoch. *In vitro* štúdie ukázali, že sukcinylácia Abf2 vedie k inhibícii jeho DNA-väzobnej aktivity a znižuje jeho citlivosť voči štiepeniu proteázou ScLon.



Projekty

1. VEGA 02/0075/18 – Faktory ovplyvňujúce dynamiku mitochondriálneho nukleoidu
2. APVV-15-0375 – Posttranslačné modifikácie v mitochondriách a ich úloha v patologických procesoch
3. APVV-19-0298 – Vzájomná inerakcia proteáz, šaperónov a kináz v mitochondriách pri strese spôsobenom patologickými stavmi.

Výstupy

1. FRANKOVSKÝ, Ján* - KERESZTESOVÁ, Barbora* - BELLOVÁ, Jana - KUNOVÁ, Nina - ČANIGOVÁ, Nikola - HANAKOVÁ, Katarína - BAUER, Jacob - ONDROVIČOVÁ, Gabriela - LUKÁČOVÁ, Veronika - SIVÁKOVÁ, Barbara - ZDRÁHAL, Zbyněk - PEVALA, Vladimír - PROCHÁZKOVÁ, Katarína - NOSEK, Jozef. - BARÁTH, Peter** - KUTEJOVÁ, Eva** - TOMÁŠKA, Ľubomír**. The yeast mitochondrial succinylome: Implications for regulation of mitochondrial nucleoids. In Journal of Biological Chemistry, 2021, vol. 297, no. 4, no. 101155 [16] p. (2020: 5.157 - IF, Q2 - JCR, 2.361 - SJR, Q1 - SJR, karentované - CCC).
2. KOTRASOVÁ, Veronika* - KERESZTESOVÁ, Barbora* - ONDROVIČOVÁ, Gabriela - BAUER, Jacob - HVALOVÁ, Henrieta - PEVALA, Vladimír - KUTEJOVÁ, Eva** - KUNOVÁ, Nina**. Mitochondrial kinases and the role of mitochondrial protein phosphorylation in health and disease. In Life-Basel, 2021, vol. 11, p. 82. (2020: 3.817 - IF, Q2 - JCR, 0.973 - SJR, Q1 - SJR, karentované - CCC).
3. HVALOVÁ, Henrieta* - ONDROVIČOVÁ, Gabriela* - KERESZTESOVÁ, Barbora - BAUER, Jacob - PEVALA, Vladimír - KUTEJOVÁ, Eva** - KUNOVÁ, Nina**. Mitochondrial HSP70 chaperone system - the influence of post-translational modifications and involvement in human diseases. In International Journal of Molecular Sciences, 2021, vol.

22, no. 8077. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC).

B. Krížové rozpoznávanie promótorov deviatimi homológmi stresového sigma faktora SigB u *Streptomyces coelicolor* A3(2)

Autori: B. Ševčíková, B. Řežuchová, V. Mazuráková, D. Homerová, R. Nováková, E. Fecková, J. Kormanec.

Na rozdiel od *Bacillus subtilis*, *Streptomyces coelicolor* obsahuje deväť homológov sigma faktora SigB s hlavnou úlohou pri diferenciácii a reakcii na osmotický stres. Pomocou heterologického dvojplazmidového systému sme identifikovali 24 promótorov rozpoznávaných deviatimi homológmi (SigBFGHIKLMN), pričom viaceré boli rozpoznávané viacerými sigma faktormi. Promótory sme overili *in vivo* v *S. coelicolor* A3(2) v podmienkach osmotického stresu a diferenciácie. Všetky promótory vykazovali vysokú podobnosť v -35 a -10 oblastiach. Imunoblotová analýza odhalila prítomnosť SigB v podmienkach osmotického stresu a SigH počas morfolologickej diferenciácie. Spolu s fenotypovou analýzou pripravených mutantov *sigB* a *sigH* v *S. coelicolor* A3(2) tieto výsledky naznačujú dominantnú úlohu SigB v reakcii na osmotický stres a dvojité úlohu SigH v reakcii na osmotický stres a morfolologickej diferenciácii a komplexnú reguláciu reakcie na osmotický stres vo vzťahu k morfolologickej diferenciácii v *S. coelicolor*.

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*”.

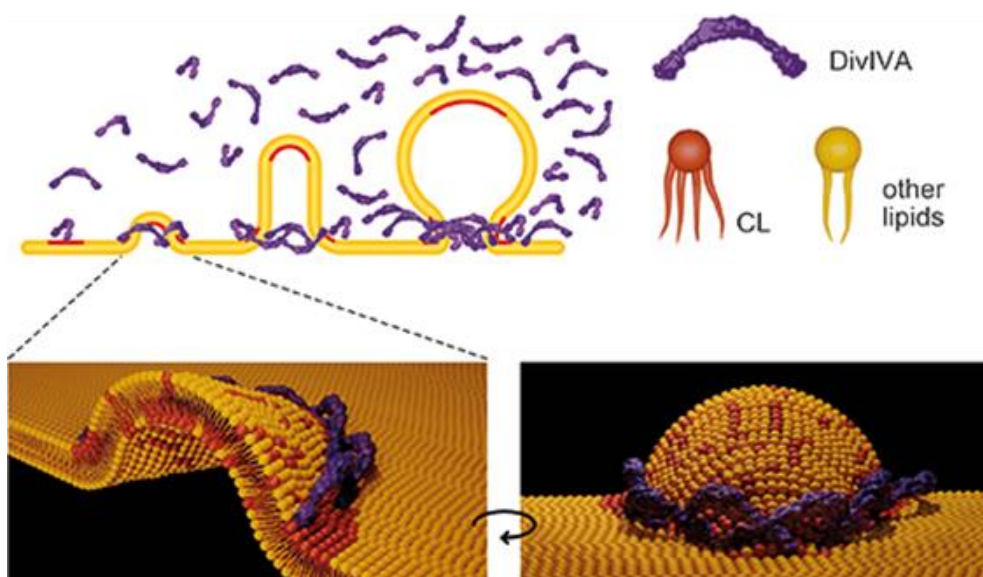
Výstupy:

1. ŠEVČÍKOVÁ, Beatrice - REŽUCHOVÁ, Bronislava - MAZURÁKOVÁ, Vladislava. - HOMEROVÁ, Dagmar - NOVÁKOVÁ, Renáta - FECKOVÁ, Lubomíra - KORMANEC, Ján**. Cross-recognition of promoters by the nine SigB homologues present in *Streptomyces coelicolor* A3(2). In International Journal of Molecular Sciences, 2021, vol. 22, no. 7849. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC).
2. KORMANEC, Ján** - REŽUCHOVÁ, Bronislava - NOVÁKOVÁ, Renáta. Screening systems for stable markerless genomic deletions/integrations in *Streptomyces* species. In Antimicrobial therapies : methods and protocols. - New York : Springer-Verlag, Humana Press, 2021, p. 91-141. ISBN 978-1-0716-1358-0.

C. Úloha *Clostridioides difficile* DivIVA pri tvorbe membrány deliacej prepážky počas bunkového delenia

Autori (za ÚMB SAV): N. Labajová a I. Barák

Dôležitou súčasťou Min systému v gram-pozitívnych baktériách je DivIVA proteín. Tento proteín bol identifikovaný ako priestorový regulátor bunkového delenia v modelovom organizme *Bacillus subtilis*, ale jeho homológy sú prítomné v mnohých iných baktériách, vrátane druhov Clostridií. Okrem svojej úlohy ako topologického regulátora systému Min počas delenia bakteriálnych buniek sa DivIVA podieľa na segregácii chromozómov počas sporulácie, genetickej kompetencii a syntéze bunkovej steny. DivIVA sa lokalizuje do oblastí s vysokým zakrivením membrány, ako sú bunkové póly a miesto bunkového delenia. Predtým sa predpokladalo, že rozpoznávanie negatívneho zakrivenia je hlavným mechanizmom, ktorým sa DivIVA viaže na tieto špecifické oblasti. My sme ukázali, že *Clostridioides difficile* DivIVA sa prednostne viaže na membrány obsahujúce negatívne nabité fosfolipidy, najmä kardiolipín. Naše pozorovania naznačujú, že DivIVA môže hrať komplexnejšiu a doteraz neznámu aktívnu úlohu pri tvorbe membrány deliacej prepážky počas bunkového delenia.



Projekty

1. VEGA 2/0001/09 - Ako bunka nájde miesto asymetrického delenia počas sporulácie *Bacillus subtilis*.
2. APVV-18-0104 – Asymetrické bunkové delenie počas tvorby bakteriálnej endospóry.

Výstupy

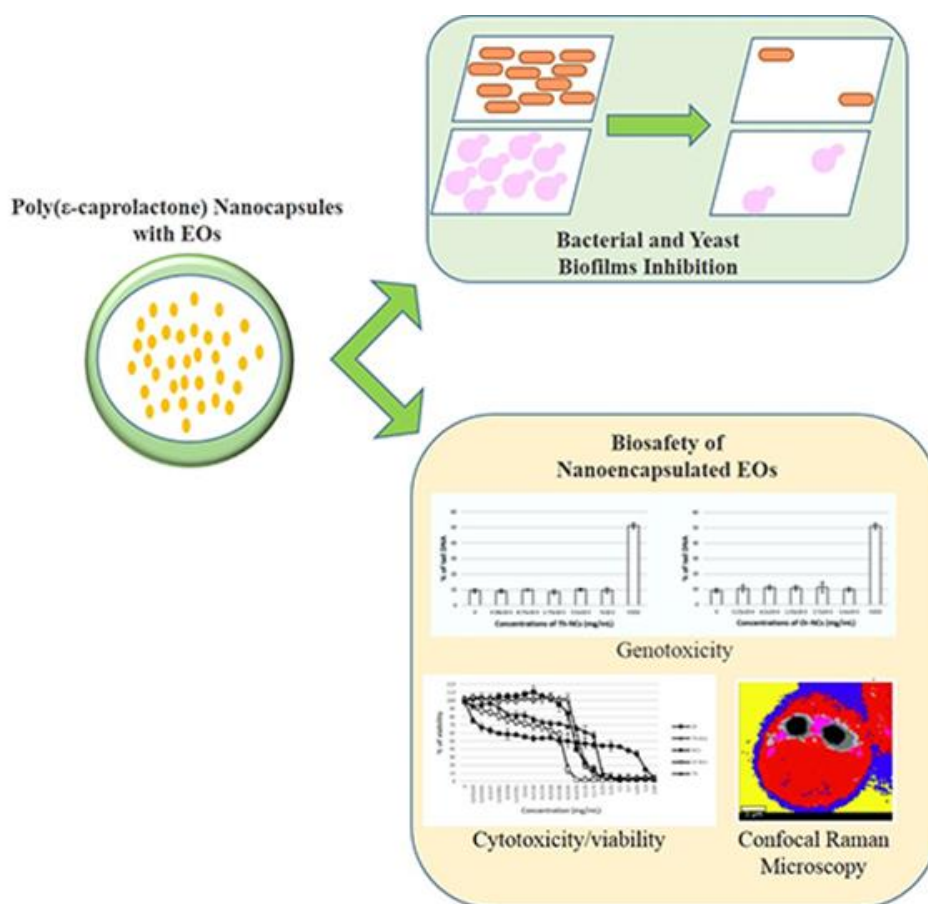
1. LABAJOVÁ, N.** - BARANOVA, N. - JURÁSEK, M. - VÁCHA, R.** - LOOSE, M. - BARÁK, I.**. Cardiolipin-containing lipid membranes attract the bacterial cell division protein divIVA. In International Journal of Molecular Sciences, 2021, vol. 22, no. 8350. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC).

2.3.2. Výsledky aplikačného typu

Poly(ϵ -kaprolaktón) enkapsulované nanočastice s éterickými olejmi so zvýšenou antimikrobiálnou aktivitou

Autori (za ÚMB SAV): Magdaléna Kapustová (Rusková), Andrea Puškárová, Mária Bučková, Domenico Pangallo

Nadmerné používanie syntetických zlúčenín s antimikrobiálnou aktivitou viedlo k selekcii rezistentných mikroorganizmov. V tejto súvislosti by použitie rastlinných éterických olejov (EO) s antimikrobiálnou aktivitou enkapsulovaných v ekologických nanosystémoch mohlo byť novou a významnou stratégiou na prekonanie tohto problému. EO chemotypu karvakrolu z *Thymus capitatus* a chemotypu tymolu a karvakrolu z *Origanum vulgare* boli zapuzdrené v biokompatibilných poly(ϵ -kaprolaktónových) nanokapsulách (NC). Tieto nanosystémy vykazovali antibakteriálne, antifungálne a antibiofilmové aktivity proti *Staphylococcus aureus*, *Escherichia coli* a *Candida albicans*. EO nanosuspenzie boli tiež testované proti panelu štrnástich kmeňov húb patriacich do *Ascomycota* a *Basidiomycota* phyla. Okrem toho bola hodnotená aj cytotoxicita a genotoxicita EO nanosuspenzií. Naše výskumy demonštrujú schopnosť poly(ϵ -kaprolaktónových) NC naplnených tymiánovým a oregánovým EO znižovať mikrobiálny rast a rast biofilmu a mohli by byť ekologickou alternatívou pri vývoji nových antimikrobiálnych stratégií.



Projekty

1. VEGA 2/0059/19 – “Kombinácia nanočastíc a esenciálnych olejov na zmiernenie biologického poškodenia rôznych typov stavebných materiálov”.

Výstupy

1. KAPUSTOVÁ, Magdaléna* - PUŠKÁROVÁ, Andrea - BUČKOVÁ, Mária - GRANATA, Giuseppe* - NAPOLI, Edoardo - ANNUŠOVÁ, Adriana - MESÁROŠOVÁ, Monika - KOZICS, Katarína - PANGALLO, Domenico** - GERACI, Coradda**. Biofilm inhibition by biocompatible poly(epsilon-caprolactone) nanocapsules loaded with essential oils and their cyto/genotoxicity to human keratinocyte cell line. In International Journal of Pharmaceutics, 2021, vol. 606, no. 12, art. no. 120846. (2020: 5.875 - IF, Q1 - JCR, 1.153 - SJR, Q1 - SJR, karentované - CCC).
2. KAPUSTOVÁ, Magdaléna* - GRANATA, Giuseppe* - NAPOLI, Edoardo - PUŠKÁROVÁ, Andrea - BUČKOVÁ, Mária - PANGALLO, Domenico** - GERACI, C.**. Nanoencapsulated essential oils with enhanced antifungal activity for potential application on agri-food, material and environmental fields. In Antibiotics, 2021, vol. 10, no. 31. (2020: 4.639 - IF, Q2 - JCR, 0.960 - SJR, Q1 - SJR).

2.3.3. Výsledky na báze medzinárodnej spolupráce

Antibakteriálna aktivita medu ako kvalitatívny parameter medu zohľadňujúci jeho biologickú funkčnosť

Autori (za ÚMB SAV): J. Majtán, M. Bučeková, J. Godočiková, V. Bugárová

Súčasný platný kvalitatívny parameter pre med nezohľadňuje jeho unikátnu biologickú funkčnosť, pričom med sa zaraďuje medzi tzv. funkčné potraviny. V našej vedeckej práci sme charakterizovali vplyv rôzneho typu zdroja sacharidov (nektár, sacharóza a invertný cukor) na celkovú antibakteriálnu

aktivitu včelou spracovaných produktov. Ukázalo sa, že antibakteriálna aktivita vzoriek medu bola signifikantne vyššia v porovnaní s aktivitou spracovaného roztoku sacharózy alebo invertného cukru. Avšak, nezaznamenali sme žiadne rozdiely v obsahu enzýmu glukózooxidáza a ani v hladinách naakumulovaného peroxidu vodíka medzi jednotlivými včelou spracovanými produktami. Z uvedených výsledkov vyplýva, že za antibakteriálnu aktivitu sú okrem včelích látok čiastočne zodpovedné aj látky botanického charakteru. Antibakteriálna aktivita medu by mohla predstavovať vhodný parameter určujúci kvalitu medu s ohľadom na jeho biologickú funkčnosť.

Projekty

1. VEGA 2/0004/18 – Vplyv včelieho enzýmu glukózooxidáza na antibakteriálne vlastnosti medu a charakterizácia jeho produkcie a aktivity v podhltanových žľazách včely medonosnej (*Apis mellifera*).

Výstupy

1. BUGÁROVÁ, V. - GODOČÍKOVÁ, J. - BUČEKOVÁ, M. - BRODSCHNEIDER, R. - MAJTÁN, J.**. Effects of the carbohydrate sources nectar, sucrose and invert sugar on antibacterial activity of honey and bee-processed syrups. In Antibiotics, 2021, vol. 10, no. 985. (2020: 4.639 - IF, Q2 - JCR, 0.960 - SJR, Q1 - SJR).
2. MAJTÁN, J.** - BUČEKOVÁ, M. - KAFANTARIS, I. - SZWEDA, P. - HAMMER, K. - MOSSIALOS, D. Honey antibacterial activity: A neglected aspect of honey quality assurance as functional food. In Trends in Food Science and Technology, 2021, vol. 118, p. 870-886. (2020: 12.563 - IF, Q1 - JCR, 2.676 - SJR, Q1 - SJR, karentované - CCC).

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

Tabuľka 2e Štatistika vybraných kategórií publikácií

PUBLIKAČNÁ A EDIČNÁ ČINNOSŤ	Počet v r. 2021/ doplňky z r. 2020
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)	3 / 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)	33 / 0
10. Vedecké práce registrované vo Web of Science Core Collection alebo Scopus (ADMA, ADMB, ADNA, ADNB)	11 / 0
11. Vedecké práce v ostatných domácich časopisoch (ADFA, ADFB)	0 / 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)	3 / 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 sa 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. 2020 (zdroj JCR) <i>Počet článkov / doplnky</i>	22 / 0	16 / 0	3 / 0	3 / 0	44 / 0
Podľa SJR z r. 2020 (zdroj Scimago) <i>Počet článkov / doplnky</i>	30 / 0	9 / 0	5 / 0	0 / 0	44 / 0

Tabuľka 2g Ohlasy

OHLASY	Počet v r. 2020/ doplnky z r. 2019
Citácie vo WOS (1.1, 2.1)	1292 / 49
Citácie v SCOPUS (1.2, 2.2)	107 / 4
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)	0 / 0
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	20
Prednášky a vývesky na národných vedeckých podujatiach	5

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

1. Bauer, J.: Interpreting Single-Molecule Force Spectroscopy Experiments with Normal Mode Analysis. *Webinar #13 Instruct Slovakia - 12 Oct 2021 Structure meets function*, Oxford, United Kingdom, 12 Oct 2021. (invited lecture)
2. Bauerová-Hlinková, V.: The Development of Structural Biology in Slovakia: Present and Future Perspectives. *Strategy for future EMBL research infrastructures in the Life Sciences in Hamburg*, Hamburg, Germany, 29-30 Mar 2021. (invited lecture)
3. Urbániková, L.: Protein as the main variable in crystallization. *9th FEBS practical crystallization course - Advanced methods in macromolecular crystallization IX*, České Budějovice, Czech Republic, 9-14 Aug 2021. (invited lecture)

2.6.2. Vyžiadané prednášky na národných vedeckých podujatiach

2.6.3. Vyžiadané prednášky na významných vedeckých inštitúciách

1. Barák, I. Beyond toxin transport: Novel role of ABC transporter for enzymatic machinery of cereulide NRPS assembly line. *Virtual TRR261 Seminar Series*. University of Tübingen, February 25, 2021.

2.7. Patentová a licenčná činnosť na Slovensku a v zahraničí v roku 2021

2.7.1. Vynálezy, na ktoré bol v roku 2021 udelený patent

a) na Slovensku

Názov vynálezu: Biopreparát z Exiguobacterium undae, spôsob jeho výroby a jeho použitie

Číslo patentu: 288915

Dátum priority: 6.3.2018

Majiteľ / spolumajiteľ: Ústav molekulárnej biológie SAV, Ústav hudobnej vedy SAV, Chemický ústav SAV, Technická univerzita vo Zvolene

Pôvodcovia vynálezu: Pangallo Domenico, Bauerová Vladena, Jeszeová Lenka, Bučková Mária, Puškárová Andrea, Kraková Lucia, Baráth Peter, Štafura Andrej, Nagy Štefan, Ing. Martin Čulík, PhD.

b) v zahraničí

2.7.2. Vynálezy prihlásené v roku 2021

a) na Slovensku

b) v iných krajinách ako prioritná prihláška

c) PCT

Názov vynálezu: Antimicrobial protein, antimicrobial recombinant protein with lytic properties, expression vector, method of their preparation and use

Krajina:

Číslo prihlášky: PCT/SK2021/050016

Dátum priority: 16.12.2021

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.

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 2021

b) udelené v roku 2021

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 2021 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
Bauerová Vladena	VEGA	2
Bukovská Gabriela	Vedecká grantová agentúra MŠVVaŠ SR a SAV/komisia VEGA č. 9	1
Krajčíková Daniela	VEGA	1
Majtán Juraj	VEGA	1

2.9. Účasť na spracovaní hesiel do encyklopédie Beliana

Počet autorov hesiel: 0

2.10. Recenzovanie knižných publikácií a príspevkov vo vedeckých časopisoch

Tabuľka 2j Počet vypracovaných recenzií na vedecké monografie, vedecké štúdie a zborníky

Meno pracovníka	Ved. monografie		Príspevky v časopisoch			Zborníky	
	Domáce	Zahraňníčné	WoS, SCOPUS	Iné databázy	Ostatné	Domáce	Zahraňníčné
Barák Imrich	0	0	5	0	0	0	0
Bučeková Marcela	0	0	7	0	0	0	0
Bukovská Gabriela	0	0	1	0	0	0	0
Gabriško Marek	0	0	1	0	0	0	0
Janeček Štefan	0	0	30	0	0	0	0
Kormanec Ján	0	0	1	0	0	0	0
Labajová Naďa	0	0	4	0	0	0	0
Majtán Juraj	0	0	21	0	0	0	0
Urbániková Ľubica	0	0	1	0	0	0	0
Zámocký Marcel	0	0	6	0	0	0	0
Spolu	0	0	77	0	0	0	0

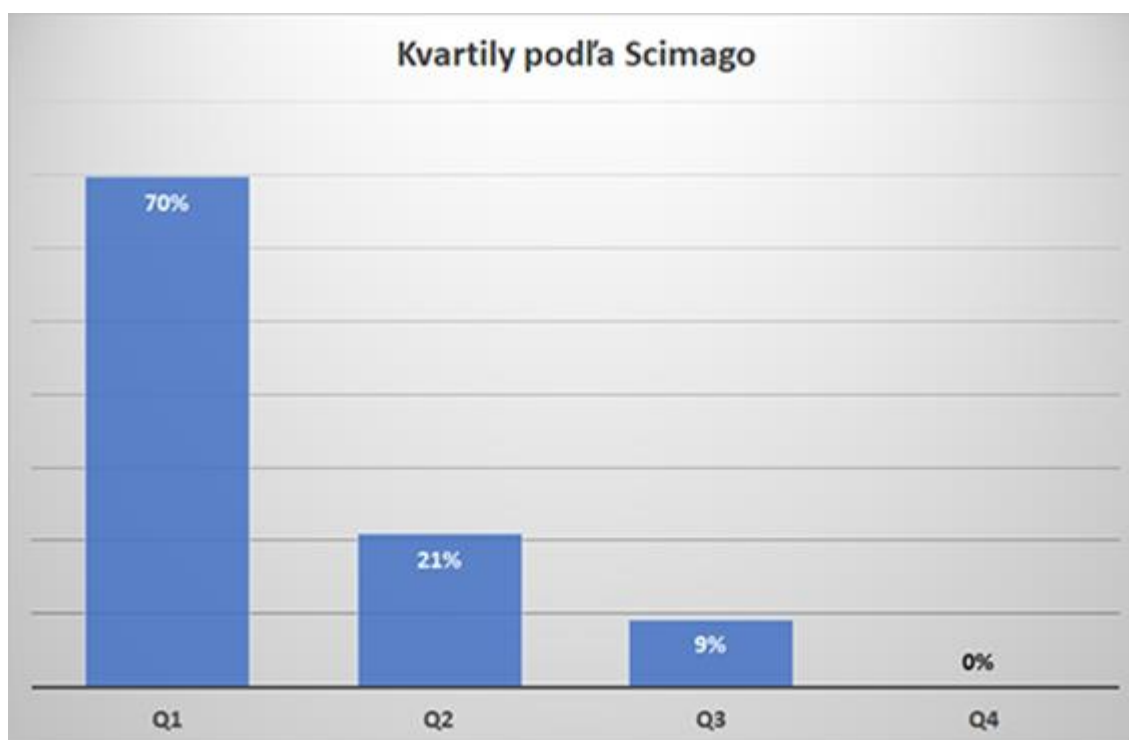
2.11. Iné informácie k vedeckej činnosti.

ÚMB SAV zareagoval na vzniknutú situáciu súvisiacu s príchodom pandémie COVID-19 a zapojil sa do jej riešenia už v roku 2020. 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 a už sa získali prvé výsledky z kokryštálov proteáz SARS-Cov-2 s potenciálnymi inhibítormi. 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 štrukturálnu 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, Communication Physics – Nature a Journal of Applied Crystallography.

Naša organizácia je medzinárodne etablovaná aj vďaka vedeckým databázam vytvoreným a spravovaným našim Oddelením genomiky a biotechnológií. Užitočnosť týchto databáz sa neprejavuje počtom citácií, ale počtom webových prístupov. Naše databázy zaznamenali vysoký počet unikátnych webových návštevníkov – vyše 6 tisíc pre databázu phiSITE, 2400 pre viruSITE a vyše 400 pre phiBIOTICS.

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 2021 vedeckí pracovníci ústavu publikovali celkovo 44 impaktovaných vedeckých publikácií. Novozavedený scientometrický indikátor, kvartily časopisov, potvrdil vysokú kvalitu našich publikácií. Vyše 90 % je v 1. a 2. kvartile Scimago (70 % z nich spadá do 1. kvartilu a 21 % do 2. kvartilu). Snaha publikovať hlavne v kvalitných medzinárodných časopisoch sa rovnako premieta v počte citácií našich prác. Za rok 2020 (vykazované v roku 2021) sme dosiahli 1442 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. 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.

V rámci medzinárodného projektu Interreg SK-AU „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 sú oslovovaní editormi z renomovaných zahraničných vedeckých časopisov ako recenzenti publikácií a ako experti sa zúčastňujú hodnotenia medzinárodných projektov.

Na národnej úrovni je ústav zapojený do projektu štrukturálnych fondov „Dlhodobý strategický výskum a vývoj zameraný na výskyt Lynchovho syndrómu v populácií 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 zaoberá štúdiom črevného mikrobiómu pacientov s kolorektálnym karcinómom a ľudí s Lynchovým syndrómom.

Pri doktorandskom štúdiu sa na ústave kladie dôraz na výber školiteľov, kde dôsledne požadujeme krytie kvalitnými projektami a solídnu publikačnú činnosť školiteľa. Dôsledne sme uplatňovali „Vnútný systém zabezpečenia kvality doktorandského štúdia“ pri prijímaní nových doktorandov, ktorý sa prijal v roku 2020. Aby sme zabezpečili kariérny rast vedeckých pracovníkov, maximálne podporujeme krátkodobé i dlhodobejšie 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 ako aj v minulom pandemickom roku sa tieto aktivity preniesli prevažne do internetových seminárov ústavu ako aj účasti na zahraničných internetových seminároch a konferenciách.

V tomto roku bol ocenený Dr. I. Barák ako Vedec roka SR 2020 a finalista ESET Science Award, v kategórii Výnimočná osobnosť slovenskej vedy.

Na základe pozvania prof. Ivany Kutej-Smatanovej z Fakulty prírodných vied Jihočeskej univerzity v Českých Budějoviciach (hlavná organizátorka kurzu) sa Ľubica Urbániková ako lektorka zúčastnila na 9. FEBS praktického kryštalizačného kurzu “Pokročilé metódy v kryštalizácii makromolekúl IX” (9th FEBS practical crystallization course “Advanced methods in macromolecular crystallization IX). Kurz sa konal v priestoroch Jihočeskej univerzity v Českých Budějoviciach v čase 9.-14.8.2021. Ide o medzinárodný kryštalizačný kurz s veľmi dobrým ohlasom u študentov, lektorov aj zástupcov FEBS, ktorý sa koná v pravidelných intervaloch už od roku 2004. Kurzy s kapacitou okolo 20-30 vybraných študentov z celého sveta sú kombináciou teoretických prednášok, praktických cvičení a kryštalizáciou proteínov prinesených študentami. Ľubica Urbániková predniesla prednášku “Proteins as the main variable in crystallization” a viedla aj praktické cvičenia kryštalizácie proteínov.

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

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 2021

Forma	Počet k 31.12.2021				Počet doktorandov po doktorandskej skúške		Počet ukončených doktorantúr v r. 2021					
	celkový počet		z toho novoprijatí				Ukončenie z dôvodov					
	M	Ž	M	Ž	M	Ž	ukončenie úspešnou obhajobou		predčasné ukončenie		neúspešné ukončenie	
Denná zo zdrojov SAV	3	11	1	3	3	8	1	3	0	1	0	0
Denná z iných zdrojov	0	0	0	0	0	0	0	0	0	0	0	0
Externá	1	1	0	0	1	1	0	0	0	0	0	0
Spolu	4	12	1	3	4	9	1	3	0	1	0	0
Z toho zahraničných	1	1	0	0	1	1	0	0	0	0	0	0
Súhrn	16		4		13		4		1		0	

Uvádzajte len doktorandov organizácie ako externej vzdelávacej inštitúcie.

Riadok „Spolu“ je súčtom troch riadkov nad ním. Každá bunka v riadku „Súhrn“ vyjadruje celkový počet doktorandov (mužov a žien spolu), čiže je súčtom príslušných dvoch buniek z riadku „Spolu“. V stĺpci „Počet doktorandov po doktorandskej skúške“ sa uvádza počet doktorandov, ktorí počas roku 2021 boli aspoň 1 deň doktorandami po doktorandskej skúške. Sú číselne zahrnutí aj v predchádzajúcich stĺpcoch.

Pod predčasným ukončením rozumieme ukončenie bez obhajoby dizertačnej práce pričom doktorand neabsolvoval celú štandardnú dĺžku štúdia. Pod neúspešným ukončením rozumieme ukončenie bez úspešnej obhajoby dizertačnej práce, pričom študent absolvoval celú štandardnú dĺžku štúdia.

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	1	0	0	0	0

3.3. Zoznam doktorandov, ktorí ukončili doktorandské štúdium úspešnou obhajobou

Tabuľka 3c Menný zoznam ukončených doktorandov v roku 2021 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 hodnotu
Mgr. Zuzana Kisová	interné štúdium hradené z prostriedkov SAV	9 / 2017	8 / 2021	4.2.7 mikrobiológia	RNDr. Mária Bučková PhD., Ústav molekulárnej biológie SAV, v. v. i.	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 2021 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 hodnotu
Mgr. Veronika Kotrasová	interné štúdium hradené z prostriedkov SAV	9 / 2016	8 / 2021	4.2.3 molekulárna biológia	Ing. Eva Kutejová DrSc., Ústav molekulárnej biológie SAV, v. v. i.	Prírodovedecká fakulta UK
Mgr. Maroš Laho	interné štúdium hradené z prostriedkov SAV	9 / 2015	8 / 2021	4.2.7 mikrobiológia	RNDr. Jaroslav Klaudivy PhD., Chemický ústav SAV	Prírodovedecká fakulta UK
Mgr. Barbora Stojkovičová	interné štúdium hradené z prostriedkov SAV	9 / 2017	11 / 2021	4.2.3 molekulárna biológia	RNDr. Vladimír Pevala PhD., Ústav molekulárnej biológie SAV, v. v. i.	Prírodovedecká fakulta UK

3.5. Uplatnenie absolventov doktorandského štúdia

Tabuľka 3e Prehľad uplatnenia absolventov doktorandského štúdia

Počet absolventov PhD. štúdia v roku 2021 (obhajoba leto 2021)	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
3	2	1	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	Zahranční doktorandi štátne občianstvo/počet
0	0	0	BIH/1, SRB/1

Zahranční 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	Názov doktorandského študijného programu	Doktorandské štúdium uskutočňované na (univerzita/vysoká škola a fakulta)
chémia	1420	biochémia	Prírodovedecká fakulta UK
biológia	1536	genetika, mikrobiológia, molekulárna biológia	Prírodovedecká fakulta UK
biochémia	4.1.22		Prírodovedecká fakulta UK
molekulárna biológia	4.2.3		Prírodovedecká fakulta UK
genetika	4.2.4		Prírodovedecká fakulta UK
mikrobiológia	4.2.7		Prírodovedecká fakulta UK

Názov a číslo študijného odboru vyplňte/vyberte podľa aktuálne platného zoznamu študijných odborov

<https://www.portalvs.sk/sk/studijne-odbory?from=menu1>.

Do 31. 8. 2023 študujú študenti doktorandského štúdia zaradení do študijných programov podľa zoznamu MŠVVaŠ, platného do 1. 9. 2019. Pre týchto študentov je potrebné napísať názov programu ako voľný text do stĺpca 3.

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 hodnotu alebo vyšší kvalifikačný stupeň
RNDr. Imrich Barák, DrSc. (mikrobiológia)	Prof. Ing. Štefan Janeček, DrSc. (Fakulta prírodných vied UCM)	Mgr. Marcela Bučeková, PhD. (IIa)
RNDr. Gabriela Bukovská, CSc. (mikrobiológia)		Mgr. Zuzana Chromiková, PhD. (IIa)
Prof. Ing. Štefan Janeček, DrSc. (molekulárna biológia)		Mgr. Barbora Stojkovičová, PhD. (IIb)
RNDr. Ján Kormanec, DrSc. (biochémia)		Prof. Ing. Štefan Janeček, DrSc. (prof., Univerzita sv. Cyrila a Metoda v Trnave)
RNDr. Ján Kormanec, DrSc. (molekulárna biológia)		Mgr. Barbora Stojkovičová, PhD. (PhD., Prírodovedecká fakulta UK)
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 2021

PEDAGOGICKÁ ČINNOSŤ	Prednášky		Cvičenia a semináre	
	doma	v zahraničí	doma	v zahraničí
Počet prednášateľov alebo vedúcich cvičení	8	0	12	0
Celkový počet hodín v r. 2021	131	0	301	0

Prehľad prednášateľov predmetov a vedúcich cvičení, s uvedením názvu predmetu, úväzku, katedry, fakulty, univerzity/vysokiej 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	14
3.	Počet pracovníkov, ktorí pôsobili ako školitelia doktorandov (PhD.)	11
4.	Počet školených doktorandov (aj pre iné inštitúcie)	15
5.	Počet oponovaných dizertačných a habilitačných prác	10
6.	Počet pracovníkov, ktorí oponovali dizertačné a habilitačné práce	9
7.	Počet pracovníkov, ktorí pôsobili ako členovia komisií pre obhajoby DrSc. prác	3
8.	Počet pracovníkov, ktorí pôsobili ako členovia komisií pre obhajoby PhD. prác	3
9.	Počet pracovníkov, ktorí pôsobili ako členovia komisií, resp. oponenti v inauguračnom alebo habilitačnom konaní na vysokých školách	4

3.9. Iné dôležité informácie k pedagogickej činnosti

V priebehu roka 2021 sa na Ústave molekulárnej biológie školilo v internej forme štúdia 14 doktorandov financovaných z prostriedkov SAV, z ktorých jedna doktorandka má prerušené štúdium (materská dovolenka). Ďalší dvaja doktorandi sa školili v externej forme štúdia. V septembri sme prijali tri nové doktorandky a jedného doktoranda. Tri doktorandky a jeden doktorand ukončili v tomto roku svoje štúdium úspešnou obhajobou, všetci v internej forme štúdia. Jedna doktorandka ukončila z vážnych rodinných dôvodov svoje štúdium predčasne, jedna doktorandka v roku 2021 prešla z internej formy štúdia na externú.

V roku 2021 sa na našom ústave uskutočňovalo doktorandské štúdium v štyroch študijných programoch: molekulárna biológia, mikrobiológia a genetika v odbore Biológia a biochémia v odbore Chémia, všetky v spolupráci s Prírodovedeckou fakultou UK Bratislava. Naši vedeckí pracovníci si v tomto roku vypísali 11 tém na doktorandské štúdium vo všetkých štyroch programoch.

Naši doktorandi sa aktívne zapájajú do vedeckého a spoločenského života na ústave. Mnohí z nich viedli v roku 2021 semináre a cvičenia na príslušných katedrách Prírodovedeckej fakulty UK, oponovali bakalárske práce a niektorí sa aktívne zúčastnili výuky na strednej škole a pod. Naša

doktorandka K. Papayová (školiťka G. Bukovská) získala v roku 2021 DoktorGrant, ktorý bude riešený v roku 2022.

Napriek vzniknutej situácii s COVID-19 pokračovali na ústave semináre, na ktorých doktorandi prezentovali výsledky svojej práce a to formou videokonferenčných seminárov.

Okrem doktorandského štúdia sa viacerí pracovníci ústavu aktívne podieľali na pedagogickom procese na viacerých slovenských ako aj zahraničných (Utrecht University, Holandsko) 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 a virológie, 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, ktorí majú každoročne možnosť zúčastniť sa prednášok na našom ústave v rámci akcie „Deň otvorených dverí“, v roku 2021 formou on line prednášok. 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 2021 alebo sa na ich organizácii podieľala, s vyhodnotením vedeckého a spoločenského prínosu podujatia

1. konferencia StruBioMol - Štruktúrna biológia pre medicínu a biotechnológiu, Ústav molekulárnej biológie SAV, 133 účastníkov, 06.12.-06.12.2021

4.1.2. Medzinárodné vedecké podujatia, ktoré usporiada organizácia SAV v roku 2022 (anglický a slovenský názov podujatia, miesto a termín konania, meno, telefónne číslo a e-mail zodpovedného pracovníka)

The Eight Symposium on the Alpha-Amylase Family - ALAMY 8/Ôsme sympóziu o alfa-amylázovej rodine - ALAMY 8, Smolenický zámok, Smolenice, Slovensko, 80 účastníkov, 09.10.-13.10.2022, (Štefan Janeček, 02 5930 7420, Stefan.Janecek@savba.sk)

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
Kutejová Eva	1	0	1
Spolu	1	0	2

4.2. Členstvo a funkcie v medzinárodných orgánoch

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

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. Účasť 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	Agentura pro zdravotnický výzkum ČR (AZV), zřízené Ministerstvem zdravotnictví ČR (MZ)	1

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“ <http://www.imb.savba.sk/strubiomol/index.php?id=home&lang=sk> 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 štruktúrnej biológie pre riešenie problémov v biomedicíne a biotechnológii. V rámci projektu sa tiež uskutočnili konferencia "Structural biology for medicine and biotechnology", prednášky pre študentov, vedeckých pracovníkov z vysokých škôl, ústavov SAV a výskumných pracovísk a open access s využívaním týchto prístrojov.

Skupina Laboratórium evolúcie proteínov (<http://imb.savba.sk/~janecek/>) vedená prof. 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 v zámorí, ktorá sa prejavuje najmä v riešení ad hoc rôznych výskumných problémov (napr. 10 spoločných publikácií za posledných 5 rokov 2017-2021 v časopisoch *Biotechnology Advances*, *Scientific Reports*, *Applied Microbiology and Biotechnology*, *FEBS Letters*, *Glycobiology*, *Proteins*, *3Biotech* a *Amylase*). 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 2021 realizovaná polročná stáž Filipa Marečka na DTU v Kodani podporená štipendiom SAIA v rámci ktorej úspešne pripravil a čiastočne biochemicky charakterizoval 4 amylolytické enzýmy z podrodiny GH13_39, pričom amylopululanázu z *Gottschalkia acidurici* sa mu podarilo získať v čistote a množstve vhodnom na následnú kryštalizáciu. Z ďalšej spolupráce významnej v roku 2021 možno spomenúť spoločnú prípravu publikácie typu "Opinion" pre časopis *Amylase* autorov Štefan Janeček a Birte Svensson, ktorá prináša zosumarizované názory autorov na alfa-amylázové rodiny v rámci databázy CAZy, klasifikujúcej enzýmy aktívne voči sacharidom (článok vyšiel začiatkom roku 2022). Naďalej pokračuje aj spolupráca s Nicole Koropatkinovou (Michiganská univerzita v Ann Arbor, Michigan, USA), týkajúca sa detailnej bioinformatickej analýzy škrob-viažucej domény z rodiny CBM74, ktorej terciárnu štruktúru vyriešili kolegovia v USA. Prejavom širokej medzinárodnej spolupráce vedúceho skupiny je aj dohoda v programovom výbore konferencie na uskutočnení v poradí už 8. sympózia zo série ALAMY ([ALpha-AMYlase family](http://imb.savba.sk/~janecek/Alamys/Alamy_8/); http://imb.savba.sk/~janecek/Alamys/Alamy_8/) v dňoch 9.-13. októbra 2022 tradične na Smolenickom zámku.

Pracovná skupina Fylogenickej ekológie dosiahla v roku 2021 nové významné výsledky týkajúce sa štúdia enzýmových antioxidantov. Popri superoxid dismutázach sme sa tento rok zamerali najmä na funkčnosť a evolučný pôvod askorbátových peroxidáz, ktoré hrajú dôležitú úlohu v rastlinných systémoch a môžu recyklovať vitamín C. Výsledky sme publikovali v spolupráci s výskumníkmi z

brazílskej univerzity v Porto Alegre. Ďalej sme pokračovali vo výskume peroxidáz-cyklooxygenáz z bezstavovcov v spolupráci s Universität für Bodenkultur vo Viedni. Tieto hémové haloperoxidázy majú sľubné biotechnologické využitie a podarila sa ich heterológna expresia. Napokon sa naše výskumy v spolupráci s výskumníkmi z Masarykovej univerzity v Brne zamerali na podrobné 3D modelovanie aktívneho centra unikátnych hybridných peroxidáz spolu s presne dokovanou hémovou prostetickou skupinou. Takto získané výsledky napovedajú o reaktivite týchto zvláštnych peroxidáz a umožňujú ich použitie ako enzýmové antioxidanty.

Laboratórium apidológie a apiterapie ÚMB SAV pod vedením Ing. Juraja Majtána, DrSc. sa v ostatnom roku aktívne podieľalo na medzinárodnej spolupráci s poprednými svetovými pracoviskami vo výskume medu a ostatných včelích produktov. V roku 2021, laboratórium hostilo zahraničnú doktorandku, Dr. Karolina Pelka z University of Gdansk (Poľsko) po dobu 3 mesiacov. Spoločná medzinárodná spolupráca v oblasti výskumu medu z pracoviskami v Poľsku, Grécku a Austrálii vyústila do spoločného vedeckého výstupu – publikácie v prestížnom karentovom periodiku “Trends in Food Science and Technology“ s IF 12,563.

*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. Laboratóriá 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 (2016-2021) máme z celkového počtu 212 impaktovaných publikácií s priemerným IF 4,345, 116 publikácií s IF 4,0 – 16,9, pričom medián IF pre oblasť BIOCHEMISTRY & MOLECULAR BIOLOGY je 3,861 a pre oblasť MICROBIOLOGY 3,473. Okrem toho väčšina našich publikácií (až 88 %) bola publikovaná v časopisoch patriacich do prvých dvoch kvalitatívnych kvartilov Scimago. Citovanosť našich článkov za obdobie (2016-2021) bola tiež na veľmi dobrej úrovni - 5789 citácií WOS a Scopus. V rámci nášho akčného plánu sa budeme snažiť zvýšiť počet publikácií, ich kvalita však bude zásadný ukazovateľ, ktorý budeme sledovať.

Navrhovaný spôsob zlepšenia:

Výskum, ktorý sa realizuje na našom pracovisku je zameraný na štúdium molekulárneho mechanizmu biologických procesov vyžadujúci si 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 – 2021) bola vysoká - 19 úspešne ukončených doktorandov, jedno predčasne ukončené štúdium doktorandky v externej forme štúdia (v r. 2018) a jednej doktorandky v dennej forme štúdia (v r. 2021). Povolený počet doktorandov bol pravidelne naplnený a vo väčšine rokov nám bola udelená výnimka na prijatie ďalšieho študenta, čím sme tento počet často prekročovali. 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 v tejto oblasti zaradil ÚMB do kategórie 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 Humboldt Foundation 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 minulom roku sa pracovníci ústavu zapojili do programu European Interest Group CONCERT-Japonsko s projektom Trvalo udržateľná regenerácia vody založená na filtrácii keramickými membránami a v rámci programu SAS-MOST (Taiwan) Joint Research Projects (2021-2023) sa rieši projekt (Epidemiológia vody/odpadovej vody: Vývoj spoľahlivých molekulárno-biologických detekčných metód pre dohľad nad ohniskami epidémií). Aj keď prvotným poslaním Slovenskej akadémie vied je kvalitný základný výskum, je určite veľmi prospešné keď sa získané výsledky, ktorých nositeľom je naše pracovisko, prenású 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) a v jeho aktivitách sa plánuje pokračovať aj v nasledujúcom období.

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. V tomto roku bol udelený **patent** na vynález s názvom „*Biopreparát z Exiguobacterium undae, spôsob jeho výroby a jeho použitie*“. Patentová prihláška PP50075-2020 „Antimikrobiálny proteín, antimikrobiálny rekombinantný proteín s lytickými vlastnosťami, expresný vektor, spôsob ich prípravy a použitie“ bola rozšírená do zahraničia pod podacím číslom **PCT/SK2021/050016**. Na základe výsledkov 7. rámcového programu bola predĺžená zmluva s konzorciom zahraničných firiem Nemysis o vzájomnej spolupráci v oblasti biotechnológií, ktorá sa úspešne realizuje.

V decembri 2021 bola podpísaná zmluva o spolupráci na obdobie 1 roku (od 1.1.2022 do 31.12.2022) medzi ÚMB SAV a súkromnou spoločnosťou NOTUS - POWERSONIC s.r.o. so sídlom vo

Vrábloch. Nosnou témou spolupráce je výskum alternatívneho technologického spracovanie medu pomocou ultrazvuku. Cieľom je vyrobiť a optimalizovať prototyp zariadenie na šetrné opracovanie medu, ktoré zabráni kryštalizácii medu.

5.3. Aktualizácia Akčného plánu organizácie v roku 2021

Z iniciatívy Predsedníctva SAV bol vypracovaný „Vnútorý systém zabezpečenia kvality doktorandského štúdia“, ktorý sa dôsledne uplatňoval aj 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 zväži 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 (praceneschopnosť, 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 pracoviska, resp. o vzájomnej spolupráci v konkrétnej oblasti výskumu

6.3. Spoločné projekty s univerzitami a ostatnými inštitúciami mimo SAV

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: Výsledkom spolupráce bola príprava a podanie patentovej prihlášky 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“ 16.12.2021 bola podaná PCT medzinárodná prihláška pod číslom PCT/SK2021/050016. „Antimicrobial protein, antimicrobial recombinant protein with lytic properties, expression vector, method of their preparation and use“ v anglickom jazyku.

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:

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 spoločenskej a hospodárskej praxi

7.2. Kontraktový – zmluvný výskum (vrátane zahraničných kontraktov)

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

Aj v roku 2021, Laboratórium apidológie a apiterapie ÚMB SAV pokračovalo v poskytovanej komerčnej službe pre včelárov v rámci projektu “medové laboratórium“ ako aj v bezplatnej konzultácii pre včelárov. V máji 2021 bolo podpísané memorandum o spolupráci medzi ÚMB SAV a Slovenským zväzom včelárov orientované na výskum nových kvalitatívnych parametrov medu. Laboratórium apidológie a apiterapie ÚMB SAV sa podieľa aj na ďalších komerčných aktivitách a to vykonávaním vedeckých analýz prírodných produktov ako sú esenciálne oleje, extrakty húb a kanabinoidy pre súkromné tuzemské a zahraničné subjekty.

V roku 2021 boli prostredníctvom Kancelárie pre transfer technológií oslovené viaceré národné a medzinárodné biotechnologické firmy s ponukou technológie prípravy nového antimikrobiálneho rekombinantného proteínu EN534-C s lytickými vlastnosťami voči patogénnym kmeňom *Streptococcus agalactiae* pre potenciálnych záujemcov z priemyslu.

Záujem prejavili spoločnosť PhagoMed Biopharma GmbH z Viedne, firmy TECHNOPHAGE (Portugalsko), s ktorou sa uskutočnilo online stretnutie a spoločnosť MICREOS (Švajčiarsko) (<https://www.micreos.com/>), s ktorou sa tiež uskutočnilo online stretnutie a rozhovory ďalej pokračujú.

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 Mackuľaka, 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.

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
	SFX Management Board at European XFEL (X-ray Free Electron Laser) in Hamburg, Germany	člen
	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore biochémia	člen
	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
RNDr. Peter Ferianc, CSc.	Zbor expertov pre biologickú bezpečnosť Ministerstva životného prostredia SR	člen
Prof. Ing. Štefan Janeček, DrSc.	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore molekulárna biológia	predseda
RNDr. Ján Kormanec, DrSc.	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore virológia	člen
	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore molekulárna biológia	člen
	SKVH komisia pre obhajoby doktorských dizertačných prác v odbore mikrobiológia	člen
Ing. Juraj Majtán, DrSc.	Odborná pracovná skupina pre farmakoekonomiku, klinické výstupy a hodnotenie zdravotníckych technológií MZ SR	člen
RNDr. Vladimír Pevala, PhD.	Komisia pre biologickú bezpečnosť	člen

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

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

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
1. konferencia StruBioMol - Štruktúrna biológia pre medicínu a biotechnológiu	medzinárodná	Ústav molekulárnej biológie SAV	06.12.-06.12.2021	133

9.3. Účasť na výstavách

Názov výstavy: Týždeň vedy a techniky na Slovensku 2021 - online Deň otvorených dverí ÚMB SAV

Miesto konania: ÚMB SAV, Bratislava

Dátum: 9.11.2021

Zhodnotenie účasti: V rámci Týždňa vedy a techniky na Slovensku 2021, usporiadalo naše pracovisko online Deň otvorených dverí, ktorého súčasťou boli tri prednášky (Mgr. R. Javorová - „Streptomycéty najvýznamnejší producenti antibiotík“, Mgr. D. Hadžega - „Ako čítať kód života“, Mgr. V. Bauerová, PhD. - „Majú bielkoviny svoju tvár?“). Na podujatie sa prihlásilo 8 tried zo 7 stredných škôl zo Slovenska. Prednášky boli po skončení podujatia hodnotené veľmi pozitívne zo strany študentov aj učiteľov.

Názov výstavy: Noc výskumníkov 2021 – Spoznaj svoju školu – Spoznaj svojho vedca

Miesto konania: ZŠ Morovnianska cesta, Handlová

Dátum: 24.9.2021

Zhodnotenie účasti: Naše pracovisko sa na festivale vedy Noc výskumníkov 2021 zapojilo do programu Spoznaj svoju školu – Spoznaj svojho vedca. Mgr. Ráchel Javorová priblížila študentom deviateho ročníka Základnej školy - Morovnianska cesta v Handlovej výskum antibiotík a baktérií, ktorému sa venujeme na Oddelení genomiky a biotechnológií na našom ústave. Od základných pojmov ako sú mikroorganizmy až po názorné ukážky pôdných baktérií streptomycét (významných producentov väčšiny pigmentov a antibiotík). Praktické ukážky zahŕňali napr. extrakciu modrého pigmentu indigoidín z buniek *Streptomyces lavendulae* a kreslenie na Petriho misky s tuhým živným médiom pôdnymi baktériami. Podujatie sa stretlo s veľmi pozitívnym ohlasom ako zo strany študentov, tak aj učiteľov, ktorí prejavili záujem o takéto prezentácie aj do nasledujúcich školských rokov.

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
Beke Gábor	0	0	1
Kľučár Ľuboš	0	0	1
Spolu	0	0	2

9.5. Členstvo v redakčných radách časopisov

RNDr. Imrich Barák, DrSc.

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

Prof. 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)
Frontiers in Microbiology (section: Food Microbiology) (funkcia: člen edičnej rady)
Heliyon (funkcia: člen edičnej rady)
Molecules (funkcia: člen edičnej rady)
Scientific Reports (funkcia: člen edičnej rady)
Včelár (funkcia: člen redakčnej 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

Mgr. Vladena Bauerová, PhD.

Slovenská spoločnosť pre molekulovú biológiu (funkcia: člen)

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.

Československá spoločnosť mikrobiologická (funkcia: člen)

Slovenská apiterapeutická spoločnosť (funkcia: člen výboru spoločnosti)

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

10. Činnosť knižnično-informačného pracoviska

10.1. Knižničný fond

Tabuľka 10a Knižničný fond

Knižničné jednotky spolu		4577
z toho	knihy a zviazané periodiká	4557
	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		
z toho zahraničné periodiká		0
Ročný prírastok knižničných jednotiek		
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 Klúčár, PhD.

- člen
- predseda II. komory

11.2. Členstvo v Predsedníctve SAV a vo Vedeckej rade SAV

11.3. Členstvo v komisiách SAV

RNDr. Imrich Barák, DrSc.

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

RNDr. Peter Ferianc, CSc.

- Komisia SAV pre životné prostredie a klimatickú zmenu (Člen)

Mgr. Ľuboš Klúčár, 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 zahraničné styky (člen)

RNDr. Ján Kormanec, DrSc.

- Komisia SAV pre posudzovanie vedeckej kvalifikácie zamestnancov (člen)

RNDr. Katarína Muchová, CSc.

- Komisia SAV pre životné prostredie a klimatickú zmenu (tajomníčka)

Mgr. Renáta Nováková, CSc.

- Etická komisia SAV (člen)

11.4. Členstvo v orgánoch VEGA

RNDr. Imrich Barák, DrSc.

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

Ing. Juraj Majtán, DrSc.

- Komisia VEGA č. 4 (člen)

12. Hospodárenie organizácie

12.1. Výdavky organizácie

Tabuľka 12a Výdavky organizácie (skutočnosť k 31. 12. 2021 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	2 174 804	1 030 247	1 122 752	21 805	47
z toho: mzdy (610)	1 098 905	508 351	579 301	11 253	46
vedecká výchova štipendiá (640)	132 195	132 195			100
poistné a príspevok do poisťovní (620)	375 863	171 102	200 945	3 816	46
tovary a služby (630)	406 838	195 044	205 057	6 737	48
transfery partnerom projektov (640)			137 449		
2. Kapitálové výdavky	7 299	2 243	5 056		31
z toho: obstarávanie kapitálových aktív	7 299	2 243	5 056		31
kapitálové transfery					

12.2. Zdroje financovania organizácie

Tabuľka 12b Zdroje financovania organizácie (skutočnosť k 31. 12. 2021 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)	1 032 490	2 243	508 351	171 102	
z toho: VEGA	121 026				
MVTS výskumné projekty	41 996			1 550	
MVTS podpora					
SASPRO/MOREPRO					
Vydávanie časopisov	7 050			716	
Vedeká výchova	132 195				

(štipendiá)					
OTAS (630)	27 238				
2. ŠF EÚ vr. fin. zo ŠR	743 753	5 056	509 670	177 164	51 863
3. medzinárodné grantové projekty	14 594		9 593	3 235	
z toho: H2020					
4. iné štátne a verejné zdroje (spolu)	351 133		69 631	23 782	85 586
z toho: APVV	351 133		69 631	23 782	85 586
podpora z kapitoly MŠVVaŠ SR (stimuly)					
5. ostatné zdroje	20 213		1 660	580	
z toho: príjmy z prenájmu	6 356				
príjmy z podnikateľskej činnosti					
príjmy z expertnej činnosti a služieb	11 111		1 660	580	

13. Nadácie a fondy pri organizácii SAV

14. Informácie o aktivitách súvisiacich s uplatňovaním princípov rodovej rovnosti

14.1. Stručné hodnotenie stavu uplatňovania princípov rodovej rovnosti v organizácii, súvisiace aktivity a opatrenia

Naše pracovisko dodržiava a uplatňuje princípy rodovej rovnosti v organizácii.

Naši zamestnanci sa zapojili do spolupráce a súčinnosti pri aktivitách projektu ATHENA v rámci rodového auditu. Konkrétne, realizácie dotazníkového prieskumu so zameraním sa na vzťahy medzi mužmi a ženami vo vede a na pracovisku.

V nasledujúcom období vedenie ústavu bude viac zamerané na zisťovanie, či prijaté opatrenia a aktivity vedenia ústavu nebudú mať negatívny dopad na rodovú rovnosť.

14.2. Rodová skladba hlavných riešiteľov (vedúcich) projektov

Tabuľka 14a Rodová skladba hlavných riešiteľov domácich projektov

ŠTRUKTÚRA PROJEKTOV	Organizácia SAV je nositeľom projektu			Organizácia SAV je zmluvným partnerom		
	Počet	Hlavný riešiteľ		Počet	Hlavný riešiteľ za organizáciu	
		Muž	Žena		Muž	Žena
1. Projekty VEGA	12	8	4	2	1	1
2. Projekty APVV	9	7	2	10	9	1
3. Projekty EŠIF	0	0	0	0	0	0
4. Projekty SASPRO, MoRePro	0	0	0	0	0	0
5. Iné projekty (FM EHP, Vedecko-technické projekty, na objednávku rezortov a pod.)	0	0	0	0	0	0

Tabuľka 14b Rodová skladba hlavných riešiteľov medzinárodných projektov

ŠTRUKTÚRA PROJEKTOV	Organizácia SAV je nositeľom projektu			Organizácia SAV je zmluvným partnerom		
	Počet	Hlavný riešiteľ		Počet	Hlavný riešiteľ za organizáciu	
		Muž	Žena		Muž	Žena
1. Projekty Horizont 2020 a Horizont Európa	0	0	0	0	0	0
2. Projekty ERA.NET, ESA, JRP	0	0	0	0	0	0
3. Projekty COST	0	0	0	0	0	0
4. Projekty EUREKA, NATO, UNESCO, CERN, IAEA, IVF, ERDF a iné	1	0	1	0	0	0
5. Projekty v rámci medzivládnych dohôd	0	0	0	0	0	0
6. Bilaterálne projekty MAD, Mobility, Open Mobility	0	0	0	0	0	0
7. Bilaterálne projekty ostatné	1	1	0	1	1	0
8. Podpora MVTS z národných zdrojov okrem SAV (APVV a iné)	0	0	0	0	0	0
9. SAS-UPJŠ ERC Visiting Fellowship Grants	0	0	0	0	0	0
10. Iné projekty	0	0	0	0	0	0

14.3. Výskum zameraný na rodovú problematiku

Uveďte stručné, základné informácie o projektoch orientovaných na rodovú problematiku, ak organizácia takýto výskum realizuje. Informácie o financovaní a výsledkoch takýchto projektov sa nachádzajú v kapitole 2 a v prílohe C.

Naša organizácia zatiaľ nie je zapojená do projektov orientovaných na rodovú problematiku.

15. 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. V tomto roku bolo aj jedným z hlavných organizátorov spoločnej videokonferenčnej konferencie organizácií *EMBnet a Goblet - GOBLET & EMBnet AGM 202: Bioinformatics Education & Training from 2012 and beyond*.

ÚMB SAV je sídlom redakcie medzinárodného časopisu *Biológia* (Botany, Zoology and Cellular and Molecular Biology) evidovaného v Current Contents a Web of Science pričom došlo významnému zlepšeniu IF z IF 2019: 0,811 na IF 2020: 1,350, časopis 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 2021 sa členovia iniciatívy zúčastnili v priebehu mesiaca september ako pozorovatelia pri oponentúrach 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.

16. Vyznamenania, ocenenia a ceny udelené pracovníkom organizácie v roku 2021

16.1. Domáce ocenenia

16.1.1. Ocenenia SAV

16.1.2. Iné domáce ocenenia

Barák Imrich

ESET Science Award

Oceňovateľ: ESET

Opis: Finalista ESET Science Award, Výnimočná osobnosť slovenskej vedy

Barák Imrich

Vedec roka SR

Oceňovateľ: CVTI-SAV-ZSVS

Opis: V kategórií Vedec roka Za unikátne výsledky v oblasti fyziológie baktérií a objav vzniku bakteriálnych nanotrubíc ako prejav zomierajúcej bunky.

16.2. Medzinárodné ocenenia

Majtán Juraj

World Expert in Honey Research

Oceňovateľ: Expertscape

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

V roku 2021 nebola prijatá žiadna žiadosť o prístup k informáciám.

18. Problémy a podnety pre činnosť SAV

Hoci sa v roku 2020 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.

V rámci revitalizácie a rekonštrukcie areálu SAV bolo navrhované zriadenie predškolského zariadenia. Pretože mladí vedeckí pracovníci majú často problém s umiestnením detí do „štátnych“ zariadení, ktoré majú často nedostatok miest a súkromné škôlky sú finančne veľmi nákladné, ocenili by sme, keby sa P SAV hľadalo možnosti už v súčasnej dobe, ako zriadiť predškolské zariadenie v areáli SAV.

Podobne pri diskusii o budúcnosti areálu SAV sa navrhovalo aj vytvorenie priestorov pre športové aktivity. Vzhľadom k sedavej činnosti väčšiny zamestnancov SAV by sme uvítali, keby sa hľadali priestory pre zriadenie fitnesscentra, prípadne inú športovú činnosť, výborné by bolo umožniť vytvorenie fyzioterapeutického zariadenia (alebo aspoň zabezpečiť prítomnosť fyzioterapeuta napr. dvakrát do týždňa), ktorý by mohli zamestnanci SAV navštevovať.

V areáli medzi Chemickým ústavom a Ústavom molekulárnej biológie (ponad tunel Sitina) je len cestná komunikácia pre vozidlá, čo nie je bezpečné pre chodcov (pracovníci SAV, študenti...). Bolo by dobré zvážiť vybudovanie chodníka popri tejto ceste, obzvlášť pokiaľ by došlo k rozvoju infraštruktúry v tejto oblasti. Priestorové možnosti na vybudovanie chodníka aj infraštruktúry tam sú.

Správu o činnosti organizácie SAV spracoval(i):

Mgr. Ľuboš Kľučár, PhD., 02 5930 7413

Schválila vedecká rada organizácie SAV dňa 27.1.2022

Riaditeľ organizácie SAV

Predseda vedeckej rady

.....
Ing. Eva Kutejová, DrSc.

.....
RNDr. Imrich Barák, DrSc.

Prílohy**Príloha A****Zoznam zamestnancov a doktorandov organizácie k 31.12.2021****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.	Prof. 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	0.75
Samostatní vedeckí pracovníci			
1.	Mgr. Martina Baliová, PhD.	100	1.00
2.	Jacob Bauer, PhD.	100	1.00
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 Kl'učár, PhD.	100	1.00
14.	Ing. Daniela Krajčíková, CSc.	100	1.00
15.	Mgr. Lucia Kraková, PhD.	100	0.50
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	1.00
4.	Mgr. Marek Gabriško, PhD.	100	1.00
5.	Mgr. Zuzana Chromiková, PhD.	100	1.00
6.	RNDr. Mária Kajsiková, PhD.	100	1.00
7.	RNDr. Romana Kalianková Chovanová, PhD.	100	1.00
8.	Mgr. Zuzana Kisová, PhD.	100	1.00
9.	RNDr. Andrea Kuchtová, PhD.	50	0.00
10.	Mgr. Nina Kunová, PhD.	100	1.00
11.	Mgr. Nad'a Labajová, PhD.	100	1.00
12.	Mgr. Matej Planý, PhD.	100	1.00
13.	Mgr. Matej Stano, PhD.	10	0.10
14.	Mgr. Barbora Stojkovičová, PhD.	100	1.00
15.	RNDr. Zuzana Šramková, PhD.	50	0.00
Odborní pracovníci s VŠ vzdelaním (výskumní a vývojoví zamestnanci)			
1.	Mgr. Veronika Bellová	100	0.58
2.	RNDr. Ľubomíra Fecková	100	1.00
3.	Ing. Jana Godočíková	100	1.00
4.	Ing. Janka Harichová	100	1.00
5.	Mgr. Filip Mareček	25	0.25
6.	Mgr. Lucia Martináková	100	1.00
7.	Ing. Bronislava Řežuchová	100	1.00
8.	RNDr. Beatrice Ševčíková	100	1.00
Odborní pracovníci s VŠ vzdelaním (ostatní zamestnanci)			
1.	Ing. Alžbeta Janečková	50	0.50
2.	Ing. Dana Rybárová	100	1.00
3.	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.	Dáša Jašková	100	1.00
7.	Karol Ondrovič	100	1.00

Zoznam zamestnancov, ktorí odišli v priebehu roka

	Meno s titulmi	Dátum odchodu	Ročný prepočítaný úväzok
Vedeckí pracovníci			
1.	RNDr. Zuzana Šramková, PhD.	31.12.2021	0.00
Odborní pracovníci s VŠ vzdelaním (výskumní a vývojoví zamestnanci)			
1.	Mgr. Zuzana Janíčková	31.8.2021	0.17
2.	Mgr. Veronika Kotrasová	31.3.2021	0.22
Odborní pracovníci s VŠ vzdelaním (ostatní zamestnanci)			
1.	Mgr. Barbora Rajčeková	31.10.2021	0.11
2.	Mgr. Simona Štrbová	14.4.2021	0.29
Ostatní pracovníci			
1.	Emília Chovancová	31.5.2021	0.42

Zoznam doktorandov

	Meno s titulmi	Škola/fakulta	Študijný odbor
Interní doktorandi hradení z prostriedkov SAV			
1.	Mgr. Dominika Csölleiová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
2.	Mgr. Dominik Hadžega	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
3.	Mgr. Henrieta Havalová	Prírodovedecká fakulta UK	1420 chémia
4.	Mgr. Iveta Jahodová	Prírodovedecká fakulta UK	1420 chémia
5.	Mgr. Ráchel Javorová	Prírodovedecká fakulta UK	1536 biológia
6.	Ing. Evelína Kalocsaiová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
7.	Mgr. Kristína Papayová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
8.	MSc. Jelena Pavlović	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
9.	Mgr. Adam Poláček	Prírodovedecká fakulta UK	1420 chémia

10.	Mgr. Andrej Poljovka	Prírodovedecká fakulta UK	1536 biológia
11.	Mgr. Romana Praženicová	Prírodovedecká fakulta UK	1420 chémia
12.	Mgr. Magdaléna Rusková	Prírodovedecká fakulta UK	1536 biológia
13.	Mgr. Monika Zámocká	Prírodovedecká fakulta UK	1536 biológia
14.	Mgr. Silvia Žarnovičanová	Prírodovedecká fakulta UK	1536 biológia
Interní doktorandi hradení z iných zdrojov			
<i>organizácia nemá interných doktorandov hradených z iných zdrojov</i>			
Externí doktorandi			
1.	Mgr. Veronika Bugárová	Prírodovedecká fakulta UK	4.2.3 molekulárna biológia
2.	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, v. v. i.
Počet spoluriešiteľských inštitúcií:	2 - Rakúsko: 1, Slovensko: 1
Čerpané financie:	Interreg Slovakia-Austria, European Regional Development Fund: 51863 €

Dosiahnuté výsledky:

V rámci projektu StruBioMol (Interreg V-A Slovakia-Austria) boli organizované tri prednášky pre výskumných pracovníkov, doktorandov a študentov VŠ z univerzít cezhraničného regiónu, ako aj ďalších záujemcov z praxe, na ktorých sa zúčastnil veľký počet záujemcov z Viedne a Bratislavského regiónu. Prednášky sa konali: 14.01.2021 (Dr. Jacob BAUER - Analýza v normálnom režime a jej aplikácia na štúdie štruktúry proteínov), 04.05.2021 (Prof. Tony Wilkinson - Systémy posttranslačných modifikácií ako ciele inhibície v liečbe Leishmaniózy) a 23. novembra 2021 (Dr. Dominika Fričová - What can we learn from Parkinson's disease-related mutations?).

<http://www.imb.savba.sk/strubiomol/index.php?id=Events&lang=sk>

Ďalej sme zorganizovali konferenciu „1st StruBioMol Conference - Structural biology for medicine and biotechnology“. Na konferencii prednášali špičkoví vedeckí pracovníci z viacerých etablovaných európskych inštitúcií vrátane Francis Crick Institute, European Synchrotron Radiation Facility (ESRF), Institute of Biophysics Czech Academy of Sciences, Department of Biosciences University of Milano, National Institute of Chemistry Slovenia, Technical University of Denmark, Institute of Organic Chemistry and Biochemistry The Czech Academy of Sciences, DESY Hamburg a Department of Structural and Computational Biology MPL University of Vienna. Koncom decembra 2021 vyšiel druhý diel monografie Proteíny – štruktúra a funkcia. Podobne ako prvý diel aj druhý diel vznikol na základe spolupráce Ústavu molekulárnej biológie SAV a Katedry mikrobiológie a virológie Prírodovedeckej fakulty UK Bratislava. Monografia je určená predovšetkým pre študentov bakalárskeho, magisterského a doktorandského štúdia, súčasne však všetkým, ktorí sa chcú dozvedieť viac o štruktúre a funkcii bielkovín.

Programy: Bilaterálne - iné

2.) Epidemiológia vody/odpadovej vody: Vývoj spoľahlivých molekulárno-biologických detekčných metód pre dohľad nad ohniskami epidémií (*Water/Wastewater epidemiology: Development of robust and reliable molecular detection systems for surveillance of disease outbreaks*)

Zodpovedný riešiteľ: Domenico Pangallo
Trvanie projektu: 1.1.2021 / 31.12.2023
Evidenčné číslo projektu: MOST 108-2221-E-006 -160 -MY3
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 2 - Taiwan: 2
Čerpané financie: SAS-MOST Joint Research Projects: 24996 €

Dosiahnuté výsledky:

V tomto roku sme optimalizovali rôzne metódy real-time PCR s cieľom odhaliť SARS-CoV-2 vo vzorkách odpadových vôd. Bola vyvinutá aj vysokovýkonná sekvenčná stratégia založená na platforme MinION na identifikáciu komunity rezistentných mikroorganizmov vo vzorkách odpadových vôd.

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 koordinátorom projektu: nie
Koordinátor: TUBITAK, Marmara Research Center (TUBITAK MRC)
Počet spoluriešiteľských inštitúcií: 6 - Japonsko: 2, Slovensko: 2, Turecko: 2
Čerpané financie: EIG Concert Japan: 17000 €

Dosiahnuté výsledky:

V tomto roku sme optimalizovali rôzne metódy real-time PCR s cieľom odhaliť gén *intl1* (prítomný v mnohých baktériách odolných voči antibiotikám) vo vzorkách životného prostredia: vode, odpadovej vode, plastoch a čiastočkách mikroplastov. Bola vyvinutá vysokovýkonná sekvenčná stratégia založená na platforme MinION na identifikáciu komunity rezistentných mikroorganizmov v rôznych vzorkách súvisiacich s vodou.

Domáce projekty

Programy: VEGA

1.) Regulácia interakčnej špecificity multi-PDZ proteínov

Zodpovedný riešiteľ: Martina Baliová
Trvanie projektu: 1.1.2021 / 31.12.2024
Evidenčné číslo projektu: 2/0127/21
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 3673 €

Dosiahnuté výsledky:

Pomocou detailnej bodovej mutagenézy sa nám podarilo zistiť, že PDZ motívy niektorých transportérov neurotransmiterov sú schopné okrem klasického interakčného módu interagovať aj atypickým spôsobom. Experimentálne výsledky sme korelovali s dobrou zhodou aj s navrhnutými in silico PDB modelmi.

2.) Ako bunka nájde miesto asymetrického delenia počas sporulácie *Bacillus subtilis*. (How the cell finds the asymmetric site of septation during sporulation of *Bacillus subtilis*)

Zodpovedný riešiteľ: Imrich Barák
Trvanie projektu: 1.1.2021 / 31.12.2024
Evidenčné číslo projektu: 2/0001/21
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 14685 €

Dosiahnuté výsledky:

Delenie buniek *B. subtilis* a jeho regulácia sa študujú už desaťročia. Aj keď mnohé štúdie odpovedali na mnoho otázok, stále ešte úplne nechápeme ako bunka presne rozpoznáva svoje miesto v strede bunky počas vegetatívneho rastu. Ešte menej sa vie o tom, ako sa asymetrické delenie reguluje počas sporulácie. Zdá sa, že existencia asymetrického delenia má kľúčový význam pri nastavovaní asymetrickej génovej expresie potrebnej na umožnenie diferenciácie buniek *B. subtilis*. Aby bolo možné rozlíšiť, ako je rozpoznávané asymetrické miesto septácie a ako sa tvorí sporulačné septum, bude potrebné objasniť, ako sa tvorí veľký komplex deliacich proteínov a ako interaguje s proteínmy biosyntézy peptidoglykánov. Na dosiahnutie tohto cieľa projektu, v prvom roku sme pripravili kmene na stanovenie funkcie EzrA, GpsB, RefZ, SpoIIE a Min počas sporulácie. Ako najdôležitejšie bola príprava plazmidových konštruktov na štúdium lokalizácie deliacich proteínov počas sporulácie - fúzie génov s Ypet, CyPet, neongreen a scarlet fluorescenčnými fúziami.

Publikácie:

1. D. Krajcikova, V. Bugarova and I. Barak (2021) YncD, *Bacillus subtilis* spore coat alanine racemase and its role in spore formation and germination. *Microorganisms* 9, 285. <https://doi.org/10.3390/microorganisms9020285> (IF 4.15) (Q2 JCR2019; Qx SJR2019)
2. N. Labajova, N. Baranova, M. Jurásek, R. Vácha, M. Loose and I. Barak (2021) DivIVA binds to cardiolipin-containing lipid bilayers. *Int. J. Mol. Sci.*, 22, 8350. <https://doi.org/10.3390/ijms22158350> (IF 5.92) (Q1 JCR2020; Q1 SJR2020)
3. Barak I. (2021) Special Issue “*Bacillus subtilis* as a Model Organism to Study Basic Cell Processes”. *Microorganisms* 9, 2459 (IF 4.15) (Q2 JCR2019; Qx 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, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 7283 €

Dosiahnuté výsledky:

V druhom roku riešenia projektu sme pokračovali v "in silico" analýze vybraných mutácií N-terminálnej oblasti ľudského ryanodínového receptora 2. Zamerali sme sa na oblasť svoriek ľudského srdcového ryanodínového receptora 2 (zvyšky ~ 850-1100), ktorá interaguje s viacerými bielkovinami, modulujúcimi cytoplazmatickú hladinu Ca²⁺ v myocytoch. Exprimovali sme oblasť zahŕňajúcu RYR1a2 doménu (Repeat1-2) a optimalizovali purifikáciu týchto fragmentov. Poznatky a skúsenosti získané pri "in silico" štúdiu ryanodínového receptora 2, predovšetkým aplikácia molekulovej dynamiky a tzv. „normal mode“ analýzy, nám umožnila lepšie porozumenie procesov zbaľovania a rozbaľovania viacerých bielkovín.

Výsledky sme publikovali v renomovanom vedeckom časopise Nanomaterials a kapitole vo vedeckej monografii vydanej zahraničným vydavateľom (Intech, London, UK). Okrem toho sme v spolupráci s Katedrou mikrobiológie a virológie PriFUK vydali druhý diel vedeckej monografie s názvom Proteíny - Štruktúra a Funkcia, podnadvpis Funkcia Proteínov.

Zoznam publikácií:

1. Jacob Bauer, Gabriel Žoldák. Interpretation of Single-Molecule Force Experiments on Proteins Using Normal Mode Analysis. Nanomaterials 2021, 11(11), 2795.
<https://doi.org/10.3390/nano11112795>
2. Jacob A. Bauer, Vladena Bauerová-Hlinková. Normal Mode Analysis: A Tool for Better Understanding Protein Flexibility and Dynamics with Application to Homology Models. In: Homology Molecular Modeling - Perspectives and Applications. IntechOpen, London, UK. 2021, p. 13-30 ISBN: 978-1-83962-805-4; on-line ISBN: 978-1-83962-806-1. DOI: 10.5772/intechopen.94139
3. Peter Kabát, Vladena Bauerová-Hlinková, Jacob Bauer. PROTEÍNY - ŠTRUKTÚRA A FUNKCIA; 2. diel Funkcia proteínov. Vydavateľstvo UK, Bratislava, 2021, 106 strán, ISBN: 978-80-223-5094-5. https://www.sav.sk/?lang=sk&doc=user-org-user&user_no=721&action=publications

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 nie

koordinátorom projektu:

Koordinátor: Fyzikálny ústav SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA: 3900 €

Dosiahnuté výsledky:

Éterické oleje (EO) chemotypu karvakrol *Thymus capitatus* (Th) a chemotypu tymol a karvakrol *Origanum vulgare* (Or) boli zapuzdrené v biokompatibilných poly(ϵ -kapolaktónových) nanokapsulách (NC). Tieto nanosystémy vykazovali antibakteriálne, antifungálne a antibiofilmové aktivity proti *Staphylococcus aureus*, *Escherichia coli* a *Candida albicans*. Th-NC a Or-NC boli účinnejšie proti všetkým testovaným kmeňom ako čisté EO a zároveň neboli cytotoxické na HaCaT (T0020001) bunkovú líniu ľudských keratinocytov.

Publications:

Kapustová, M., Granata, G., Napoli, E., Puškárová, A., Bučková, M., Pangallo, D., & Geraci, C. (2021). Nanoencapsulated essential oils with enhanced antifungal activity for potential application on agri-food, material and environmental fields. *Antibiotics*, 10(1), 31.
Kapustová, M., Puškárová, A., Bučková, M., Granata, G., Napoli, E., Annušová, A., Mesárošová, M., Kozics, K., Pangallo, D. and Geraci, C., 2021. Biofilm inhibition by biocompatible poly (?-caprolactone) nanocapsules loaded with essential oils and their cyto/genotoxicity to human keratinocyte cell line. *International Journal of Pharmaceutics*, 606, 120846.

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, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 6590 €

Dosiahnuté výsledky:

V poslednom roku riešenia projektu VEGA sme pokračovali v charakterizácii replikačných proteínov bakteriofága BFK20 a bakteriofága phiBP. Replikačný proteín gp43 bakteriofága BFK20 je multifunkčný proteín s primázovou-polymerázovou a helikázovou doménou. Helikázová doména s konzervovanými motívmi replikatívnych helikáz z rodiny SF4 sa nachádza v C-koncovej oblasti proteínu. Delečné mutanty obsahovali helikázové jadro so všetkými konzervovanými motívmi a prilahlé oblasti rôznej dĺžky. Charakterizovali sme a porovnali vlastnosti jednotlivých mutantov – ATPázovú a helikázovú aktivitu, oligométny stav a väzbu na DNA. Pripravili sme publikáciu o delečných mutantoch proteínu gp43, ktorá bola po revízii prijatá na publikovanie. Pokračovali sme v práci s bodovými mutantami proteínu gp41 - helikázy z rodiny SF2 fága BFK20. Začali sme testovať ich ATPázovú aktivitu a väzbu na DNA substrát. Ďalej sme pokračovali v charakterizácii jedného z replikačných proteínov bakteriofága phiBP: organizátora fágového replizómu. Testovali sme oligométny stav proteínu pomocou kroslinkovania glutaraldehydom, natívnej elektroforézy BN-PAGE a FPLC gélovej filtrácie na kolóne Superdex 200 Increase. Zistili sme, že organizátor replizómu vytvára oligométny komplex s vyšším počtom podjednotiek, pravdepodobne 6 a 12. Pripravili sme bodový mutant so zamenou aminokyseliny K8A (lyzín v

pozícii 8 zamenený za alanín) s cieľom overiť vplyv tejto zámény na ATPázovú aktivitu proteínu. Pokračovali sme v príprave publikácie o [*Brevibacterium*] *flavum* CCM 251, priemyselnom producentovi L-lyzínu. Osekvenovali sme genóm [*B.*] *flavum* CCM 251 pomocou MinION technology (ONT Nanopore). Následne sme s využitím bioinformatických prístupov stanovili základné vlastnosti genómu: 3,362,281 bp, 54.13% G+C, 3,190 génov, 93.3% CDSs. Zistili sme 99,98% homológiu s kmeňmi [*Brevibacterium*] *flavum* ATCC 15168 (CP011309) a *Corynebacterium glutamicum* BE (CP053188) a 92,18% s *Corynebacterium glutamicum* ATCC 13032. Na základe in silico analýzy sme v [*B.*] *flavum* CCM 251 detegovali dve kompletne aspartátové biosyntetické dráhy, ktoré sa podieľajú na produkcii L-lyzínu (priamy variant a sukcinylázový variant). Publikácia bola akceptovaná v časopise *Biologia*.

Výstupy:

- 1.Halgasova N., Krajcikova D., Kraus D., Bukovska G. The helicase core accessory regions of the phage BFK20 DnaB-like helicase gp43 significantly affect its activity, oligomeric state and DNA binding properties. (2021) *Virology* 558: 96-109. <https://doi.org/10.1016/j.virol.2021.02.016>
- 2.Nora Halgasova and Gabriela Bukovska: Three charged amino acid residues at the extreme C-terminus of the BFK20 gp41 helicase play a role in the ATPase activity of the protein. Poster - Abstract ID: 121, page 22 In: Book of Abstracts: Helicases and Nucleic Acid-Based Machines: Structure, Mechanism and Regulation and Roles in Human Disease. Online conference 6. – 9. JULY 2021, France
- 3.Maria KAJSIKOVA, Michal KAJSIK, Hana DRAHOVSKA and Gabriela BUKOVSKA: Complete genome sequence of the industrial l-lysine production strain [*Brevibacterium*] *flavum* CCM 251. *Biologia*, Section Cellular and Molecular Biology. Accepted.

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, v. v. i.
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 5528 €

Dosiahnuté výsledky:

10-30 % septínov v kvasinkách je počas mitózy sumoylovaných. Úloha sumoylovaných septínov je neznáma. Prvým krokom pre pochopenie úlohy tejto posttranslačnej modifikácie je identifikácia proteínov, ktoré špecificky interagujú so sumoylovanými septínmi. Kvasinkové septíny (Cdc3 - Cdc10 - Cdc11 - Cdc12) exprimované v baktériách boli sumoylované in vitro a naviazané na magnetické guľičky (kraličie IgG) cez TAP tag. Guľičky s naviazanými septínmi boli inkubované s bunkovým extraktom z kvasiniek. Guľičky boli následne premyté a septíny s interagujúcimi proteínmi eluované. Paralelne sme uskutočnili tento experiment s nemodifikovanými septínmi. Vzorky sa potom naniesli polyakrylamidový gél a nechali vbehnúť do gélu. Gél bol ofarbený s koloidnou Coomassie, proteínove pásiky vyrezané a uskutočnené štiepenie trypsinom v géli. Interagujúce proteíny boli identifikované pomocou hmotnostnej spektrometrie. Slx5-Slx8, proteínový komplex sprostredkujúci ubiquitináciu sumoylovaných proteínov (STUbL), je jeden príklad z identifikovaných proteínov, ktoré špecificky interagovali so sumoylovanými septínmi. Táto interakcia bola už potvrdená pomocou pull-down experimentu. Predpokladáme, že sumoylácia

je potrebná pre proteolytickú degradáciu septínov. Ďalšie funkcie sumoylácie septínov sú predmetom budúceho skúmania.

7.) Amylololytické enzýmy – tisíce sekvencií, stovky štruktúr, desiatky špecificít – a čo evolúcia...? (*Amylolytic enzymes – thousands of sequences, hundreds of structures, dozens of specificities – and what about evolution...?*)

Zodpovedný riešiteľ: Štefan Janeček
Trvanie projektu: 1.1.2021 / 31.12.2024
Evidenčné číslo projektu: 2/0146/21
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 10551 €

Dosiahnuté výsledky:

(1)

N-terminálna doména prítomná v skupine amylo maltáz z rodiny GH77 reprezentovaných enzýmami z *Escherichia coli* a *Corynebacterium glutamicum* bola na základe detailnej in silico štúdie navrhnutá ako nová možná škrob-viažuca doména.

Marecek F., Müller M.S., Svensson B. & Janecek S.: A putative novel starch-binding domain revealed by in silico analysis of the N-terminal domain in bacterial amylo maltases from the family GH77. *3 Biotech* 2021, 11: 229. doi: 10.1007/s13205-021-02787-8

(2)

Na základe detailnej bioinformatickej analýzy alfa-amyláz z rodiny GH13 klasifikovaných do podrodín 1, 5, 15, 24, 32 a 42 bola zistená výnimočnosť podrodiny GH13_32, ktorá obsahuje fungálne alfa-amylázy ako aj ich bakteriálne homológy aktivované chloridovým aniónom.

Janickova Z. & Janecek S.: In silico analysis of fungal and chloride-dependent alpha-amylases within the family GH13 with identification of possible secondary surface-binding sites. *Molecules* 2021, 26: 5704. doi: 10.3390/molecules26185704

8.) Úloha N-terminálnej fosforylácie a prirodzenej proteínovej neusporiadanosti v regulácii stability transportérov neurotransmiterov.

Zodpovedný riešiteľ: František Jurský
Trvanie projektu: 1.1.2021 / 31.12.2024
Evidenčné číslo projektu: 2/0126/21
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 3512 €

Dosiahnuté výsledky:

V prvom roku riešenia projektu boli vytvorené viaceré fosfomimetické a neutrálne mutácie v N-terminálnom konci glycinového transportéra GlyT2 a sledovaný ich vplyv na štiepenie proteázou

kalpain. Bol tiež zaznamenaný ich vplyv na mikroštruktúru proteínu detegovaný pomocou jeho dynamickej interakcie s farbičkou Coomassie Brilliant Blue.

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, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 14719 €

Dosiahnuté výsledky:

Baktérie sú vo svojom prirodzenom prostredí vystavené rôznym stresovým podmienkam, pričom odozva na tieto strese 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.

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 homológov tohto stresového sigma faktora SigB, 45 homológov anti-sigma faktora RsbW, 17 homológov anti-anti-sigma faktora RsbV a 44 homológov aktivačných PP2C fosfatáz RsbU/RsbP. Tieto homológy (SigB, SigF, SigG, SigH, SigI, SigK, SigL, SigM, SigN) hrajú dominantnú úlohu najmä v kontrole morfolologickej diferenciácie a v odozve na osmotický stres. Porovnanie aminokyselinových sekvencií SigB homológov u *S. coelicolor* odhalilo značnú podobnosť medzi týmito sigma faktormi, a to najmä v oblastiach 2.4 a 4.2, ktoré sú dôležité v rozpoznávaní oblastí promótorov -10 a -35. Toto naznačovalo, že by mohli rozpoznávať veľmi podobné promótory. V predchádzajúcom období sme zaviedli a optimalizovali účinný dvojplazmidový systém v *Escherichia coli* na identifikáciu promótorov špecificky rozpoznávaných príslušnými heterologickými sigma faktormi. Pomocou tohto systému sme identifikovali 24 reprezentatívnych promótorov špecificky rozpoznávaných štyrmi SigB homológmi zo *S. coelicolor* (SigF, SigG, SigH, SigB). Promótory sme overili in vivo v podmienkach osmotického stresu a diferenciácie v divom type *S. coelicolor*, ako aj v mutantoch *sigB*, *sigH*, *sigF*, *sigG* pomocou S1-nukleázového mapovania. Tieto výsledky naznačili, že viaceré promótory boli závislé na viacerých SigB homológoch. Preto sme pomocou dvojplazmidového systému charakterizovali krížové rozpoznávanie týchto 24 identifikovaných promótorov všetkými deviatimi SigB homológmi zo *S. coelicolor*. Promótory boli rozpoznávané variabilne; niektoré iba jedným sigma faktorom, iné dvoma, troma, štyrmi, resp. až piatimi SigB homológmi. Toto potvrdilo, že promótory týchto deviatich homologických sigma faktorov sú krížovo rozpoznávané týmito sigma faktormi, pričom tieto výsledky naznačili niekoľko skupín promótorov rozpoznávaných dominantne stresovými (SigB, SigL), alebo diferenciačnými SigB homológmi (SigF, SigH, SigN). Po sekvenčnej analýze promótorov sme zistili, že všetky promótory boli konzervované v oblastiach -35 a -10 s konsensus sekvenciou GTTTcg N14-15 GGGtAc. Avšak ani detailnou analýzou v súvislosti s ich krížovým rozpoznávaním sme neidentifikovali jednotlivé sekvenčné motívy špecifické pre jednotlivé sigma faktory.

Imunoblotovou analýzou pomocou protilátok voči SigB, SigH a UshX sme dokázali, že SigB je prítomný iba v podmienkach osmotického stresu a SigH a jeho špecifický anti-sigma faktor UshX sú prítomné dominantne pri neskorých štádiách morfolologickej diferenciácie. Spolu s fenotypovou analýzou pripravených mutantov v operónoch *sigB* a *sigH* v *S. coelicolor* tieto výsledky naznačujú dominantnú úlohu SigB v reakcii na osmotický stres a dvojité úlohu SigH v reakcii na osmotický stres a morfolologickej diferenciácii a komplexnú reguláciu reakcie na osmotický stres vo vzťahu k morfolologickej diferenciácii v *S. coelicolor*.

Publikácie

1, Sevcikova B, Rezuchova D, Mazurakova V, Homerova D, Novakova R, Feckova L, Kormanec J: Cross-recognition of promoters by the nine SigB homologues present in *Streptomyces coelicolor* A3(2). *Int. J. Mol. Sci.* 22 (2021) 7849.

2, Kormanec J, Rezuchova B, Novakova R: Screening systems for stable markerless genomic deletions/integrations in *Streptomyces* species. *Antimicrobial Therapies* (Barreiro C, Barredo JL, eds.). *Methods in Molecular Biology* Vol. 2296, Humana, New York, NY, 2021, pp. 91-141.

10.) 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, v. v. i.
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	VEGA SAV: 13298 €

Dosiahnuté výsledky:

V spolupráci s Chemickým ústavom SAV sme dokončili proteomickú analýzu štandardného kmeňa *Saccharomyces cerevisiae* ako aj kmeňa s deléciou génu kódujúceho mitochondriálnu Lon proteázu a ďalších mutantných kmeňov v Lon proteáze. Študovali sme vplyv delécie a mutácií v Lon proteáze na komplexy dýchacieho reťazca. Výsledky boli súčasťou úspešne obhájenej dizertačnej práce Mgr. Barbory Stojkovičovej (rod. Keresztesovej) s názvom „Ako strata funkcie Lon proteázy ovplyvňuje mitochondrie kvasinky *Saccharomyces cerevisiae*“. Okrem toho sme pripravili vzorky DNA pochádzajúcich z týchto kmeňov pre podrobnú NGS analýzu pomocou Illumina a Nanopore sekvenovania. V súčasnosti čakáme na výsledky, ktoré plánujeme ďalej analyzovať.

V spolupráci so skupinou prof. Ľubomíra Tomášku (Katedra genetiky UK v Bratislave) sme dokončili štúdium vplyvu sukcinylácie na reguláciu funkcie kvasinkového mitochondriálneho nukleoidu. Výsledkom aktívnej spolupráce je publikácia:

Frankovsky, J., Keresztesova, B., Bellova, J., Kunova, N., Canigova, N., Hanakova, K., Bauer, J., Ondrovicova, G., Lukacova, V., Sivakova, B., Zdrahal, Z., Pevala, V., Prochazkova, K., Nosek, J., Kutejova, E., Tomáška L.

The yeast mitochondrial succinylome: Implications for regulation of mitochondrial nucleoids. (2021) *J. Biol. Chem.* 297 (4): 1-16

Obmedzenú možnosť práce v laboratóriu spôsobenú pandémiou COVID-19 sme využili na prípravu

a publikovanie vyžiadaných review článkov:

Kotrasova, V., Keresztesova, B., Ondrovicova, G., Bauer, J., Havalova, H., Pevala, V., Kutejova, E., Kunova, N.

Mitochondrial Kinases and the Role of Mitochondrial Protein Phosphorylation in Health and Disease.

(2021) LIFE-BASEL 11: 82

11.) 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, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA SAV: 9405 €

Dosiahnuté výsledky:

V projekte sme prvýkrát charakterizovali a porovnali antibakteriálnu aktivitu medov a včelami spracovaných sirupov, ktoré boli pripravené z roztoku sacharózy alebo z invertného sirupu za bežných podmienok priamo na včelnici. Ďalej sme porovnali obsah GOX a hladiny peroxidu vodíka vo vzorkách medu a včelou spracovaných sirupov. Tieto parametre boli tiež porovnané medzi spracovaným roztokom sacharózy a spracovaným invertným sirupom. Naše výsledky jasne ukazujú, že vzorky medu majú v porovnaní so sirupmi, ktoré boli spracované včelami signifikantne vyššiu antibakteriálnu aktivitu. Neboli však zistené žiadne rozdiely v obsahu GOX a akumulovaných hladinách peroxidu vodíka medzi medmi a včelami spracovanými sirupmi. Porovnanie rovnakých parametrov medzi rôznymi zdrojmi sacharidov, ktoré boli spracované včelami neodhalilo žiadne rozdiely vo všetkých meraných parametroch, s výnimkou obsahu GOX. Množstvo GOX bolo štatisticky významne vyššie v roztokoch sacharózy spracovanej včelami, čo naznačuje, že včely pri spracovaní roztoku sacharózy pravdepodobne vylučujú viac enzýmov metabolizujúcich sacharidy. Stanovenie intenzity farby medu ukázalo, že vo včelstvách boli včelami spracované sirupy čiastočne zmiešané s medom.

Výstupy:

BUGÁROVÁ, V. - GODOČÍKOVÁ, J. - BUČEKOVÁ, M. - BRODSCHNEIDER, R. - MAJTÁN, J.**. Effects of the carbohydrate sources nectar, sucrose and invert sugar on antibacterial activity of honey and bee-processed syrups. In Antibiotics, 2021, vol. 10, no. 985.

MAJTÁN, J.** - BUČEKOVÁ, M. - KAFANTARIS, I. - SZWEDA, P. - HAMMER, K. - MOSSIALOS, D. Honey antibacterial activity: A neglected aspect of honey quality assurance as functional food. In Trends in Food Science and Technology, 2021, vol. 118, p. 870-886.

12.) Bio-čistenie farebných škvŕn na historických dokumentoch: mikrobiálne, enzymatické a chemické prístupy (*Bio-cleaning of colored stains on historical documents: microbial, enzymatic,*

and chemical approaches)

Zodpovedný riešiteľ: Domenico Pangallo
Trvanie projektu: 1.1.2021 / 31.12.2024
Evidenčné číslo projektu: 2/0099/21
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA: 9437 €

Dosiahnuté výsledky:

Mnohé mikroorganizmy boli izolované a vybrané pre ich hydrolytické vlastnosti. Celulolytické, lipolytické, proteolytické a ligninolytické mikroorganizmy boli použité v bioreštauračných aplikáciách, najmä na biočistenie.

Publications:

Sidari, R., Ženišová, K., Tobolková, B., Belajová, E., Cabicarová, T., Bučková, M., Puškárová, A., Planý, M., Kuchta, T. and Pangallo, D., 2021. Wine Yeasts Selection: Laboratory Characterization and Protocol Review. *Microorganisms*, 9(11), p.2223.

Kisová, Z., Pavlovič, J., Šefčíková, L., Bučková, M., Puškárová, A., Kraková, L., Šišková, A.O., Kleinová, A., Machatová, Z. and Pangallo, D., 2021. Removal of overpainting from an historical painting of the XVIII Century: a yeast enzymatic approach. *Journal of Biotechnology*, 335, 55-64.

Planý, M., Pinzari, F., Šoltys, K., Kraková, L., Cornish, L., Pangallo, D., Jungblut, A.D. and Little, B., 2021. Fungal-induced atmospheric iron corrosion in an indoor environment. *International Biodeterioration & Biodegradation*, 159, p.105204.

Pavlovic, J., Cavalieri, D., Mastromei, G., Pangallo, D., Perito, B. and Marvasi, M., 2021. MinION technology for microbiome sequencing applications for the conservation of cultural heritage. *Microbiological Research*, p.126727.

13.) 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: 1380 €

Dosiahnuté výsledky:

Počas roka 2021 sa dokončila genomická a proteomická analýza probiotického kmeňa *Lactobacillus plantarum* LS/07 pre publikovanie v pripravovanom článku. V sekretóme študovaného kmeňa sa identifikovali zaujímavé proteíny s využitím online dostupných a našich unikátnych genomických dát.

14.) 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, v. v. i.
Počet spoluriešiteľských inštitúcií: 2 - Rakúsko: 1, Holandsko: 1
Čerpané financie: VEGA SAV: 10920 €

Dosiahnuté výsledky:

Dosiahli sme v spolupráci s brazílskymi kolegami významné výsledky ohľadom prieskumu reaktivity askorbátových peroxidáz a im evolučne príbuzných enzýmov, ktoré boli zverejnené v článku Lazzarotto, F., Menguer, P.K., Del-Bem, L., Zámocký, M., Margis-Pinheiro, M. Ascorbate Peroxidase Neofunctionalization at the Origin of APX-R and APX-L: Evidence from Basal Archaeplastida. *Antioxidants* (2021) 10(4):597. Výsledky ohľadom reaktivity rôznych peroxidáz s dôležitými substrátmi boli prezentované na online konferencii 14th World Congress on Polyphenols Applications 22.-24.9.2021 formou prednášky: Zámocký M., Poljovka A. "Differences within four heme peroxidase superfamilies in the reactivity with phenolic compounds" v príslušnom zborníku konferencie na str. 26.

Programy: APVV

15.) STROM A KRAJINA – VPLYV DREVÍN NA DIVERZITU PÔDNYCH MIKROORGANIZMOV V POĽNOHOSPODÁRSKEJ KRAJINE (*Tree and country - influence of trees on diversity of soil microorganisms in agricultural land*)

Zodpovedný riešiteľ: Slavomír Adamčík
Zodpovedný riešiteľ v organizácii SAV: Marcel Zámocký
Trvanie projektu: 1.7.2021 / 30.6.2025
Evidenčné číslo projektu: APVV-20-0257
Organizácia je koordinátorom projektu: nie
Koordinátor: Botanický ústav SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV - SAV: 3131 €

Dosiahnuté výsledky:

Na začiatku projektu sme sa zamerali na analýzu zloženia pôd pochádzajúcich z bučín stredného Slovenska najmä na prítomnosť húb, ktoré vykazujú mangán-peroxidázové aktivity. Pomocou vybraných primerov na PCR sme sledovali biodiverzitu v pôdnych vzorkách z rôznych lesných lokalít.

16.) 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 koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 42090 €

Dosiahnuté výsledky:

Dôležitou súčasťou Min systému v gram-pozitívnych baktériách je DivIVA proteín. Tento proteín bol pôvodne identifikovaný ako priestorový regulátor bunkového delenia v modelovom organizme *Bacillus subtilis*, ale jeho homológy sú prítomné v mnohých iných gram-pozitívnych baktériách, vrátane druhov Clostridií. Okrem svojej úlohy ako topologického regulátora systému Min počas delenia bakteriálnych buniek sa DivIVA podieľa na segregácii chromozómov počas sporulácie, genetickej kompetencii a syntéze bunkovej steny. DivIVA sa lokalizuje do oblastí s vysokým zakrivením membrány, ako sú bunkové póly a miesto bunkového delenia, kde získava odlišných väzbových partnerov. Predtým sa predpokladalo, že rozpoznávanie negatívneho zakrivenia je hlavným mechanizmom, ktorým sa DivIVA viaže na tieto špecifické oblasti. My sme ukázali, že *Clostridioides difficile* DivIVA sa prednostne viaže na membrány obsahujúce negatívne nabité fosfolipidy, najmä kardiolipín. Prekvapivo sme pozorovali, že po naviazaní DivIVA modifikuje distribúciu lipidov a indukuje zmeny lipidických dvojvrstiev obsahujúcich kardiolipín. Naše pozorovania naznačujú, že DivIVA môže hrať komplexnejšiu a doteraz neznámu aktívnu úlohu pri tvorbe membrány deliacej prepážky počas bunkového delenia.

Publikácie:

1. 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)
2. H. Han, R. Schubert, J. Makroczyova, D. Meza, P. Heuser, M. Aepfelbacher, I. Barák, C. Betzel, P. Fromme, J. Hajdu, I. Kursula, V. S Lamzin, P. Nissen, E. Tereschenko, J. Schulz, C. Uetrecht, J. Uličný and K. Lorenzen (2021) The XBI BioLab for life science experiments at the European XFEL. *Journal of Applied Crystallography* 54, 1-15. <https://doi.org/10.1107/S1600576720013989> (IF = 2.99) (Q2 JCR2019; Q1 SJR2019)
3. D. Krajcikova, V. Bugarova and I. Barak (2021) YncD, *Bacillus subtilis* spore coat alanine racemase and its role in spore formation and germination. *Microorganisms* 9, 285. <https://doi.org/10.3390/microorganisms9020285> (IF 4.15) (Q2 JCR2019; Qx SJR2019)
4. N. Labajova, N. Baranova, M. Jurásek, R. Vácha, M. Loose and I. Barak (2021) DivIVA binds to cardiolipin-containing lipid bilayers. *Int. J. Mol. Sci.*, 22, 8350. <https://doi.org/10.3390/ijms22158350> (IF 5.92) (Q1 JCR2020; Q1 SJR2020)
5. Barak I. (2021) Special Issue “*Bacillus subtilis* as a Model Organism to Study Basic Cell Processes”. *Microorganisms* 9, 2459 (IF 4.15) (Q2 JCR2019; Qx SJR2019)

17.) Farebné škvrnky 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, v. v. i.
Počet spoluriešiteľských inštitúcií: 2 - Slovensko: 2
Čerpané financie: APVV: 25000 €

Dosiahnuté výsledky:

Vysokovýkonné sekvenovanie založené na platforme MinION sa použilo na analýzu mikrobioty prítomnej v rôznych objektoch kultúrneho dedičstva a okolitom prostredí. Na odstránenie lipidickej patiny z historickej maľby sa použil prístup enzymatického biočistenia.

Publications:

Kisová, Z., Pavlovič, J., Šefčíková, L., Bučková, M., Puškárová, A., Kraková, L., Šišková, A.O., Kleinová, A., Machatová, Z. and Pangallo, D., 2021. Removal of overpainting from an historical painting of the XVIII Century: a yeast enzymatic approach. *Journal of Biotechnology*, 335, 55-64.
Planý, M., Pinzari, F., Šoltys, K., Kraková, L., Cornish, L., Pangallo, D., Jungblut, A.D. and Little, B., 2021. Fungal-induced atmospheric iron corrosion in an indoor environment. *International Biodeterioration & Biodegradation*, 159, p.105204.
Pavlovic, J., Cavalieri, D., Mastromei, G., Pangallo, D., Perito, B. and Marvasi, M., 2021. MinION technology for microbiome sequencing applications for the conservation of cultural heritage. *Microbiological Research*, p.126727.

18.) 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 / 31.12.2021
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: 7500 €

Dosiahnuté výsledky:

V poslednom roku riešenia projektu APVV sme sa venovali expresii a stanoveniu aktivity endolyzínu KMB-572_5 (dve katalytické domény: Amidase5, glucosaminidase a jedna väzbová doména Cpl-7; 52,9 KDa). Lytickú aktivitu izolovaného proteínu sme stanovili pomocou difúznej a optickej metódy. Určili sme optimálne podmienky pre lytickú aktivitu endolyzínu EN572_5: pH 6-7, 5 mM Ca²⁺, 50-150 mM NaCl. Zistili sme, že endolyzín EN572_5 je aktívny aj po osemnástich týždňoch pri teplote 6°C v elučnom roztoku s obsahom 500 mM imidazolu. Pri sledovaní lytického spektra endolyzínu EN572_5 pre rôzne substráty sme pomocou optickej metódy otestovali 13

rôznych izolátov *S. agalactiae*, kde sme zaznamenali v priemere 75% lytickú aktivitu. Pokračovali sme v bioinformatickej a biochemickej charakterizácii endolyzínu EN534-C. Pomocou bioinformatických softvérov sme pripravili 3D model EN534 a predikovali väzbové miesta pre dvojmocné katióny vápnika a zinku. Potvrdili sme, že v prítomnosti dvojmocných katiónov vápnika dochádza k zvýšeniu lytickej aktivity endolyzínu voči vybraným bakteriálnym kmeňom. Pomocou drop testu sme testovali lytickú aktivitu endolyzínu EN534-C na ďalších bakteriálnych kmeňoch a rozšírili tak antibakteriálne spektrum pôsobenie endolyzínu voči ďalším kmeňom *Streptococcus agalactiae*, *Enterococcus faecalis* a *Staphylococcus aureus*. Lytickú aktivitu endolyzínu EN534-C sme potvrdili analýzou viability buniek pomocou kvapkového testu a optickej analýzy pri teplotách 4°C, 20°C, 25°C, 30°C, 37°C a 42°C, pričom najvyššia lytická aktivita voči vybranému bakteriálnemu kmeňu *S. agalactiae* CCM6187 bola dosiahnutá pri teplotách 30°C a 37°C.

V rámci riešenia projektu sa zaoberáme štúdiom proteínu gp15 bakteriofága BFK20, s doménou pre solubilnú lytickú transglykozylázu (SLT). Pripravili sme 7 rôznych konštruktov obsahujúcich túto doménu, ktoré sú navzájom odlišné dĺžkou sekvencií prilahlých k SLT doméne. Predpokladaná veľkosť jednotlivých proteínov sa pohybuje v rozmedzí od 12 – 44 kDa. Proteíny sme exprimovali v kmeni *E. coli* BL21 (DE3), pričom individuálne konštrukty vykazovali variabilnú mieru expresie a odlišný expresný profil. Predpokladáme, že skrátenie sekvencie, ktorá predchádza SLT doméne, výrazne znižuje mieru expresie oproti konštruktom, ktoré majú túto oblasť predĺženú. Zároveň sme pozorovali prítomnosť viacerých fragmentov, čo naznačuje, že dochádza k proteolytickému štiepeniu študovaného proteínu.

Naše výsledky sme spísali do vedeckej publikácie, do dvoch popularizačných článkov v časopise Quark a zúčastnili sme sa zahraničnej a domácich konferencií.

Výstupy:

1. Pápayová, K., Bocánová, L., Pšenko, M. a Bukovská, G.: Rekombinantný endolyzín EN534-C ako potenciálny bioagens s exolytickou aktivitou voči vaginálnym streptokokom. In: Tomáškovy dny 2021: 30. konferencie mladých mikrobiológů. [elektronický dokument] 1. vyd. ISBN 978-80-210-9882-4. Brno, ČR, Masarykova univerzita, 2021. s. 51 [online]

2. Pápayová, K., Bocánová, L., Kajsikova, M. a Bukovská, G.: Charakterizácia proteínových derivátov s lytickou doménou SLT pôvodom z proteínu gp15 korynefága BFK20. Interaktívna konferencia mladých vedcov 2021 [elektronický dokument]: Preveda. 1. vyd. ISBN 978-80-972360-7-6. Banská Bystrica: Občianske združenie Preveda, 2021. s. [1-1], art. no. 2188 [online]

3. Pápayová, K., Bocánová, L., Kajsikova, M. a Bukovská, G.: Identifikácia SLT domény proteínu gp15 bakteriofága BFK20 s vlastnosťou degradácie peptidoglykánů. Študentská vedecká konferencia PriF UK 2021 [elektronický dokument]: zborník recenzovaných príspevkov. 1. vyd. ISBN 978-80-223-5132-4. Bratislava, Prírodovedecká fakulta UK, 2021. s. 364-369 [online]

Patent:

V roku 2020 (17.12.) sme podali novú patentovú prihlášku č. PP 50075-2020 v Slovenskej republike. Dňa 16.12.2021 bola podaná medzinárodná prihláška PCT patentovej prihlášky pod číslom PCT/SK2021/050016. „Antimicrobial protein, antimicrobial recombinant protein with lytic properties, expression vector, method of their preparation and use“ v anglickom jazyku.

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

Zodpovedný riešiteľ:	Dana Cholujová
Zodpovedný riešiteľ v organizácii SAV:	Luboš Kľučár
Trvanie projektu:	1.7.2020 / 30.6.2024
Evidenčné číslo projektu:	APVV-19-0212
Organizácia je	nie

koordinátorom projektu:

Koordinátor: Biomedicínske centrum SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 8431 €

Dosiahnuté výsledky:

Vzorky pacientov s rôznymi B-bunkovými lymfómami v rôznych štádiách boli analyzované pomocou hmotnostnej cytometrie (CyTOF). CyTOF dáta boli spracované SPADE algoritmom. Na základe SPADE výsledkov sme vytvorili rôzne skupiny patientských vzoriek, ktoré sme následne porovnávali rôznymi štatistickými testami ako napr.: Mann-Whitney U-test, Kolmogorov-Smirnov test, ale aj ďalšími analýzami ako sú Korešpondenčná analýza a PCA. Výsledky pomáhajú porozumieť vzniku B-bunkových malignít.

20.) Nádorové imunoeditovanie v mnohopočetnom myelóme: imunitné kontrolné body a klinický význam (*Cancer immunoediting in multiple myeloma: immune checkpoints and clinical significance*)

Zodpovedný riešiteľ: Jana Jakubíková
Zodpovedný riešiteľ v organizácii SAV: Ľuboš Kľučár
Trvanie projektu: 1.8.2021 / 30.6.2025
Evidenčné číslo projektu: APVV-20-0183
Organizácia je koordinátorom projektu: nie
Koordinátor: Biomedicínske centrum SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 4152 €

Dosiahnuté výsledky:

Mnohopočetný myelóm (MM) patrí medzi nádorové ochorenie krvi (malígne B-bunkové lymfómy), ktoré vznikajú s premenou normálnych plazmatických buniek na klonálne plazmatické bunky. Imunitné kontrolné body sú špecifické inhibičné signálne dráhy. Nádorové bunky dokážu aktivovať tieto imunitné kontrolné body a tým potlačiť reakciu imunitného systému. Porozumenie týchto mechanizmov poskytuje základ pre nové liečebné postupy. V úvodnom polroku riešenia projektu sme sa venovali overeniu kvality dát, spracovaniu metadát a vizualizáciám.

21.) Zhodnotenie imunitných kontrolných bodov u B bunkových malignít (*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: 2446 €

Dosiahnuté výsledky:

Imunitné kontrolné body sú inhibičné signálne dráhy, ktoré môžu byť aktivované nádorovými bunkami. Aktiváciou imunitných kontrolných bodov sa potlačí imunitná odpoveď. V poslednej dobe sa dosiahli veľké úspechy v terapii nádorových ochorení použitím monoklonálnych protilátok, ktoré inhibujú molekuly imunitných kontrolných bodov. Mali sme prístup k CyTOF vzorkám pacientov (s ochoreniami MM – mnohopočetný myelóm alebo WM – Waldenströmová makroglobulinémia), ktoré pochádzali nielen z primárneho nádora ale aj z nádorového mikroprostredia. Vzorky sme analyzovali pomocou rôznych algoritmov (napr. SPADE) a štatistických testov (napr. Mann-Whitney U-test). Výsledky sme zobrazovali pomocou heatmap, box-plotov, dot-plotov a PCA. Zistené rozdiely medzi vzorkami primárneho nádora a nádorového mikroprostredia pomáhajú vyvíjať nové liečebné postupy založených na imunoterapii. Záverečná publikácia obsahujúca výsledky tohto projektu je v súčasnosti v oponentskom konaní.

22.) Identification of new treatment options in refractory testicular germ cell tumors

(Identification of new treatment options in refractory testicular germ cell tumors)

Zodpovedný riešiteľ:	Ľuboš Kľučár
Trvanie projektu:	1.7.2021 / 30.6.2025
Evidenčné číslo projektu:	
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	APVV: 1527 €

Dosiahnuté výsledky:

Nádory semeníkov zo zárodočných buniek (TGCT) sú najčastejším nádorom mladých mužov s rastúcou incidenciou na Slovensku. Cieľom projektu je identifikovať nové terapeutické ciele a identifikovať nové lieky, ktoré prekonávajú rezistenciu na cisplatinu pomocou high-throughput metód molekulárnej biológie a translačného výskumu. V prvom polroku riešenie projektu bola pozornosť venovaná príprave a štandardizácii analyzačných postupov na experimentálnej aj na bioinformatickej úrovni, ako aj príprave a spracovania metadát analyzovaných vzoriek.

23.) 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: 2024 €

Dosiahnuté výsledky:

Sfinalizovali sme analýzu dát z RNA-seq vzoriek 23 pacientov s rakovinou prsníka. Analýza diferenciálnej expresie génov (DNA microarrays, RNA-seq, RT-qPCR) bola doplnená o

metranskriptomickú štúdiu mikrobiómu prítomného v analyzovaných bunkách primárneho tumoru ako aj zdravého prsníkového tkaniva. Údaje z našich vzoriek boli porovnané s obdobnými vzorkami z Číny zo Sichuan University.

HADŽEGA, Dominik - MINÁRIK, G. - KARABA, Marián - KALAVSKA, K. - BENCA, Juraj - ČIERNIKOVÁ, Soňa - SEDLÁČKOVÁ, T. - NEMCOVÁ, Petra - BOHÁČ, M. - PINDAK, D. - KLUČÁR, Luboš** - MEGO, M. Uncovering microbial composition in human breast cancer primary tumour tissue using transcriptomic RNA-seq. In International Journal of Molecular Sciences, 2021, vol. 22, no. 9058. (2020: 5.923 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 1422-0067. Dostupné na: <https://doi.org/10.3390/ijms22169058>

24.) 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 koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 37048 €

Dosiahnuté výsledky:

Za účelom aktivácie silentných biosyntetických génových klastrov (BGC) v našom modelovom kmeni *S. lavendulae* subsp. *lavendulae* CCM 3239 sme v predchádzajúcom období pripravili indukčnú antibiotickú rezistenčnú kazetu v plazmide pKasOpAmRb so silným promótorom *kasOp** a s reverzne orientovaným génom rezistencia na apramycín.

Pripravenú kazetu sme verifikovali pri aktivácii známeho silentného BGC 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 ale aj ďalšie antibiotikum undecylprodigiosín. Pripravili a verifikovali sme rekombinantné kmene so správne integrovanou kazetou pre génom SLIV_12960 (actII-4). Avšak po fenotypickej analýze nedochádzalo k produkcii aktinorhodínu, ale druhého silentného antibiotika undecylprodigiosínu, čo je v súlade s publikovanými výsledkami. Absencia aktinorhodínu je pravdepodobne spôsobená inhibíciou aktinorhodínového biosyntetického génu SLIV_12965 reverznou transkripciou génu rezistencie pre apramycín z integrovanej kazety. Preto sme pre účely ďalšieho použitia tejto kazety zaviedli silný obojstranný terminátor T5 zo *S. lavendulae* subsp. *lavendulae* CCM 3239 za gén rezistencie pre apramycín, za tvorby plazmidu pKasOpAmRT2. Na overenie stratégie aktivácie silentných BGC v našom študovanom kmeni *S. lavendulae* subsp. *lavendulae* CCM 3239 sme pripravenú kazetu z pKasOpAmRb integrovali pomocou stratégie REDIRECT pred silentný biosyntetický gén *bspA* kódujúci neribozomálnou peptidsyntetázou (NRPS) z BGC pre modrý pigment indigoidín. Pripravené rekombinantné kmene sme geneticky verifikovali. Fenotypová analýza týchto mutantných kmeňov *S. lavendulae*, *bpsAkasOp::aac1, 2, 3, 4* preukázala 528-násobnú zvýšenú produkciu modrého pigmentu indigoidínu v porovnaní s kmeňom divokého typu. Tieto výsledky potvrdili účinnú aktiváciu BGC pre indigoidín pomocou tohto systému u *S. lavendulae* subsp. *lavendulae* CCM 3239.

V predchádzajúcom období sme bioinformatickou analýzou genómu *S. lavendulae* subsp. *lavendulae* CCM 3239 identifikovali 27 BGCs pre rôzne reprezentatívne typy sekundárnych

metabolitov. Ich detailnou bioinformatickou analýzou sme identifikovali v každom BGC potenciálne gény pre dráhovo-špecifické regulátory, ako aj operónové usporiadanie daných BGC a ich transkripciu. Na základe tejto analýzy sme pre aktiváciu pomocou pripravenej aktivačnej kazety v plazmide pKasOpAmRT2 vybrali BGC2 pre silentnú neznámu polyketid syntetázu prvého typu (PKSI), BGC11 a BGC15 pre neznáme neribozomálne peptidové syntetázy (NRPS), BGC21 pre lantipeptid a BGC26 pre predpokladané pyrolidínové antibiotikum. Vo všetkých prípadoch biosyntetické gény boli organizované v operónoch, kde sme navrhli primery pre integráciu tejto kazety pred prvý biosyntetický gén v operóne alebo pred predpokladaný transkripčný aktivátor v danom BGC. V predchádzajúcom období sme dokázali, že jeden z BGC u *S. lavendulae* subsp. *lavendulae* CCM 3239 (SLAV_37345 – SLAV_37475) je zodpovedný za produkciu známeho aminoglykozidového antibiotika streptotricín. Po delécii tohto BGC došlo k strate jeho produkcie. Ako alternatívu TAR klonovania sme pripravili a optimalizovali nový účinný systém pre bezmarkerové vkladanie veľkých BGC do oblastí genómu vhodného hostiteľa *Streptomyces lividans RedStrep 1.3* pre ich účinnú a stabilnú heterologickú expresiu. Pripravený systém na báze plazmidu pAMR23A sme verifikovali úspešnou integráciou časti landomycínového BGC (lanFABCDL) pod kontrolu silného promotora *ermEp** a celého 40 kb BGC pre mitramycín v kmeni *S. lividans RedStrep 1.3*. Pripravené bezmarkerové kmene boli stabilné a produkovali vysoké hladiny UWM6/rabelomycínu a mitramycínu.

V predchádzajúcom období sme pomocou metódy REDIRECT deletovali viaceré potenciálne biosyntetické gény auricínového klastra v genóme *S. lavendulae* subsp. *lavendulae* CCM 3239. Všetky pripravené mutanty sme verifikovali Southern blot hybridizáciou. Pomocou TLC, biochromatografiou a HPLC sme postupne analyzovali produkciu sekundárnych metabolitov u pripravených mutantov. U niektorých doposiaľ charakterizovaných mutantov nebola postihnutá biosyntéza auricínu (*aur1DE*, *aur1H*, *aur1G*, *aur1N*, *sa14*, *sa16*, *sa21*, *sa22*, *sa27*, *aur2E*), takže uvedené gény nie sú esenciálne pre biosyntézu auricínu. U ďalších došlo k výraznému poklesu produkcie auricínu (*aur1A*, *sa15*, *sa45*, *aur2F*), takže tieto gény sú dôležité pri biosyntéze auricínu, ale daný krok je sprostredkovaný aj ďalším homologickým genómom. U niektorých mutantov nedochádzalo k produkcii auricínu a ani žiadneho iného sekundárneho metabolitu (*aur1C*, *sa49*, *sa50*, *aur2AB*, *aur2C*, *aur2EFGHI*, *aur2B-I*). Tieto gény sú kritické pre biosyntézu auricínu. V prípade mutantov v géne *sa48*, *sa10*, *sa11*, *sa12*, a *sa13* nedochádzalo k produkcii auricínu, ale iného sekundárneho metabolitu, pravdepodobne medziproduktu auricínu. Pripravili sme kmeň *S. lavendulae DellP* s deletovaným veľkým lineárnym plazmidom pSA3239, ktorý obsahuje aj auricínový BGC. Genomická sekvencia tohto kmeňa preukázala cirkularizáciu chromozómu u *S. lavendulae* subsp. *lavendulae*. Bioinformatická analýza genómu potvrdila esenciálnu úlohu pSA3239 pre replikáciu aj lineárneho chromozómu *S. lavendulae* subsp. *lavendulae* CCM 3239.

V predchádzajúcom období sme pomocou PCR amplifikovali viaceré kľúčové biosyntetické gény pre aromatické polyketidové antibiotiká landomycín (*lan*), auricín (*aur*), mitramycín (*mtm*) a aktinorhodín (*act*) a klonovali ich pod kontrolou silného RBS miesta za účelom vytvorenia operónu pod kontrolou silného *kasOp** promotora. Viaceré predpokladané biosyntetické gény počiatkových krokov výstavby týchto antibiotík sme postupne klonovali a kombinovali do operónov pod kontrolou silného *kasOp** promotora a fágového PhiBT1 integračného vektora. Po ich konjugácii do heterologického hostiteľského kmeňa *S. coelicolor* M1146 sme analyzovali produkciu sekundárnych metabolitov pomocou TLC a HPLC. V prípade rekombinantného plazmidu pKasOp-aur1DEF CGHA z auricínového BGC nedochádzalo k produkcii žiadneho sekundárneho metabolitu. V prípade pKasOp-lanABCDFLE z landomycínového BGC dochádzalo k produkcii rabelomycínu, ktorý je vedľajším produktom medziproduktu väčšiny angucyklínových antibiotík. V prípade zmesného plazmidu pKasOp-aur1DEF lanFDLE rovnako nedochádzalo k produkcii žiadneho sekundárneho metabolitu. Avšak v prípade zmesného plazmidu pKasOp-lanABCaur1CGHA dochádzalo k produkcii rabelomycínu a rovnako aj v prípade zmesného plazmidu pKasOp-mtmABCtaur1CGHA. V prípade zmesného plazmidu pKasOp-actABCtaur1CGHA dochádzalo k produkcii novej látky s $m/z=325.0734$ [M+H]⁺. Tieto výsledky naznačujú, že kľúčové biosyntetické gény *aur1D* a *aur1E*, kódujúce homológy KS α a KS β , sú neaktívne a ich úlohu

pravdepodobne nahradzujú iné homologické gény *aur2A* a *aur2B* zo vzdialeného klastra *aur2*. Tento predpoklad sme aj potvrdili rozrušením génov *aur1DE* a *aur2AB* v chromozóme *S. lavendulae* subsp. *lavendulae* CCM 3239, kde v prvom prípade nebola postihnutá produkcia auricínu a v druhom prípade nedochádzalo k produkcii. Obdobne, keď sme nahradili gény *aur1DE* homologickými génmi *aur2AB*, tak v prípade tohto zmesného konštrukt pKasOp-*aur2ABtaur1FCGHA* dochádzalo k nízkej produkcii rabelomycínu. Táto však bola dramaticky zvýšená priradením ďalších dvoch biosyntetických génov *aur1L* a *aur1M*, ktoré kódujú fosfopanteteinyltransferázu (PPTase) potrebnú pre aktiváciu ACP a malonyl CoA:ACP transacylázu (MCAT) potrebnú pre naviazanie malonyl CoA na ACP. Uvedený konštrukt pKasOp-*aur2ABtaur1FCGHALM* po konjugácii do *S. coelicolor* M1146 spôsobil vysokú produkciu rabelomycínu. Takže, tieto dva biosyntetické gény sú rovnako potrebné pre počiatočné kroky výstavby auricinového aglykónu. Po ich priradení za heterologický operón *actABCtaur1CGHA* rovnako dochádzalo k výrazne zvýšenej produkcii novej látky s m/z=325.0734 [M+H]⁺ po konjugácii pKasOp-*actABCtaur1CGHALM* do *S. coelicolor* M1146. Tieto výsledky zároveň potvrdzujú funkčnosť biosyntetických génov *aur2A* (KS α), *aur2B* (KS β), *aur1F* (ACP), *aur1C* (CYC), *aur1G* (KR), *aur1H* (ARO), *aur1L* (PPTase), *aur1M* (MCAT) pri výstavbe auricinového aglykónu. Taktiež sú v súlade s unikátnou štruktúrou auricínu, ktorá naznačuje jedinečný mechanizmus jeho biosyntézy dvoma prekrývajúcimi sa biosyntetickými cestami, pre angucyklíny (*aur1*) a pyronaftochinóny (*aur2*).

Publikácie

1, Csolleiova D, Knirschova R, Rezuchova D, Homerova D, Sevcikova B, Matulova M, Núñez LE, Novakova R, Feckova L, Javorova R, Cortés J, Kormanec J: An efficient system for stable markerless integration of large biosynthetic gene clusters into *Streptomyces* chromosomes. Appl. Microbiol. Biotechnol. 105 (2021) 2123-2137.

2, Novakova R, Rückert C, Knirschova R, Feckova L, Busche T, Csolleiova D, Homerova D, Rezuchova B, Javorova R, Sevcikova B, Kalinowski J, Kormanec J: The linear plasmid pSA3239 is essential for the replication of the *Streptomyces lavendulae* subsp. *lavendulae* CCM 3239 chromosome. Res. Microbiol. 172 (2021) 103870.

3, Kormanec J, Rezuchova B, Novakova R: Screening systems for stable markerless genomic deletions/integrations in *Streptomyces* species. Antimicrobial Therapies (Barreiro C, Barredo JL, eds.). Methods in Molecular Biology Vol. 2296, Humana, New York, NY, 2021, pp. 91-141.

25.) 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 koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	APVV: 40000 €

Dosiahnuté výsledky:

V roku 2021 sme pokračovali v štúdiu vplyvu fosforylácie na vlastnosti vybraných proteínov mitochondriálneho nukleoidu, konkrétne TFAM a Lon proteázy. Výsledky boli súčasťou úspešne obhájenej dizertačnej práce Mgr. Veroniky Kotrasovej s názvom „Vplyv fosforylácie na vlastnosti a stabilitu proteínov mitochondriálneho nukleoidu“. Pripravené vzorky fosfomimikujúcich mutantov Lon proteázy analyzujeme elektrónovou mikroskopiou v spolupráci s Centrálnym laboratóriom kryoelektrónovej mikroskopie a tomografie CEITEC v Brne .

V spolupráci so skupinou prof. Lubomíra Tomášku (Katedra genetiky UK v Bratislave) sme dokončili štúdium vplyvu succinylácie na mitochondriálny nukleoid kvasinky *S. cerevisiae*.

Výsledkom aktívnej spolupráce je publikácia:

Frankovsky, J., Keresztesova, B., Bellova, J., Kunova, N., Canigova, N., Hanakova, K., Bauer, J., Ondrovicova, G., Lukacova, V., Sivakova, B., Zdrahal, Z., Pevala, V., Prochazkova, K., Nosek, J., Kutejova, E., Tomáška L.

The yeast mitochondrial succinylome: Implications for regulation of mitochondrial nucleoids. (2021) J. Biol. Chem. 297 (4): 1-16.

Obmedzenú možnosť práce v laboratóriu spôsobenú pandémiou COVID-19 sme využili na prípravu a publikovanie review článkov:

Kotrasova, V., Keresztesova, B., Ondrovicova, G., Bauer, J., Havalova, H., Pevala, V., Kutejova, E., Kunova, N.

Mitochondrial Kinases and the Role of Mitochondrial Protein Phosphorylation in Health and Disease.

(2021) LIFE-BASEL 11: 82

Havalova, H., Ondrovicova, G., Keresztesova, B., Bauer, J., Pevala, V., Kutejova, E., Kunova, N. Mitochondrial HSP70 Chaperone System - The Influence of Post-Translational Modifications and Involvement in Human Diseases.

(2021) Int J Mol Sci 22(15): 8077

26.) Dvojsečný meč plazminogénového systému: Od udržiavania homeostázy po COVID-19

(The double-edged sword of the plasminogen system: From homeostasis maintenance to COVID-19)

Zodpovedný riešiteľ:	Vladimír Leksa
Trvanie projektu:	1.8.2021 / 30.6.2025
Evidenčné číslo projektu:	APVV-20-0513
Organizácia je koordinátorom projektu:	áno
Koordinátor:	Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	APVV: 19914 €

Dosiahnuté výsledky:

Kvôli pandémii koronavírusu sme sa sústredili na štúdium infekcie buniek vírusom SAR-CoV2. Podarilo sa nám odhaliť možný spôsob blokovania infekcie a na základe toho pripraviť vedeckú publikáciu, ktorá je toho času v štádiu revízie.

27.) Laktoferín a laktofericín ako prirodzené inhibítory plazmínu: Od určenia štruktúry po terapeutické aplikácie *(Lactoferrin and lactoferricin as natural plasmin inhibitors: From the structure resolution to therapeutic applications)*

Zodpovedný riešiteľ: Vladimír Leksa
Trvanie projektu: 1.1.2021 / 31.12.2024
Evidenčné číslo projektu: 2/0152/21
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: VEGA: 6145 €

Dosiahnuté výsledky:

Sústredili sme sa na úlohu laktofericínu pri blokování infekcie buniek vírusom SARS-CoV-2 a pripravili vedecký článok, ktorý je teraz v štádiu revízie.

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 koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 24221 €

Dosiahnuté výsledky:

Kvôli pandémie koronavírusu sme sa sústredili na štúdium infekcie buniek vírusom SAR-CoV2. Podarilo sa nám odhaliť možný spôsob blokovania infekcie a na základe toho pripraviť vedeckú publikáciu, ktorá je toho času v štádiu revízie.

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 koordinátorom projektu: nie
Koordinátor: Slovenská technická univerzita v Bratislave Fakulta chemickej a potravinárskej technológie
Počet spoluriešiteľských inštitúcií: 1 - Slovensko: 1
Čerpané financie: APVV: 25000 €

Dosiahnuté výsledky:

Štúdium povrchového rastu izolátov vláknitej huby *Mucor circinelloides* z produktov a výrobných

závodov tradičných slovenských syrov, vo vzťahu k environmentálnym faktorom (teplota, pH, aw, dekontaminačné prostriedky). Predmetom výskumu bude charakterizácia povrchového rastu *Mucor circinelloides* so zameraním na rozdiely v rýchlosti rastu vzhľadom na živné médium.

30.) Štartovacie a prídavné kultúry na výrobu slovenskej bryndze s tradičnými organoleptickými vlastnosťami. (*Microbial starters and adjunct cultures for production of Slovakian bryndza cheese with traditional organoleptic properties*)

Zodpovedný riešiteľ: Domenico Pangallo
Trvanie projektu: 1.7.2021 / 30.6.2024
Evidenčné číslo projektu: APVV-20-0001
Organizácia je koordinátorom projektu: nie
Koordinátor: Národné poľnohospodárske a potravinárske centrum; Výskumný ústav potravinársky
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 8000 €

Dosiahnuté výsledky:

Cieľom tohto výskumného projektu bude syntetizovať doteraz získané poznatky, využiť internú zbierku mikrobiálnych izolátov z tradičných slovenských syrov vytvorenú v rámci predchádzajúcich výskumných projektov a doplniť tieto o ďalšie potrebné poznatky a ďalšie kmene baktérií mliečneho kysnutia i kvasiniek a vláknitých húb ako kandidátov na štartovacie kultúry. Predkladaný výskumný projekt sa bude zaoberať charakterizáciou mikrobiálnych spoločenstiev a genetickou charakterizáciou mikroorganizmov v srvátkových kultúrach a zrecích miestnostiach, na čo sa použijú kultivačné mikrobiologické metódy a moderné molekulárno-biologické metódy vrátane veľkokapacitného paralelného sekvenovania DNA (High-throughout sequencing). Študovať budeme tiež diverzitu bakteriofágov, keďže ovplyvňujú mikrobiálne spoločenstvá syrov a potenciálnu úspešnosť štartovacích kultúr. Na objektívnu charakterizáciu arómy modelových syrov sa použije plynová chromatografia – olfaktometria s podporou plynovej chromatografie – hmotnostnej spektrometrie. Výstupom projektu bude súbor kmeňov mikroorganizmov a poznatkov o ich metabolickom potenciáli, vrátane údajov z ich experimentálnej aplikácie, ktoré bezprostredne umožnia technický vývoj štartovacích kultúr pre výrobu bryndze s tradičnými organoleptickými vlastnosťami.

31.) Črevná mikrobiota a diabetická periferálna neuropatia: účinok cementirestatu v potkaňom modeli diabetu. (*Gut microbiota and diabetic peripheral neuropathy: effect of cementirestat in rat models of diabetes.*)

Zodpovedný riešiteľ: Milan Štefek
Zodpovedný riešiteľ v organizácii SAV: Domenico Pangallo
Trvanie projektu: 1.8.2021 / 30.6.2024
Evidenčné číslo projektu: APVV-20-0411
Organizácia je koordinátorom projektu: nie
Koordinátor: Centrum experimentálnej medicíny SAV
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV: 10000 €

Dosiahnuté výsledky:

Mikrobiálna nerovnováha vo vnútri gastrointestinálneho traktu (dysbióza) môže byť spojená s metabolickými poruchami ako je obezita, inzulínová rezistencia, diabetes a imunitná dysfunkcia. Tieto prepojenia sú však stále kontroverzné a vyžadujú ďalší výskum. Cieľom tohto projektu je lepšie porozumenie vzájomných interakcií črevnej mikrobioty a diabetického stavu a odhalenie ich dôsledkov na vývoj chronických diabetických komplikácií s dôrazom na periférnu neuropatiu. Budú sa študovať účinky cementrestatu, nového inhibítora aldózareduktázy, na vyššie uvedené procesy. Experimentálne údaje poskytnú cenné poznatky o úlohe zmien črevnej mikrobioty v etiológii diabetickej periférnej neuropatie a naznačia možné terapeutické prístupy.

32.) Hybridné hémové peroxidázy húb z pralesa s využitím v environmentálnych biotechnológiách (*Fungal Hybrid Heme Peroxidases from Primeval Forest with Application in Environmental Biotechnologies*)

Zodpovedný riešiteľ: Marcel Zámocký
Trvanie projektu: 1.7.2021 / 30.6.2025
Evidenčné číslo projektu: APVV-20-0284
Organizácia je koordinátorom projektu: áno
Koordinátor: Ústav molekulárnej biológie SAV, v. v. i.
Počet spoluriešiteľských inštitúcií: 0
Čerpané financie: APVV - SAV: 9529 €

Dosiahnuté výsledky:

Rozsiahle genomické analýzy zamerané prvotne na evolúciu glutatión peroxidáz boli zverejnené v publikácii Trenz, T., Delaix, C., Turchetto-Zolet, A., Zámocký, M., Lazzarotto, F., Margis-Pinheiro, M. "Going Forward and Back: The complex Evolutionary History of the GPx" ktorá vyšla v časopise Biology Basel (2021) 10(11) 1165. Zároveň sa rozbehla prvá séria genomických analýz vzoriek lesnej pôdy odobranej z bučín stredného Slovenska. Pozorované zmeny diverzity rôznych hémových peroxidáz boli prezentované na medzinárodnej online konferencii 14th World Congress on Polyphenols Applications v dňoch 22.-24.9.2021 formou prednášky: Zámocký M., Poljovka A. "Differences within four heme peroxidase superfamilies in the reactivity with phenolic compounds" v príslušnom zborníku tejto konferencie na str. 26.

33.) 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 SAV: 7099 €

Dosiahnuté výsledky:

Výsledky ohľadom skúmanej reaktivity rôznych hémových peroxidáz s dôležitými prírodnými

substrátmi boli prezentované na online konferencii 14th World Congress on Polyphenols Applications 22.-24.9.2021 formou prednášky: Zámocký M., Poljovka A. "Differences within four heme peroxidase superfamilies in the reactivity with phenolic compounds" v príslušnom zborníku konferencie na str. 26. Prebehlo tiež posúdenie rôznych typov peroxidáz pre konverziu na vanilín.

Programy: Štrukturálne fondy EÚ Výskum a vývoj

34.) Dlhodobý strategický výskum a vývoj zameraný na výskyt Lynchovho syndrómu v populácii SR a možnosti prevencie nádorov spojených s týmto syndrómom

Zodpovedný riešiteľ:	Domenico Pangallo
Trvanie projektu:	1.1.2020 / 30.6.2023
Evidenčné číslo projektu:	
Organizácia je koordinátorom projektu:	nie
Koordinátor:	Univerzita Komenského v Bratislave, Univerzitný Vedecký park
Počet spoluriešiteľských inštitúcií:	0
Čerpané financie:	ŠF: 74505 €

Dosiahnuté výsledky:

V rámci riešenia projektu bola navrhnutá a otestovaná metodika identifikácie a kvantifikácie bakteriálnych členov červeného mikrobiomu využívajúca sekvenovanie dlhých úsekov DNA obsahujúcich ribozomálne operónové sekvencie (rrn). Táto metodika zahŕňa amplifikáciu úsekov dlhých približne 4000 bázových párov obsahujúcich gény kódujúce 3 hlavné časti - malú ribozomálnu podjednotku, medzerníkovú oblasť a veľkú ribozomálnu podjednotku (16S-ITS-28S), ich následnú purifikáciu po separácii z elektroforetického gélu pomocou kitu a následné sekvenovanie pomocou zariadenia MinION (ONT). Vyvinutá metodika zahŕňa aj nami naskriptovaný proces bioinformatického spracovania a vyhodnotenia sekvenčných dát, ktorý na taxonomickú klasifikáciu a identifikáciu neznámych baktérií využíva nami vytvorenú databázu referenčných sekvencií označenú ako "AEROS" (skratka z angl. Almost Entire Ribosomal Operon Sequences). Databáza AEROS je tvorená z ribosomálnych operónových sekvencií z celkovo 7 192 organizmov a je verejne dostupná online pre vedecké účely na <https://github.com/xsitarcik/AEROS-DB>. Metodika bola úspešne overená aj na umelo vytvorenej modelovej skupine baktérií obsahujúcej rody prirodzene sa vyskytujúce v ľudskom črevnom mikrobióme.

Príloha C

Publikačná činnosť organizácie (generovaná z ARL)

ABC Kapitoly vo vedeckých monografiách vydané v zahraničných vydavateľstvách

- ABC01 BAUER, Jacob** - BAUEROVÁ-HLINKOVÁ, Vladena. Normal mode analysis: a tool for better understanding protein flexibility and dynamics with application to homology models. In Homology molecular modeling : perspectives and applications. - London : IntechOpen, 2021, p. 13-30. ISBN 978-1-83962-805-4.
- ABC02 FURTMULLER, P.G. - ZÁMOCKÝ, Marcel - HOFBAUER, S. - OBINGER, C. Evolution, structure and biochemistry of human peroxidases. In Mammalian heme peroxidases : diverse roles in health and disease. - London : CRC Press, 2021, p. 3-20. ISBN 978-1-0032-1228-7.
- ABC03 KORMANEC, Ján** - REŽUCHOVÁ, Bronislava - NOVÁKOVÁ, Renáta. Screening systems for stable markerless genomic deletions/integrations in Streptomyces species. In Antimicrobial therapies : methods and protocols. - New York : Springer-Verlag, Humana Press, 2021, p. 91-141. ISBN 978-1-0716-1358-0. Dostupné na: https://doi.org/10.1007/978-1-0716-1358-0_6

ACB Vysokoškolské učebnice vydané v domácich vydavateľstvách

- ACB01 KABÁT, Peter - BAUEROVÁ, Vladena - BAUER, Jacob. Proteíny štruktúra a funkcia : 2. diel Funkcia proteínov. H. Drahovská, M. Kúdelová. 1. vyd. Bratislava : Univerzita Komenského, 2021. 105 s. ISBN 978-80-223-5094-5

ADCA Vedecké práce v zahraničných karentovaných časopisoch – impaktovaných

- ADCA01 BAUER, Jacob** - ŽOLDÁK, Gabriel**. Interpretation of single-molecule force experiments on proteins using normal mode analysis. In Nanomaterials-Basel, 2021, vol. 11, no. 11, no. 2795. (2020: 5.076 - IF, Q1 - JCR, 0.919 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents, WOS, SCOPUS). ISSN 2079-4991. Dostupné na: <https://doi.org/10.3390/nano11112795>
- ADCA02 BODIK, Michal** - KRAJČÍKOVÁ, Daniela - HAGARA, Jakub - MAJKOVÁ, Eva - BARÁK, Imrich** - ŠIFFALOVÍČ, Peter. Diffraction pattern of Bacillus subtilis CotY spore coat protein 2D crystals. In Colloids and Surfaces B - Biointerfaces, 2021, vol. 197, 111425. (2020: 5.268 - IF, Q1 - JCR, 0.939 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents, WOS, SCOPUS). ISSN 0927-7765. Dostupné na: <https://doi.org/10.1016/j.colsurfb.2020.111425>
- ADCA03 CSÖLLEIOVÁ, Dominika - KNIRSCHOVÁ, Renáta - REŽUCHOVÁ, Bronislava - HOMEROVÁ, Dagmar - ŠEVČÍKOVÁ, Beatrice - MATULOVÁ, Mária - NÚÑEZ, L.E. - NOVÁKOVÁ, Renáta - FECKOVÁ, Lubomíra - JAVOROVÁ, Rachel - CORTÉS, J. - KORMANEC, Ján**. An efficient system for stable markerless integration of large biosynthetic gene clusters into Streptomyces chromosomes. In Applied Microbiology and Biotechnology, 2021, vol. 105, p. 2123–2137. (2020: 4.813 - IF, Q1 - JCR, 1.074 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0175-7598. Dostupné na: <https://doi.org/10.1007/s00253-021-11161-w>
- ADCA04 DANKO, Martin** - MOSNÁČKOVÁ, Katarína - VYKYDALOVÁ, Anna - KLEINOVÁ, Angela - PUŠKÁROVÁ, Andrea - PANGALLO, Domenico - BUJDOŠ, Marek - MOSNÁČEK, Jaroslav. Properties and degradation performances of biodegradable poly(lactic acid)/poly(3-hydroxybutyrate) blends and keratin

- composites. In *Polymers : Open Access Polymer Science Journal*, 2021, vol. 13, art. no. 2693, [18] p. (2020: 4.329 - IF, Q1 - JCR, 0.770 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 2073-4360. Dostupné na:
<https://doi.org/10.3390/polym13162693>
- ADCA05 FARKAS, Bence - VOJTKOVÁ, Hana - BUJDOŠ, Marek - KOLENČÍK, Marek - ŠEBESTA, Martin - MATULOVÁ, Michaela - DUBORSKÁ, Eva - DANKO, Martin - KIM, Hyunjung - KUČOVÁ, Kateřina - KISOVÁ, Zuzana - MATÚŠ, Peter - URÍK, Martin**. Fungal Mobilization of Selenium in the Presence of Hausmannite and Ferric Oxyhydroxides. In *Journal of Fungi*, 2021, vol. 7, art. no. 810, [10] p. (2020: 5.816 - IF, Q1 - JCR, 1.702 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 2309-608X. Dostupné na:
<https://doi.org/10.3390/jof7100810>
- ADCA06 FARKAS, Bence - BUJDOŠ, Marek - POLÁK, Filip - MATULOVÁ, Michaela - CESNEK, Martin - DUBORSKÁ, Eva - ZVĚŘINA, Ondřej - KIM, Hyunjung - DANKO, Martin - KISOVÁ, Zuzana - MATÚŠ, Peter - URÍK, Martin**. Biobleaching of manganese oxides at different oxidation states by filamentous fungus *Aspergillus niger*. In *Journal of Fungi*, 2021, vol. 7, art. no. 808, [15] p. (2020: 5.816 - IF, Q1 - JCR, 1.702 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 2309-608X. Dostupné na: <https://doi.org/10.3390/jof7100808>
- ADCA07 FRANKOVSKY, J. - KERESZTESOVÁ, Barbora* - BELLOVÁ, Jana - KUNOVÁ, Nina - ČANIGOVÁ, N. - HANAKOVA, K. - BAUER, Jacob - ONDROVIČOVÁ, Gabriela - LUKÁČOVÁ, Veronika - SIVÁKOVÁ, Barbara - ZDRÁHAL, Zbyněk - PEVALA, Vladimír - PROCHÁZKOVÁ, K. - NOSEK, J. - BARÁTH, Peter** - KUTEJOVÁ, Eva** - TOMAŠKA, Lubomír**. The yeast mitochondrial succinylome: Implications for regulation of mitochondrial nucleoids. In *Journal of Biological Chemistry*, 2021, vol. 297, no. 4, no. 101155 [16] p. (2020: 5.157 - IF, Q2 - JCR, 2.361 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0021-9258. Dostupné na: <https://doi.org/10.1016/j.jbc.2021.101155>
- ADCA08 HADŽEGA, Dominik - MINÁRIK, G. - KARABA, Marián - KALAVSKA, K. - BENCA, Juraj - ČIERNIKOVÁ, Soňa - SEDLÁČKOVÁ, T. - NEMCOVÁ, Petra - BOHÁČ, M. - PINDAK, D. - KLUČÁR, Ľuboš** - MEGO, M. Uncovering microbial composition in human breast cancer primary tumour tissue using transcriptomic RNA-seq. In *International Journal of Molecular Sciences*, 2021, vol. 22, no. 9058. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 1422-0067. Dostupné na:
<https://doi.org/10.3390/ijms22169058>
- ADCA09 HALGAŠOVÁ, Nora - KRAJČÍKOVÁ, Daniela - KRAUS, Daniel - BUKOVSKÁ, Gabriela**. The helicase core accessory regions of the phage BFK20 DnaB-like helicase gp43 significantly affect its activity, oligomeric state and DNA binding properties. In *Virology*, 2021, vol. 558, p. 96-109. (2020: 3.616 - IF, Q3 - JCR, 1.389 - SJR, Q2 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0042-6822. Dostupné na: <https://doi.org/10.1016/j.virol.2021.02.016>
- ADCA10 HAN, H. - ROUND, E. - SCHUBERT, R. - MAKROCZYOVÁ, Jana - BARÁK, Imrich - HAJDU, Janos**. The XBI BioLab for life science experiments at the European XFEL. In *Journal of Applied Crystallography*, 2021, vol. 54, p. 7–21. (2020: 3.304 - IF, Q2 - JCR, 1.429 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0021-8898. Dostupné na:
<https://doi.org/10.1107/S1600576720013989>
- ADCA11 HAVALOVÁ, Henrieta* - ONDROVIČOVÁ, Gabriela* - KERESZTESOVÁ, Barbora - BAUER, Jacob - PEVALA, Vladimír - KUTEJOVÁ, Eva** - KUNOVÁ, Nina**. Mitochondrial HSP70 chaperone system - the influence of post-translational modifications and involvement in human diseases. In *International Journal of*

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- ADCA12 JANÍČKOVÁ, Zuzana - JANEČEK, Štefan**. In silico analysis of fungal and chloride-dependent alpha-amylases within the family GH13 with identification of possible secondary surface-binding sites. In *Molecules*, 2021, vol. 26, no. 5704. (2020: 4.412 - IF, Q2 - JCR, 0.782 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents, WOS, SCOPUS). ISSN 1420-3049. Dostupné na: <https://doi.org/10.3390/molecules26185704>
- ADCA13 KAPUSTOVÁ, Magdaléna* - PUŠKÁROVÁ, Andrea - BUČKOVÁ, Mária - GRANATA, Giuseppe* - NAPOLI, Edoardo - ANNUŠOVÁ, Adriana - MESÁROŠOVÁ, Monika - KOZICS, Katarína - PANGALLO, Domenico** - GERACI, Coradda**. Biofilm inhibition by biocompatible poly(epsilon-caprolactone) nanocapsules loaded with essential oils and their cyto/genotoxicity to human keratinocyte cell line. In *International Journal of Pharmaceutics*, 2021, vol. 606, no. 12, art. no. 120846. (2020: 5.875 - IF, Q1 - JCR, 1.153 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0378-5173. Dostupné na: <https://doi.org/10.1016/j.ijpharm.2021.120846>
- ADCA14 KISOVÁ, Zuzana - PAVLOVIČ, Jelena - ŠEŤIKOVÁ, Lucia - BUČKOVÁ, Mária - PUŠKÁROVÁ, Andrea - KRAKOVÁ, Lucia - OPÁLKOVÁ ŠÍŠKOVÁ, Alena - KLEINOVÁ, Angela - MACHATOVÁ, Zuzana - PANGALLO, Domenico**. Removal of overpainting from an historical painting of the XVIII century: A yeast enzymatic approach. In *Journal of Biotechnology*, 2021, vol. 335, p. 55-64. (2020: 3.307 - IF, Q2 - JCR, 0.901 - SJR, Q2 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0168-1656. Dostupné na: <https://doi.org/10.1016/j.jbiotec.2021.06.008>
- ADCA15 KOTRASOVÁ, Veronika* - KERESZTESOVÁ, Barbora* - ONDROVIČOVÁ, Gabriela - BAUER, Jacob - HAVALOVÁ, Henrieta - PEVALA, Vladimír - KUTEJOVÁ, Eva** - KUNOVÁ, Nina**. Mitochondrial kinases and the role of mitochondrial protein phosphorylation in health and disease. In *Life-Basel*, 2021, vol. 11, p. 82. (2020: 3.817 - IF, Q2 - JCR, 0.973 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 2075-1729. Dostupné na: <https://doi.org/10.3390/life11020082>
- ADCA16 LABAJOVÁ, Nad'a** - BARANOVA, N. - JURÁSEK, M. - VÁCHA, R.** - LOOSE, M. - BARÁK, Imrich**. Cardiolipin-containing lipid membranes attract the bacterial cell division protein divIVA. In *International Journal of Molecular Sciences*, 2021, vol. 22, no. 8350. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 1422-0067. Dostupné na: <https://doi.org/10.3390/ijms22158350>
- ADCA17 LEITNER, J. - MAHASONGKRAM, K. - SCHATZLMAIER, P. - PFISTERER, K. - LEKSA, Vladimír - PATA, S. - KASINRERK, W. - STOCKINGER, H.** - STEINBERGER, P.**. Differentiation and activation of human CD4 T cells is associated with a gradual loss of myelin and lymphocyte protein. In *European Journal of Immunology*, 2021, vol. 51, p. 848-863. (2020: 5.532 - IF, Q2 - JCR, 2.272 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0014-2980. Dostupné na: <https://doi.org/10.1002/eji.202048603>
- ADCA18 MAJTÁN, Juraj** - BUČKOVÁ, Marcela - JESEŇÁK, M. Natural products and skin diseases. In *Molecules*, 2021, vol. 26, p. 4489. (2020: 4.412 - IF, Q2 - JCR, 0.782 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents, WOS, SCOPUS). ISSN 1420-3049. Dostupné na: <https://doi.org/10.3390/molecules26154489>
- ADCA19 MAREČEK, Filip - MØLLER, M.S. - SVENSSON, B. - JANEČEK, Štefan**. A

- putative novel starch-binding domain revealed by in silico analysis of the N-terminal domain in bacterial amylomaltases from the family GH77. In 3 Biotech, 2021, vol. 11, p. 229. (2020: 2.406 - IF, Q3 - JCR, 0.557 - SJR, Q2 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 2190-5738. Dostupné na: <https://doi.org/10.1007/s13205-021-02787-8>
- ADCA20 NOVÁKOVÁ, Renáta - RUCKERT, C. - KNIRSCHOVÁ, Renáta - FECKOVÁ, Ľubomíra - BUSCHE, T. - CSÖLLEIOVÁ, Dominika - HOMEROVÁ, Dagmar - REŽUCHOVÁ, Bronislava - JAVOROVÁ, Rachel - ŠEVČÍKOVÁ, Beatrice - KALINOWSKI, J. - KORMANEC, Ján. The linear plasmid pSA3239 is essential for the replication of the *Streptomyces lavendulae* subsp. *lavendulae* CCM 3239 chromosome. In Research in Microbiology, 2021, vol. 172, no. 6, no. 103870. (2020: 3.992 - IF, Q2 - JCR, 1.329 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0923-2508. Dostupné na: <https://doi.org/10.1016/j.resmic.2021.103870>
- ADCA21 NOVÁKOVÁ, Slavomíra** - DANCHENKO, Maksym* - OKAJČEKOVÁ, Terézia - BARANOVIČOVÁ, Eva - KOVÁČ, Andrej - GRENDÁR, Marián - BEKE, Gábor - PÁLEŠOVÁ, Janka - STRNÁDEL, Ján - JANÍČKOVÁ, Mária - HALAŠOVÁ, E. - ŠKOVIEROVÁ, Henrieta. Comparative Proteomic and Metabolomic Analysis of Human Osteoblasts, Differentiated from Dental Pulp Stem Cells, Hinted Crucial Signaling Pathways Promoting Osteogenesis. In International Journal of Molecular Sciences, 2021, vol. 22, no. 15, art. no.7908. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 1422-0067. Dostupné na: <https://doi.org/10.3390/ijms22157908>
- ADCA22 OPÁLKOVÁ ŠIŠKOVÁ, Alena** - BUČKOVÁ, Mária - KRONEKOVÁ, Zuzana - KLEINOVÁ, Angela - NAGY, Štefan - RYDZ, Joanna - OPÁLEK, Andrej - SLÁVIKOVÁ, Monika - ECKSTEIN ANDICSOVÁ, Anita**. The drug-loaded electrospun poly(epsilon-caprolactone) mats for therapeutic application. In Nanomaterials-Basel, 2021, vol. 11, art. no. 922, [19] p. (2020: 5.076 - IF, Q1 - JCR, 0.919 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents, WOS, SCOPUS). ISSN 2079-4991. Dostupné na: <https://doi.org/10.3390/nano11040922>
- ADCA23 OPÁLKOVÁ ŠIŠKOVÁ, Alena** - MOSNÁČKOVÁ, Katarína - HRŮZA, Jakub - FRAJOVÁ, Jaroslava - OPÁLEK, Andrej - BUČKOVÁ, Mária - KOZICS, Katarína - PEER, Petra - ECKSTEIN ANDICSOVÁ, Anita**. Electrospun poly(ethylene terephthalate)/silk fibroin composite for filtration application. In Polymers : Open Access Polymer Science Journal, 2021, vol. 13, art. no. 2499, [23] p. (2020: 4.329 - IF, Q1 - JCR, 0.770 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 2073-4360. Dostupné na: <https://doi.org/doi.org/10.3390/polym13152499>
- ADCA24 PAVLOVIĆ, Jelena - CAVALIERI, D. - MASTROMEI, G. - PANGALLO, Domenico - PERITO, B. - MARVASI, M.**. MinION technology for microbiome sequencing applications for the conservation of cultural heritage. In Microbiological Research, 2021, vol. 247, no. 126727. (2020: 5.415 - IF, Q1 - JCR, 1.254 - SJR, Q2 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0944-5013. Dostupné na: <https://doi.org/10.1016/j.micres.2021.126727>
- ADCA25 PLANÝ, Matej - PINZARI, F.** - ŠOLTÝS, K. - KRAKOVÁ, Lucia - CORNISH, L. - PANGALLO, Domenico - JUNGBLUT, A.D. - LITTLE, B. Fungal-induced atmospheric iron corrosion in an indoor environment. In International Biodeterioration & Biodegradation, 2021, vol. 159, no. 105204. (2020: 4.320 - IF, Q2 - JCR, 1.103 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 0964-8305. Dostupné na: <https://doi.org/10.1016/j.ibiod.2021.105204>
- ADCA26 SCHIANO, I. - RACO, S. - CESTONE, E. - JESEŇÁK, M. - RENNEROVÁ, Z. - MAJTÁN, Juraj**. Pleuran-beta-glucan from oyster culinary-medicinal mushroom,

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- ADCA27 ŠEVČÍKOVÁ, Beatrica - REŽUCHOVÁ, Bronislava - MAZURÁKOVÁ, V. - HOMEROVÁ, Dagmar - NOVÁKOVÁ, Renáta - FECKOVÁ, Ľubomíra - KORMANEC, Ján**. Cross-recognition of promoters by the nine SigB homologues present in Streptomyces coelicolor A3(2). In International Journal of Molecular Sciences, 2021, vol. 22, no. 7849. (2020: 5.924 - IF, Q1 - JCR, 1.455 - SJR, Q1 - SJR, karentované - CCC). (2021 - Current Contents). ISSN 1422-0067. Dostupné na: <https://doi.org/10.3390/ijms22157849>
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ADMA25 ŠIMONOVIČOVÁ, Alexandra - KUPKA, Daniel - NOSALJ, Sanja - KRAKOVÁ, Lucia - DRAHOVSKÁ, H. - BÁRTOVÁ, Zuzana - VOJTKOVÁ, Hana - BOTUROVÁ, Kateřina - PANGALLO, Domenico**. Differences in metabolites production using the Biolog FF Microplate™ system with an emphasis on some organic acids of *Aspergillus niger* wild type strains. In *Biologia*, 2020, vol. 75, no. 10, p. 1537-1546. (2019: 0.811 - IF, Q4 - JCR, 0.265 - SJR, Q3 - SJR, karentované - CCC). (2020 - Current Contents, WOS, SCOPUS). ISSN 0006-3088. Dostupné na: <https://doi.org/10.2478/s11756-020-00521-y> (VEGA č. 2/0142/19 : Štúdium biooxidačných a bioredukčných procesov síry a jej zlúčenín v životnom prostredí a v priemysle)

Citácie:

1. [1.1] LI, C. - ZHOU, J.W. - DU, G.C. - CHEN, J. - TAKAHASHI, S. - LIU, S. *Developing *Aspergillus niger* as a cell factory for food enzyme production*. In *BIOTECHNOLOGY ADVANCES*. ISSN 0734-9750, NOV 15 2020, vol. 44., Registrované v: WOS

2. [1.2] KUČOVÁ, Kateřina. *Bioaccumulation of hazardous metals by plants in post-mine dump sites*. In *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM*. ISSN 13142704, 2020-01-01, 2020-August, 5.1, pp. 99-105., Registrované v: SCOPUS

3. [1.2] PAVLÍKOVÁ, Marie. *Impact of textile industry wastewater on microorganisms of activated sludge*. In *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM*. ISSN 13142704, 2020-01-01, 2020-August, 6.1, pp. 253-258., Registrované v: SCOPUS

ADMA26 ZÁMOCKÝ, Marcel - TAFER, H. - CHOVANOVÁ, Katarína - LOPANDIC, Ksenija - KAMLÁROVÁ, Anna - OBINGER, C. Genome sequence of the filamentous soil fungus *Chaetomium cochliodes* reveals abundance of genes for heme enzymes from all peroxidase and catalase superfamilies. In *BMC Genomics*, 2016, vol. 17, p. 763. (2015: 3.867 - IF, Q1 - JCR, 2.348 - SJR, Q1 - SJR). ISSN 1471-2164. Dostupné na: <https://doi.org/10.1186/s12864-016-3111-6>

Citácie:

1. [1.1] DARSHAN, K. - AGGARWAL, R. - BASHYAL, B.M. - SINGH, J. - SHANMUGAM, V. - GURJAR, M.S. - SOLANKE, A.U. *Transcriptome Profiling Provides Insights Into Potential Antagonistic Mechanisms Involved in *Chaetomium globosum* Against *Bipolaris sorokiniana**. In *FRONTIERS IN MICROBIOLOGY*. ISSN 1664-302X, DEC 7 2020, vol. 11., Registrované v: WOS

ADMB Vedecké práce v zahraničných neimpaktovaných časopisoch registrovaných v databázach Web of Science alebo SCOPUS

ADMB01 BUSCHE, T. - NOVÁKOVÁ, Renáta - AL'DILAIMI, A. - HOMEROVÁ, Dagmar - FECKOVÁ, Ľubomíra - REŽUCHOVÁ, Bronislava - MINGYAR, Erik - CSÖLLEIOVÁ, Dominika - BEKEOVÁ, Carmen - WINKLER, A. - ŠEVČÍKOVÁ, Beatrice - KALINOWSKI, J. - KORMANEC, Ján - RUCKERT, C. Complete genome sequence of *Streptomyces lavendulae* subsp. *lavendulae* CCM 3239 (formerly "*Streptomyces aureofaciens* CCM 3239"), a producer of the Angucycline-Type antibiotic Auricin. In *Genome Announcements*, 2018, vol. 6, no. 9, no. e00103-18. (2017: 0.553 - SJR, Q3 - SJR). ISSN 2169-8287. Dostupné na:

<https://doi.org/10.1128/genomeA.00103-18>

Citácie:

1. [1.1] JUETTNER, N.E. - BOGEN, J.P. - BAUER, T.A. - KNAPP, S. - PFEIFER, F. - HUETTENHAIN, S.H. - MEUSINGER, R. - KRAEMER, A. - FUCHSBAUER, H.L. *Decoding the Papain Inhibitor from Streptomyces mobaraensis as Being Hydroxylated Chymostatin Derivatives: Purification, Structure Analysis, and Putative Biosynthetic Pathway.* In *JOURNAL OF NATURAL PRODUCTS*. ISSN 0163-3864, OCT 23 2020, vol. 83, no. 10, p. 2983-2995., Registrované v: WOS
2. [1.2] ASNANI, A. - AMALIYAH, R. - YUNIATY, A. *Screening Anti-MRSA Activities of Indigenous Microbes and Prediction of the Biosynthetic Gene Clusters.* In *Journal of Physics: Conference Series*. ISSN 17426588, 2020, 1665, 1, pp., Registrované v: SCOPUS

ADMB02

CSÁDEROVÁ, Lucia - DEBREOVÁ, M. - RADVÁK, Peter - STANO, Matej - VREŠTIAKOVÁ, Magdaléna - KOPÁČEK, Juraj - PASTOREKOVÁ, Silvia - ŠVASTOVÁ, Eliška. The effect of carbonic anhydrase IX on focal contacts during cell spreading and migration. In *Frontiers in Physiology*, 2013, vol. 4, no. 271, p. 1-12. (2012: 0.840 - SJR, Q2 - SJR). (2013 - SCOPUS). ISSN 1664-042X. Dostupné na: <https://doi.org/10.3389/fphys.2013.00271> (APVV-0658-11 : Karbonická anhydráza IX ako funkčný komponent nádorovej progresie: úloha v epitelovo-mezenchýmovej tranzícii a v prenose medzibunkových signálov. APVV-0108-10 : Identifikácia molekulových dráh riadených prostredníctvom hypoxia-indukovanej anhydrázy IX kyseliny uhličitej v nádorových bunkách. VEGA 2/0130/11 : Úloha karbonickej anhydrázy IX v bunkovej migrácii ako zložke metastatickej kaskády)

Citácie:

1. [1.1] AL-SHARAKY, D.R. - KANDIL, M.A. - AIAD, H.A.S. - EL-HOSARY, E.M. - ALAGIZY, H.A. - ELSHENAWY, M.A.S. - EL-REBEY, H.S. *ROC-1, P21 and CAIX as markers of tumor aggressiveness in bladder carcinoma in Egyptian patients.* In *DIAGNOSTIC PATHOLOGY*. APR 7 2020, vol. 15, no. 1., Registrované v: WOS
2. [1.1] BASSANI, I. - RANCUREL, C. - PAGNOTTA, S. - ORANGE, F. - PONS, N. - LEBRIGAND, K. - PANABIERES, F. - COUNILLON, L. - NOBLIN, X. - GALIANA, E. *Transcriptomic and Ultrastructural Signatures of K+-Induced Aggregation in Phytophthora parasitica Zoospores.* In *MICROORGANISMS*. JUL 2020, vol. 8, no. 7., Registrované v: WOS
3. [1.1] BECKER, H.M. - DEITMER, J.W. *Transport Metabolons and Acid/Base Balance in Tumor Cells.* In *CANCERS*. APR 2020, vol. 12, no. 4., Registrované v: WOS
4. [1.1] BECKER, H.M. *Carbonic anhydrase IX and acid transport in cancer.* In *BRITISH JOURNAL OF CANCER*. ISSN 0007-0920, JAN 2020, vol. 122, no. 2, p. 157-167., Registrované v: WOS
5. [1.1] DAUNYS, S. - PETRIKAITE, V. *The roles of carbonic anhydrases IX and XII in cancer cell adhesion, migration, invasion and metastasis.* In *BIOLOGY OF THE CELL*. ISSN 0248-4900, DEC 2020, vol. 112, no. 12, p. 383-397., Registrované v: WOS
6. [1.1] DVORANOVA, J. - KUGLER, M. - HOLUB, J. - SICHA, V. - DAS, V. - NEKVINDA, J. - EL ANWAR, S. - HAVRANEK, M. - POSPISILOVA, K. - FABRY, M. - KRAL, V. - MEDVEDIKOVA, M. - MATEJKOVA, S. - LISKOVA, B. - GURSKA, S. - DZUBAK, P. - BRYNDA, J. - HAJDUCH, M. - GRUNER, B. - REZACOVA, P. *Sulfonamido carboranes as highly selective inhibitors of cancer-specific carbonic anhydrase IX.* In *EUROPEAN JOURNAL OF MEDICINAL CHEMISTRY*. ISSN 0223-5234, AUG 15 2020, vol. 200., Registrované v: WOS
7. [1.1] HUANG, B.R. - LIU, Y.S. - LAI, S.W. - LIN, H.J. - SHEN, C.K. - YANG, L.Y. - LU, D.Y. *CAIX Regulates GBM Motility and TAM Adhesion and Polarization through EGFR/STAT3 under Hypoxic Conditions.* In *INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES*. AUG 2020, vol. 21, no. 16., Registrované v: WOS
8. [1.1] JOHN, A. - VETRIVEL, U. - SIVASHANMUGAM, M. - NATARAJAN, S.K. *Microsecond Simulation of the Proteoglycan-like Region of Carbonic Anhydrase IX and Design of Chemical Inhibitors Targeting pH Homeostasis in Cancer Cells.* In *ACS OMEGA*. ISSN 2470-1343, MAR 3 2020, vol. 5, no. 8, p. 4270-4281., Registrované v: WOS
9. [1.1] LEE, S.H. - GRIFFITHS, J.R. *How and Why Are Cancers Acidic? Carbonic Anhydrase IX and the Homeostatic Control of Tumour Extracellular pH.* In *CANCERS*. JUN 2020, vol. 12, no. 6., Registrované v: WOS
10. [1.1] LI, Z. - JIANG, L. - TOYOKUNI, S. *Role of carbonic anhydrases in ferroptosis-resistance.* In *ARCHIVES OF BIOCHEMISTRY AND BIOPHYSICS*. ISSN 0003-9861, AUG 15 2020, vol. 689., 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, no. e01085. (2013 - SCOPUS). ISSN 2050-084X. Dostupné na: <https://doi.org/10.7554/eLife.01085>

Citácie:

1. [1.1] CHOLLET, J. - DUNKLER, A. - BAUERLE, A. - VIVERO-POL, L. - MULAW, M.A. -

- GRONEMEYER, T. - JOHNSON, N. *Cdc24 interacts with septins to create a positive feedback loop during bud site assembly in yeast. In JOURNAL OF CELL SCIENCE. ISSN 0021-9533, JUN 2020, vol. 133, no. 11, jcs240283., Registrované v: WOS*
2. [1.1] MILLER, K.E. - KANG, P.J. - PARK, H.O. *Regulation of Cdc42 for polarized growth in budding yeast. In MICROBIAL CELL. ISSN 2311-2638, JUL 2020, vol. 7, no. 7, p. 175-189., Registrované v: WOS*
3. [1.1] PRABHAKAR, A. - CHOW, J. - SIEGEL, A.J. - CULLEN, P.J. *Regulation of intrinsic polarity establishment by a differentiation-type MAPK pathway in S. cerevisiae. In JOURNAL OF CELL SCIENCE. ISSN 0021-9533, APR 2020, vol. 133, no. 7, jcs241513., Registrované v: WOS*
4. [1.1] SAADELDIN, I.M. - SWELUM, A.A.A. - ELSAFADI, M. - MAHMOOD, A. - OSAMA, A. - SHIKSHAKY, H. - ALFAYEZ, M. - ALOWAIMER, A.N. - MAGDELDIN, S. *Thermotolerance and plasticity of camel somatic cells exposed to acute and chronic heat stress. In JOURNAL OF ADVANCED RESEARCH. ISSN 2090-1232, MAR 2020, vol. 22, p. 105-118., Registrované v: WOS*

ADNA Vedecké práce v domácich impaktovaných časopisoch registrovaných v databázach Web of Science alebo SCOPUS

- ADNA01 UGORČÁKOVÁ, Jana - HLAVATY, T. - NOVOTNA, T. - BUKOVSKÁ, Gabriela. Detection of point mutations in KRAS oncogene by real-time PCR-based genotyping assay in GIT diseases. In Bratislavské lekárske listy : international journal for biomedical sciences and clinical medicine, 2012, vol. 113, p. 73-79. (2011: 0.403 - IF, Q4 - JCR, 0.161 - SJR, Q3 - SJR). ISSN 0006-9248. Dostupné na: https://doi.org/10.4149/BLL_2012_018
- Citácie:
1. [2.1] YILMAZ, N. - YILMAZ, U. - TANBEK, K. - ARIKAN, S. - AKSAKAL, N. - ZEYBEK, U. - ERGEN, A. *The role of miRNAs targeting K-ras and APC genes in colorectal cancer. In BRATISLAVA MEDICAL JOURNAL-BRATISLAVSKE LEKARSKE LISTY. ISSN 0006-9248, 2020, vol. 121, no. 8, p. 554-557., Registrované v: WOS*

ADNB Vedecké práce v domácich neimpaktovaných časopisoch registrovaných v databázach Web of Science alebo SCOPUS

- ADNB01 JAMRICHOVÁ, D. - GODÁNY, Andrej - URBÁNIKOVÁ, Ľubica. Optimization of expression conditions of the acetyltransferase CE16 from hypocrea jecorina encoded by a synthetic gene and expressed in escherichia coli cells. In Nova Biotechnologica et Chimica, 2015, vol. 14, p. 201-211. (2014: 0.140 - SJR, Q4 - SJR). ISSN 1338-6905. Dostupné na: <https://doi.org/10.1515/nbec-2015-0027>
- Citácie:
1. [1.2] SMEKENOV, Izat - ALYBAYEV, Sanzhar - AYUPOV, Temurkhan - RAKHMATULLAEVA, Guliza - BISSENBAEV, Amangeldy. *A polyclonal antibody against a recombinantly expressed Triticum aestivum RHT-D1A protein. In Journal of Genetic Engineering and Biotechnology. ISSN 1687157X, 2020-12-01, 18, 1, pp., Registrované v: SCOPUS*
- ADNB02 PLANÝ, Matej - KUČHTA, T. - ŠOLTÝS, K. - SZEMEŠ, T. - PANGALLO, Domenico - SIEKEL, P. Metagenomic analysis of Slovak bryndza cheese using next-generation 16S rDNA amplicon. In Nova Biotechnologica et Chimica, 2016, vol. 15, no. 1, p. 23-34. (2015: 0.168 - SJR, Q4 - SJR). ISSN 1338-6905. Dostupné na: <https://doi.org/10.1515/nbec-2016-0003>
- Citácie:
1. [1.1] GAGLIO, R. - FRANCIOSI, E. - TODARO, A. - GUARCELLO, R. - ALFEO, V. - RANDAZZO, C.L. - SETTANNI, L. - TODARO, M. *Addition of selected starter/non-starter lactic acid bacterial inoculums to stabilise PDO Pecorino Siciliano cheese production. In FOOD RESEARCH INTERNATIONAL. ISSN 0963-9969, OCT 2020, vol. 136., Registrované v: WOS*
2. [1.1] STEFANIKOVA, J. - DUCKOVA, V. - MISKEJE, M. - KACANIOVA, M. - CANIGOVA, M. *The Impact of Different Factors on the Quality and Volatile Organic Compounds Profile in "Bryndza" Cheese. In FOODS. SEP 2020, vol. 9, no. 9., Registrované v: WOS*

AFC Publikované príspevky na zahraničných vedeckých konferenciách

- AFC01 PEŤKOVÁ, K. - VOJTKOVÁ, Hana - JURKOVIČ, Ľubomír - FERIANC, Peter - REMENÁR, Matej. Isolation and identification of bacteria isolates from arsenic contaminated anthroposols. In 14th GeoConference on Energy and Clean Technologies : proceedings from International Multidisciplinary Scientific Geoconference, 17-26 June, 2014. I. - Sofia, Bulgaria : STEF92

Technology Ltd., Andrey Lypchev Blvd., 1797 Sofia, Bulgaria, 2014, p. 399-404. ISBN 978-619-7105-16-2. ISSN 1314-2704. (International Multidisciplinary Scientific Geoconferences : SGEM 2014)

Citácie:

1. [1.1] BOTUROVA, K. *Microbiota as an indicator of the environmental burden of mined-out sites*. In *ADVANCES IN ENVIRONMENTAL ENGINEERING (AEE2019)*. ISSN 1755-1307, 2020, vol. 444, 012004., Registrované v: WOS

2. [1.1] DLABAJA, M. *Utilisation of secondary raw materials for production of artificial soils substrate*. In *ADVANCES IN ENVIRONMENTAL ENGINEERING (AEE2019)*. ISSN 1755-1307, 2020, vol. 444, 012011., Registrované v: WOS

AFK Postery zo zahraničných konferencií

AFK01

STRUHARNANSKA, E. - LEVARSKI, Z. - BÍROVÁ, S. - STUCHLIK, S. - TURNA, Ján - ZÁMOCKÝ, Marcel. Effect of recombinant catalase AfKatG as an additive in growth media of food strains. In *Journal of Biotechnology : European Biotechnology Congress 2018 Athens*, 2018, vol. 280, p. S60. (2017: 2.533 - IF, Q2 - JCR, 0.929 - SJR, Q1 - SJR, karentované - CCC). (2018 - Current Contents). ISSN 0168-1656. Dostupné na: <https://doi.org/10.1016/j.jbiotec.2018.06.196>

Citácie:

1. [1.1] XU, L. - NING, X.B. - CHAI, H.Y. - FEI, G.Q. *Preliminary evaluation of irradiated medium and the optimization of conditions for a catalase produced by Bacillus firmus GL3*. In *JOURNAL OF FOOD MEASUREMENT AND CHARACTERIZATION*. ISSN 2193-4126, APR 2020, vol. 14, no. 2, p. 1073-1084., Registrované v: WOS

Príloha D

Údaje o pedagogickej činnosti organizácie

Semestrálne prednášky:

Jacob Bauer, PhD.

Názov semestr. predmetu: Pokročilé metódy 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: 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

Počet hodín za semester: 10

Názov katedry a vysokej školy: Univerzita sv. Cyrila a Metoda v Trnave, Katedra biológie

Prof. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 12

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

Prof. 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

Prof. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Základy bioinformatiky

Počet hodín za semester: 13

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

Mgr. Ľuboš Kľučár, PhD.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

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

Mgr. Ľuboš Kľučár, PhD.

Názov semestr. predmetu: Výpočtová genomika

Počet hodín za semester: 26

Názov katedry a vysokej školy: Právnická 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

Mgr. Dominik Hadžega

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

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

Prof. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 24

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

Prof. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 24

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

Prof. 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

Prof. 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

Prof. Ing. Štefan Janeček, DrSc.

Názov semestr. predmetu: Základy bioinformatiky

Počet hodín za semester: 13

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

Mgr. Ráchel Javorová

Názov semestr. predmetu: Cvičenia z mikrobiológie

Počet hodín za semester: 4

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

Mgr. Ráchel Javorová

Názov semestr. predmetu: Cvičenia z mikrobiológie

Počet hodín za semester: 4

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

Ing. Evelína Kalocsaiová

Názov semestr. predmetu: Základné cvičenie z molekulárnej biológie

Počet hodín za semester: 14

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

Mgr. Ľuboš Kľučár, PhD.

Názov semestr. predmetu: Bioinformatika

Počet hodín za semester: 26

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

Mgr. Ľuboš Kľučár, PhD.

Názov semestr. predmetu: Výpočtová genomika

Počet hodín za semester: 26

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

Mgr. Kristína Pápayová

Názov semestr. predmetu: Molekulárna biológia - cvičenia

Počet hodín za semester: 15

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, 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

Mgr. Magdaléna Rusková

Názov semestr. predmetu: Cvičenia z mikrobiológie

Počet hodín za semester: 20

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

Mgr. Monika Zámocká

Názov semestr. predmetu: Cvičenia zo základnej molekulárnej biológie

Počet hodín za semester: 14

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

Semináre:

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

Počet hodín za semester: 5

Názov katedry a vysokej školy: Univerzita sv. Cyrila a Metoda v Trnave, Katedra biológie

RNDr. Lucia Bocánová, PhD.

Názov semestr. predmetu: Molekulárna biológia

Počet hodín za semester: 5

Názov katedry a vysokej školy: Univerzita sv. Cyrila a Metoda v Trnave, Katedra biotechnológií

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: Prírodovedecká fakulta UK, Katedra genetiky

RNDr. Imrich Barák, DrSc.

Názov semestr. predmetu: Pokročilé prednášky z molekulárnej biológie

Počet hodín za semester: 4

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

RNDr. Imrich Barák, DrSc.

Názov semestr. predmetu: Pokročilé prednášky z molekulárnej biológie

Počet hodín za semester: 2

Názov katedry a vysokej školy: Prírodovedecká fakulta UK, Katedra biochémie

RNDr. Ján Kormanec, DrSc.

Názov semestr. predmetu: Vybrané kapitoly z mikrobiológie

Počet hodín za semester: 4

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

Ing. Eva Kutejová, DrSc.

Názov semestr. predmetu: Izolácia proteínov - od expresie ku chromatografii

Počet hodín za semester: 2

Názov katedry a vysokej školy: Univerzita Komenského v Bratislave, Genetika

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	1
Dánsko					Štefan Janeček	8
					Filip Mareček	183
Počet vyslaní spolu					3	192

(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
Poľsko					Karolina Pelka	108
Taliansko					Pierluca Nuccetelli	105
Počet prijatí spolu					2	213

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

Krajina	Názov konferencie	Meno pracovníka	Počet dní
Argentína (online)	RedTEz	Štefan Janeček	3
Bulharsko (online)	PRACE	Lucia Bocánová	5
		Kristína Pápayová	5
Česko	XXVI. Annual Congress of CSBMB and SSBMB	Imrich Barák	4
		Zuzana Chromiková	4
		Ráchel Javorová	2
		Ján Kormanec	4
		Eva Kutejová	4
		Barbora Stojkovičová	4
Česko (online)	ELIXIR All Hands meeting 2021	Ľuboš Kľučár	11
	Tomáškovy dny 2021	Kristína Pápayová	1
Francúzsko (online)	HELICASES2021	Nora Halgašová	4
Taliansko (online)	GOBLET & EMBnet AGM 2021	Ľuboš Kľučár	3
USA (online)	GCC2021	Dominik Hadžega	8
		Ľuboš Kľučár	8

Spolu	8	15	70
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Vysvetlivky: MAD - medziakademické dohody, KD - kultúrne dohody, VTS - vedecko-technická spolupráca v rámci vládnych dohôd

Skratky použité v tabuľke C:

ELIXIR All Hands meeting 2021 - ELIXIR All Hands meeting 2021

GCC2021 - 2021 Galaxy Community Conference

GOBLET & EMBnet AGM 2021 - GOBLET & EMBnet AGM 2021

HELICASES2021 - Helicases and Nucleic Acid-Based Machines: Structure, Mechanism and Regulation and Roles in Human Disease

PRACE - PRACE Autumn School 2021: Fundamentals of Biomolecular Simulations and Virtual Drug Development

RedTEz - Third Meeting & First Workshop of the Argentine Network of Enzymatic Technology

Tomáškovy dny 2021 - Tomáškovy dny 2021, 30. konferencie mladých mikrobiológů

XXVI. Annual Congress of CSBMB and SSBMB - XXVI. Annual Congress of Czech and Slovak Societies for Biochemistry and Molecular Biology with cooperation of Austrian and German Biochemical Section

Príloha F

Vedecko-popularizačná činnosť pracovníkov organizácie SAV

Meno	Spoluautori	Typ ¹	Názov	Miesto zverejnenia	Dátum alebo počet za rok
RNDr. Imrich Barák, DrSc.		TL	Bakteriálne bunky pod stresom vystreľujú dlhé nanotrubičky a zomierajú	Monitor Medicíny SLS 1-2/2021, vol. 11	2021
RNDr. Imrich Barák, DrSc.		PB	https://www.tyzden.sk/video/71311/pod-lampou-o-revolucnom-objave-rodí-sa-skutocny-liek-proti-covidu/?rtm_source=newsletter_daily&rtm_medium=email&rtm_campaign=denny-newsletter-26.2.2020&ref=tit pod la	Týždeň - Pod lampou	26.2.2021
RNDr. Imrich Barák, DrSc.	-	TL	Článok o finalistoch ESET Science Award	Forbes Next	1.10.2021
RNDr. Imrich Barák, DrSc.	-	IN	Jednoducho veda, Týždeň - Bunky, spóry, antibiotiká	https://www.tyzden.sk/video/78831/jednoducho-veda--bunky-spory-antibiotika-s-imrichom-barakom-/?ref=kat	22.11.2021
RNDr. Imrich Barák, DrSc.	-	TV	Nočná pyramída	STV3	3.10.2021
RNDr. Imrich Barák, DrSc.	-	TL	Rozhovor - (Ne)smrteľné baktérie	Quark	1.9.2021
RNDr. Imrich Barák, DrSc.	-	TL	Rozhovor so slovenským vedcom	Denník N	17.9.2021
Mgr. Marcela Bučková, PhD.		TL	Marcela Bučková, PhD.: Kvalitný med môže byť drahý. Doma ním treba šetriť	Rikiki magazín moderného rodiča	2021
Mgr. Marcela Bučková, PhD.		RO	RTVS - Rádio Slovensko - rozhovor	RTVS - Rádio Slovensko	13.12.2021
RNDr. Gabriela Bukovská, CSc.		TL	Článok : "Odolnosť baktérií na antibiotiká by mohla vyriešiť fágová terapia"	Pravda	3.1.2021
RNDr. Gabriela Bukovská, CSc.		TL	Článok "Fágová terapia zo Slovenska" https://www.quark.sk/fagova-terapia-zo-slovenska/	Quark	8.12.2021
RNDr. Gabriela Bukovská, CSc.		TL	Článok "Nebezpečné retiazky" https://www.quark.sk/nebezpecne-retiazky/	Quark	21.10.2021
Prof. Ing. Štefan Janeček, DrSc.	Nicolas Terrapon,	IN	Recent Advances in Carbohydrate-Active	https://molecules-12.sciforum.net/	23.6.2021

	Elizabeth Ficko-Blean		Enzymes - webinar		
Ing. Juraj Majtán, DrSc.		TL	Antibiotikum budúcnosti?Med!	Moje zdravie 3/2021	1.3.2021
Ing. Juraj Majtán, DrSc.		RO	Diskusia o mede a včelích pruruktoch	Slovenský rozhlas - sobotné dobré ráno	7.8.2021
Ing. Juraj Majtán, DrSc.		TV	Naši svetoví - zaoštréné	Správy RTVS	22.10.2021
Ing. Juraj Majtán, DrSc.		PB	Nové kvalitatívne parametre medu	Brusno - kultúrny dom	8.8.2021
Ing. Juraj Majtán, DrSc.		TV	Noviny o 12	Tv JOJ	1.10.2021
Ing. Juraj Majtán, DrSc.		IN	Ocenený vedec: Na Slovensku máme jeden z najlepších medov sveta. Odhaliť v obchode nekvalitný je priam nereálne	www.startitup.sk	2.11.2021
Ing. Juraj Majtán, DrSc.		IN	Odborník na med: Pri jeho skladovaní by ste nikdy nemali robiť TÚTO CHYBU, inak stratí účinky!	www1.pluska.sk	25.12.2021
Ing. Juraj Majtán, DrSc.		TL	V našom výskume ostáva nezodpovedaných ešte veľmi veľa otázok	Včelár 11/2021	1.11.2021
Ing. Juraj Majtán, DrSc.		IN	Vedec Juraj Majtán patrí vo výskume medu k svetovej špičke.	www.dalito.sk	9.11.2021
Ing. Juraj Majtán, DrSc.		PB	Všetko o mede	Bardejov - Bašta	25.6.2021
Ing. Juraj Majtán, DrSc.	Marcela Bučeková	IN	Vo svojom Medovom laboratóriu skúmajú kvalitu a účinky medu. Čo ním môžeme liečiť?	Forbes magazín	26.7.2021
Ing. Juraj Majtán, DrSc.	Martin Nikodým, Róbert Kňazko	PB	Včely v meste	Urban market - Tyršovo nábrežie v Bratislave	14.8.2021
Ing. Juraj Majtán, DrSc.	Róbert Kňazko	TV	Ako sa darí včelám v meste?	TV Bratislava	18.8.2021
Mgr. Vladimír Leksa, PhD.		TL	popularizačné články	https://dennikn.sk/autor/vladimir-leksa/	35

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