Questionnaire
Summary of the main activities of a research institute of the Slovak Academy of Sciences

Period: January 1, 2012 - December 31, 2015

1. Basic information on the institute:

1.1. Legal name and address

Institute of Animal Physiology, Slovak Academy of Sciences
Šoltesovej 4-6
04001 Košice

1.2. URL of the institute web site

http://www.saske.sk/ufhz/en/

1.3. Executive body of the institute and its composition

Directoriat	Name	Age	Years in the position
Director	Prof. MVDr. Štefan Faix, DrSc.	57	6
Deputy director	Doc. RNDr. Peter Javorský, DrSc.	65	25
Scientific secretary	Prof. MVDr. Vladimír Kmeť, DrSc.	64	14

1.4. Head of the Scientific Board

Doc. RNDr. Peter Javorský, DrSc.

1.5. Basic information on the research personnel

1.5.1. Number of employees with university degrees (PhD students included) engaged in research projects, their full time equivalent work capacity (FTE) in 2012, 2013, 2014, 2015, and average number of employees in the assessment period

	2012		2013		2014		2015		total		
	number	FTE	number	FTE	number	FTE	number	FTE	number	averaged number per year	averaged FTE
Number of employees with university degrees	29,0	28,700	29,0	28,500	26,0	23,800	24,0	21,700	**108,0**	**27,0**	**25,675**
Number of PhD students	12,0	12,000	11,0	11,000	11,0	11,000	12,0	12,000	**46,0**	**11,5**	**11,500**
Total number	41,0	40,700	40,0	39,500	37,0	34,800	36,0	33,700	**154,0**	**38,5**	**37,175**

1.5.2. Institute units/departments and their FTE employees with university degrees engaged in research and development

Research staff	2012		2013		2014		2015		average	
	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE
Institute in whole	29,0	28,700	29,0	28,500	26,0	23,800	24,0	21,700	**27,0**	**25,675**
Department of Digestive Tract Physiology	20,0	20,000	20,0	20,000	18,0	16,300	17,0	15,200	**18,8**	**17,875**
Department of Developmental Physiology	9,0	8,700	9,0	8,500	8,0	7,500	7,0	6,500	**8,3**	**7,800**

1.6. Basic information on the funding of the institute

Institutional salary budget and others salary budget

Salary budget	2012	2013	2014	2015	average
Institutional Salary budget *[thousands of EUR]*	383,675	234,145	380,274	385,625	**345,930**
Other Salary budget *[thousands of EUR]*	97,913	237,378	126,308	72,533	**133,533**

1.7. Mission Statement of the Institute as presented in the Foundation Charter

1. To promote research in the field of veterinary, biological and agricultural sciences.

2. To implement obtained results in society and practice.

3. To cooperate with institutes working in related scientific areas at the Slovak Academy of Sciences, universities and other research organizations at both national and international levels.

4. To function as an educative institution for training of new researchers in the field of veterinary physiology, animal physiology, microbiology and biochemistry.

1.8. Summary of R&D activity pursued by the institute during the assessment period in both national and international contexts, (recommended 5 pages, max. 10 pages)

The Institute was founded in 1964 as the Department of Animal Physiology of the Institute of Experimental Biology and it became an independent Institute in 1969. So far the IAP has been the only Institute in Slovakia focusing on basic research in the field of animal physiology.

The main subjects of scientific research at the Institute are the study of physiology of the gastrointestinal tract and the study of developmental physiology.

The keynote of research at the **Department of Gastrointestinal Tract Physiology** is: “healthy animal – healthy food – healthy human”. The relationships between nutrition, digestion, gastrointestinal microorganisms and host organism are evaluated using a comprehensive analytical approach, using animal experimental models as well as *in vitro* models (e.g. cell culture, parabiotic chamber, Rumen simulation technique). The major focus is on the interactions between the host and gastrointestinal microorganisms. The identification of commensal microbiota in animals and/or humans is performed predominantly using the methods of molecular biology. The possible partial replacement of

antibiotics in animal feed, with respect to the acquired antibiotic resistance in commensal microflora, represents an interesting part of recent research activities. We study the influence of probiotics, antimicrobial substances of bacterial (bacteriocins) and plant origin (essential oils), and of polyunsaturated fatty acids on the physiology of digestion. Besides the main topic, we also study the role of microbiota in enteritis. Original results have been obtained regarding the functional maturation of the small intestine in rodents related to experimentally-induced changes in nutrition during early life. In these studies, a wide range of biochemical and morphological techniques have been used to analyse enzyme activities, cytokines production, antioxidant activity or cell death.

Scientific research at the **Department of Developmental Physiology** focuses on mammalian reproduction, specifically on the very early stages of the reproduction process. Oocyte maturation, fertilization and early embryo development are studied under physiological as well as pathological conditions. The main topics are: molecular determination of physiological processes during ontogenesis, and evaluation of interactions between the changing maternal environment and embryo.

Noteworthy results obtained at the Department of Gastrointestinal Tract Physiology:

A1. Basic research - Results obtained at home laboratories:

Selenomonas ruminantium plasmids: Genomic analyses of the important rumen bacterium *Selenomonas ruminantium* revealed the role of recombination in plasmid evolution. Based on plasmid genome comparisons a recombination hot-spot was identified probably participating in plasmid evolution through recombination and exchange of replication modules. Using PCR several *S. ruminantium* plasmid replication modules were characterized and a replication module from a new, as yet undescribed plasmid was identified. Significant structural instability of *S. ruminantium* plasmids was observed (Fecskeová et al., 2012).

Antibiotic resistance in rooks: The study focused on antibiotic resistance in rooks, because they have many behavioural and ecological aspects which are important from an epidemiological point of view. A total of 130 *Escherichia coli* strains isolated from rook faeces were investigated for antibiotic resistance and virulence. *E. coli* strains with a higher level of MICs of cephalosporins and fluoroquinolones were selected for detection of betalactamase genes (CTX-M, CMY), plasmid-mediated quinolone resistance qnrS, integrase 1, and for avian pathogenic *E.coli* virulence factors (iutA, cvaC, iss, tsh, ibeA, papC, kpsII). Genes of CTX-M1, CMY-2, integrase 1, papC, cvaC, iutA were detected in one strain of *E.coli*, and qnrS, integrase 1, iss, cvaC, tsh were detected in another E.coli. DNA microarray revealed the absence of verotoxin and enterotoxin genes and pathogenicity islands. The results show that rooks can serve as a reservoir of antibiotic-resistant E. coli with avian pathogenic virulence factors for the human population, and potentially transmit such *E. coli* over long distances (Kmeť et al. 2013).

New bacteria from Varroa destructor mites: Varroa bee-hive (Varroa destructor) attack is a serious and common problem in bee-keeping, and the fight against this parasite has become an often-discussed topic within the professional and general public. In addition to its devastating effect on honey-bee health, it could also serve as a vector of several other microbial diseases. Using a

cultivation approach the cultivable ecto-microflora of Varroa as a potential source of bacterial diseases in bee communities was analysed. Multiple bacterial strains isolated from Varroa mites were isolated and identified with a combination of MALDI-TOF (Matrix-assisted laser desorption/ionization - time of flight), mass spectrometry and 16S rRNA-based methods. The Varroa mite ecto-bacterial population was found to be dominated by Gram-positive bacteria of Bacillus (*B. altitudinis, B. cereus*) and Microbacterium (*M. oxydans, M. paraoxydans*) genera. Gram-negative bacteria were represented by members of Brevundimonas (*B. vesicularis*) and Rhizobium (*R. radiobacter*) genera. No honey-bee pathogenic bacteria were detected and most of the identified species had not been associated with Varroa mite, honey bee or honey before. *B. altitudinis* and *M. oxydans* related isolates are probably representatives of new bacterial taxa (Vaníková et al., 2015).

A2. Basic research - Results of international cooperation:

Bifidobacterium isolated from dog faeces: The aim of the study was to identify and characterize dog bifidobacterial isolates and compare them with commercial probiotic strains. Sixteen isolates of *Bifidobacterium animalis ssp*. lactis from dog faeces (German Shepherd Dog) were identified using subspecies-specific PCR, MALDI-TOF MS and sequencing. This study is the first describing B. animalis ssp. lactis occurring within the intestinal tract of dogs. Our dog isolates showed slightly different fingerprinting profiles obtained by means of RAPD-PCR and REP-PCR from those isolated from yoghurt and type strains of B. animalis ssp. lactis. Strong auto-aggregation activity was observed only in dog-origin *B. animalis ssp*. lactis strains (Bunesova et al., 2012) in cooperation with the Faculty of Agrobiology, Food and Natural Resources at the Czech University of Life Sciences in Prague, Czech Republic).

Evaluation of rumen ciliates and archaea relationship: Development and testing of a fluorescence in situ hybridization (FISH)-based technique and identifying and quantifying simultaneously the methanogenic populations colonizing *Entodinium spp*. in the rumen of cows fed on different forages was carried out. New FISH probes targeting protozoal *Entodinium spp*. were designed and used together with FISH probes for methanogens in the cow rumen. Phylogenetically closely-related *Entodinium spp*. were colonized by similar methanogenic populations regardless of the forage given. Methanogens including *Methanobrevibacter thaueri, Methanobrevibacter millerae* and *Methanobrevibacter smithii*, and members of *Methanomicrobium* and *Methanosphaera* were generally the predominant colonizers of protozoa. Simultaneous FISH probing appears to be a reliable and effective approach to investigate the dynamics of symbiotic relationships between ruminal protozoa and methanogens at the single-cell level. This is the first report on methanogenic archaeal populations which specifically colonize *Entodinium spp*. as identified using simultaneous FISH probing (Xia et al., 2014 in cooperation with Lethbridge Research Centre, Agriculture and Agri-Food Canada, Canada).

B. Applied research:

Experimental probiotics in dogs: In order to find solutions for recent health problems in dogs, especially concerning the impairment of the immune system, we focused on monitoring the effects of the plant extract *Eleutherococcus senticosus* Rupr. & Maxim. – an adaptogen known for its anti-stress, antioxidant, immunostimulatory and anti-inflammatory effects, as observed in human studies to date. A combination of the plant extract with the probiotic strain *Lactobacillus*

fermentum CCM 7421 (AD1) administered orally to healthy dogs for 14 days was also evaluated. Different results after the application of the extract alone and in the combination with the probiotic showed more beneficial use of the combinative application, in which an increase in the lactic acid bacteria population, reduction of clostridia and ammonia concentration in faeces, as well as stimulation of phagocytic activity of leukocytes and increase in serum total protein were observed. After optimization of dose and length of application to maintain normal faecal consistency, the application of *E. senticosus* extract with *L. fermentum* CCM 7421 strain could find promising applications in modulation of intestinal microflora and the immune system in dogs (Strompfová et al., 2012).

Chlorophyll as a modulator of probiotic effect: Long-term applications of probiotic strains from the group of lactic acid bacteria may disturb the acid-base balance because of increased production of organic acids in the gastrointestinal tract. For this reason, combinations of our selected strain *Lactobacillus fermentum* CCM 7421 and chlorophyll as a substance with alkaline properties were tested. Results obtained under *in vitro* conditions showed the possibility of combining them at a concentration of 0.05 to 0.25 % (copper gluconate of chlorophyllin was used) without negative impact on growth of probiotic strain CCM 7421 and with slight decrease in counts at a concentration of 1% (up to 1.1 log CFU/ml). In contrast, addition of 1 % chlorophyllin caused significant growth reduction of tested *staphylococci*, *Listeria monocytogenes* and *Citrobacter freundii*. Experiments *in vivo* tested the effect of 14-day application of chlorophyllin alone (60 mg/day/dog) as well as in combination with *L. fermentum* CCM 7421 (108 CFU/day/dog). The counts of lactic acid bacteria in faeces remained unchanged in both groups, but counts of coliform bacteria decreased significantly in the group with application of chlorophyllin alone. The counts of Clostridium-like bacteria were lower in the combinative group. Some buffering effect of chlorophyllin was detected in the combinative group since pH values were lower by 0.7 in dogs after sole application of the strain in comparison with dogs in the combinative group. Testing of non-specific cellular immunity parameters revealed stimulation of phagocytic activity of leukocytes and their respiratory burst after addition of the strain and chlorophyllin. The combination of probiotic bacteria and chlorophyll is therefore practically possible and more suitable than the sole application of chlorophyll (because of more liquid faeces after chlorophyllin application alone). However, it is necessary to ensure the homogeneous distribution of chlorophyll in the diet through the use of a concentrated preparation or alternatively to administer the additives separately during the daytime (Strompfová et al., 2015).

Isolation of Staphylococcus nepalensis from guano: Cultured bacteria from a six-year-old guano sample from a mixed *Myotis myotis* and *M. blythii* summer roost colony were isolated and identified as Staphylococcus nepalensis using a combination of MALDI TOF and 16S rRNA gene sequencing analysis. Several virulence factors were produced by the tested isolates, mainly capsule formation and resistance to tetracycline, ampicillin and chloramphenicol antibiotics. This is the first report on the occurrence of *S. nepalensis* in the guano of bats, and our results indicate that such guano accumulating near or directly in human dwellings and buildings may represent a significant risk for human health (Vandžurová et al., 2013).

Fermentation of fungal substrates in rumen: Enrichment of cereal agro-industrial substrates with *Cunninghamella echinulata* as a source of fungal gamma-linolenic acid (GLA) could open up new perspectives in animal nutrition, especially of livestock. The examined cereal-enriched diets with fungal GLA did not affect biohydrogenation of fatty acids, but significantly influenced the

concentration of GLA in rumen fluid. Substrates enriched with *C. echinulata* were used for the first time in sheep nutrition (Wencelová et al., 2014).

Noteworthy results obtained at the Department of Developmental Physiology:

A1. Basic research - Results obtained at home laboratories:

Adrenergic receptors in preimplantation embryos: Catecholamines play an important role in embryogenesis, and data obtained in a rodent model indicate that they can act even during the preimplantation period of development. Using RT-PCR with specific oligonucleotide primers distinguishing among all members of the adrenergic receptor family, we examined expression of adrenergic receptors in bovine and rabbit oocytes, morulas and blastocysts. We found several profiles of adrenoceptor mRNA expression. Transcripts for some receptor subtypes (bovine alpha 2 receptors, rabbit α2A, α2C, β1 and β2 receptors) were detected at all examined stages, which suggests receptor expression throughout (or at most stages in) the preimplantation developmental period. Expression in oocytes but not at later stages was found in only one adrenoceptor subtype (rabbit α1B). In contrast, mRNA for several adrenoceptors was found in embryos but not in oocytes (bovine beta adrenoceptors and rabbit α1A). Nucleotide sequences of our PCR products amplified in rabbit oocytes and preimplantation embryos represent the first published mRNA sequences (partial sequences coding at least one transmembrane region) of rabbit α2C, β1 and β2 adrenoceptors. Our results suggest that expression of adrenergic receptors may be a general feature of mammalian oocytes and preimplantation embryos. On the other hand, comparison of three mammalian species (cattle, rabbit, mouse) revealed possible inter-species differences in the expression of particular adrenoceptor subtypes. Our results support the opinion that stress mediators can act directly in cells of preimplantation embryos (Čikoš et al., 2014).

Maternal overweight influences fertility and might affect delivered offspring: The relationship between alterations of body condition in mammals and reproductive disorders is an important but controversial issue. The majority of clinical and experimental studies have reported negative effects of maternal obesity in humans or maternal overweight arising from elevated accumulation of body fat in animals on various reproductive parameters. However, there are still numerous studies showing no or even positive influence. In our study we investigated the effects of maternal body condition on oocyte quality and zygote production and possible consequences for somatic parameters and behavior of naturally-delivered offspring. To produce females with various types of body condition, a previously established two-generation animal model was used. When compared to normal controls, fertilized mice females with slightly elevated amounts of body fat showed increased numbers of spontaneously-ovulated oocytes and elevated fertilization index. On the other hand, mice with slightly and highly elevated amounts of body fat showed increased numbers of isolated immature oocytes and degenerates, significantly lower deposits of neutral lipids in the cytoplasm of mature oocytes, and lower reduction of DNA cytosine methylation signal in parental pronuclei of zygotes. Highly-elevated amounts of body fat in mothers were also accompanied with lower weight of newborns and five-week-old offspring, and several deviations from normal behavior in them (Open field, Forced swimming test). We conclude that alterations in maternal body condition might affect the reproductive process at several steps, including the period of ovulation, fertilization and early embryo development *in vivo*. Furthermore, they might affect

the somatic phenotype and behavior of delivered offspring as well. The effect of obesity-like phenotype is dependent on its level (i.e. amount of maternal body fat deposits) and it might impact particular reproductive parameters in an opposite manner. Nevertheless, in summary, negative effects dominate. Besides, the data suggest that changes in offspring might originate in epigenetic or metabolic modifications established even at the earliest stages of conceptus development (Fabian et al., 2015).

A2. Basic research - Results of international cooperation:

Analysis of Polo-Like kinase 1 (Plk1): Western blotting showed that Plk1 protein content increased significantly during the S-phase of the one-cell stage and declined during the first mitotic division. Activation of Plk1 preceded nuclear envelope breakdown (NEBD) in both pronuclei at the entry to first embryo mitosis. Immunofluorescence revealed the presence of phosphorylated, active PLK1 (pThr210-Plk1) in both male and female pronuclei, and in the microtubule-organizing centers (MTOCs) shortly before NEBD. During the first mitotic metaphase, pThr210-Plk1 accumulated at the spindle poles and was also associated with condensed chromosomes. Inhibition of Plk1 activity with a specific Plk1 inhibitor, BI 2536, at the one-cell stage induced the formation of a bipolar spindle that displayed disordered microtubular arrangements and dislocated condensed chromosomes. Although such embryos entered mitosis, they did not complete it and became arrested at the metaphase. Time-lapse recording revealed progressive misalignment of condensed chromosomes during the first mitotic metaphase. These data indicate that Plk1 activity is not essential for entry into first mitosis, but is required for the events leading up to metaphase-anaphase transition in the one-cell mouse embryo (Baran et al., 2013 in cooperation with the Institute of Animal Physiology and Genetics, Academy of Sciences of the Czech Republic, Liběchov, Czech Republic).

Polo-like kinase 1 orchestrates important cell events: New activities of PLK1 protein kinase were identified on a mouse oocyte experimental model. Experiments showed that PLK1 becomes activated at meiotic resumption on microtubule organizing centers (MTOCs) and later at kinetochores. Activity of PLK1 is required for efficient meiotic resumption by promoting nuclear envelope breakdown independently of CDK1. PLK1 is also needed to recruit centrosomal proteins to acentriolar MTOCs to promote normal spindle formation, as well as for stable kinetochore-microtubule attachment. Consequently, PLK1 inhibition leads to metaphase I arrest with misaligned chromosomes activating the spindle assembly checkpoint (SAC). Unlike in mitosis, metaphase I arrest is not bypassed by inactivation of the SAC. We showed that PLK1 is required for the full activation of the anaphase promoting complex/cyclosome (APC/C) by promoting the degradation of APC/C inhibitor EMI1, and is therefore essential for entry into anaphase I. Moreover, our data suggest that PLK1 is required for proper chromosome segregation and the maintenance of chromosome condensation during the meiosis I-II transition, independently of the APC/C. Thus, our results define the meiotic roles of PLK1 in oocytes and reveal interesting differential requirements of PLK1 between mitosis and oocyte meiosis in mammals (Šolc et al., 2015 in cooperation with the Institute of Animal Physiology and Genetics, Academy of Sciences of the Czech Republic, Liběchov, Czech Republic).

2. Partial indicators of main activities:

2.1. Research output

2.1.1. Principal types of research output of the institute: basic research/applied research, international/regional (ratios in percentage)

basic research international – 75%

applied research international – 5%

basic research regional – 5%

applied research regional – 15%

The majority of research output consists of basic research publications (80%) and the rest of research output is connected with applied research at international and national levels (20%).

2.1.2 List of selected publications documenting the most important results of basic research. The total number of publications listed for the assessment period should not exceed the average number of employees with university degrees engaged in research projects. The principal research outputs (max. 5, including Digital Object Identifier - DOI) should be underlined

1. BARAN, Vladimír - FABIAN, Dušan - REHÁK, Pavol. Akt/PKB plays role of apoptosis relay on entry into first mitosis of mouse embryo. In *Zygote*, 2013, vol. 21, no. 4, p. 406-416. (1.500 - IF2012). (2013 - Current Contents). ISSN 0967-1994.
2. BARAN, Vladimír - ŠOLC, Peter - KOVAŘÍKOVÁ, Veronika - REHÁK, Pavol - ŠUTOVSKÝ, P. Polo-like kinase 1 is essential for the first mitotic division in the mouse embryo. In *Molecular Reproduction and Development*, 2013, vol. 80, p. 522-534. (2.812 - IF2012). (2013 - Current Contents). ISSN 1040-452X.
3. BUNEŠOVÁ, V. - KILLER, J. - VLKOVÁ, E. - MUSILOVÁ, Šárka - TOMÁŠKA, Martin - RADA, V. - KMEŤ, Vladimír. Isolation and chracterization of bifidobacteria from ovine cheese. In *International journal of food microbiology*, 2014, vol. 188, p. 26-30. (3.155 - IF2013). (2014 - Current Contents). ISSN 0168-1605. projects: ITMS 26220220065 and ITMS 2620220152.
4. BURKUŠ, Ján - KAČMAROVÁ, Martina - KUBANDOVÁ, Janka - KOKOŠOVÁ, Natália - FABIANOVÁ, Kamila - FABIAN, Dušan - KOPPEL, Juraj - ČIKOŠ, Štefan. Stress exposure during the preimplantation period affects blastocyst lineages and offspring development. In *Journal of reproduction and development*, 2015, vol. 61 no. 4. (1.515 - IF2014). (2015 - Current Contents). ISSN 0916-8818 (Print).
5. FABIAN, Dušan - KUBANDOVÁ, Janka - ČIKOŠ, Štefan - BURKUŠ, Ján - FABIANOVÁ, Kamila - RAČEKOVÁ, Eniko - CZIKKOVÁ, Soňa - KOPPEL, Juraj. The effect of maternal body condition on in vivo production of zygotes and behavior of delivered offspring in mice. In *Theriogenology : international journal of animal reproduction Theriogenology (Los Altos)*, 2015, vol. 83, p. 577-589. (1.798 - IF2014). (2015 - Current Contents). ISSN 0093-691X.
6. KIŠIDAYOVÁ, Svetlana - MIHALIKOVÁ, Katarína - SIROKA, Peter - ČOBANOVÁ, Klaudia - VÁRADYOVÁ, Zora. Effects of inorganic and organic

selenium on the fatty acid composition of rumen contents of sheep and the rumen bacteria and ciliated protozoa. In *Animal Feed Science and Technology*, 2014, vol. 193, p. 51-57. (2.086 - IF2013). (2014 - Current Contents). ISSN 0377-8401.

7. KMEŤ, Vladimír - DRUGDOVÁ, Zuzana - KMEŤOVÁ, M. - STANKO, Michal. Virulence and antibiotic resistance of Escherichia coli isolated from rooks. In *Annals of Agricultural and Environmental Medicine*, 2013, vol.20, no.2, p.273-275. (3.060 - IF2012). (2013 - Current Contents). ISSN 1232-1966. http://www.ncbi.nlm.nih.gov/pubmed/23772573
8. KOLESAR FECSKEOVÁ, Lívia - IVAN, Jozef - JAVORSKÝ, Peter - PRISTAŠ, Peter. Variability of putative rep gene cassettes in Selenomonas ruminantium plasmids. In *FEMS Microbiology Letters*, 2012, vol., 336 no. 2, p. 98-103. (2.044 - IF2011). (2012 - Current Contents). ISSN 0378-1097.
9. KOPČÁKOVÁ, Anna - BAČKOR, P. - JAVORSKÝ, Peter - PRISTAŠ, Peter. Staphylococcus nepalensis in the guano of bats (Mammalia). In *Veterinary Microbiology*, 2013, vol., 164, p. 116-121. (3.127 - IF2012). (2013 - Current Contents). ISSN 0378-1135.
10. KUBANDOVÁ, Janka - ČIKOŠ, Štefan - BURKUŠ, Ján - CZIKKOVÁ, Soňa - KOPPEL, Juraj - FABIAN, Dušan. Amount of maternal body fat significantly affected the quality of isolated mouse preimplantation embryos and slowed down their development. In *Theriogenology : international journal of animal reproduction Theriogenology (Los Altos)*, 2014, vol. 81, no. 2, p. 187-195. (1.845 - IF2013). (2014 - Current Contents). ISSN 0093-691X. DOI 10.1016/j.theriogenology.2013.10.014.
11. LAUKOVÁ, Andrea - KANDRIČÁKOVÁ, Anna - ŠČERBOVÁ, Jana. Use of bacteriocin-producing, probiotic strain Enterococcus faecium AL41 to control intestinal microbiota in farm ostriches. In *Letters in Applied Microbiology*, 2015, vol. 60, no., p. 531-535. (1.659 - IF2014). (2015 - Current Contents). ISSN 0266-8254.
12. MALINIČOVÁ, Lenka - DUBÍKOVÁ, Katarína - PIKNOVÁ, Mária - PRISTAŠ, Peter - JAVORSKÝ, Peter. Peptidoglycan hydrolase enterolysin A recognizes lipoteichoic acid chains in the cell walls of sensitive bacteria. In *Protein and Peptide Letters*, 2012, vol. 19, no. 9, p. 924-929. (1.942 - IF2011). ISSN 0929-8665.
13. MOON-VAN DER STAAY, SY - VAN DER STAAY, G.W.M. - MICHALOWSKI, T. - JOUANY, JP - PRISTAŠ, Peter - JAVORSKÝ, Peter - KIŠIDAYOVÁ, Svetlana - VÁRADYOVÁ, Zora - MCEWAN, NR - NEWBOLD, CJ - VAN ALEN, T.A. - DE GRAAF, R. - SCHMID, M. - HUYNEN, M.A. - HACKSTEIN, JHP. The symbiotic intestinal ciliates and the evolution of their hosts. In *European journal of protistology*, 2014, vol. 50, no. 2, p. 166-173. (2.339 - IF2013). (2014 - Current Contents). ISSN 0932-4739.
14. MOZEŠ, Štefan - ŠEFČÍKOVÁ, Zuzana - RAČEK, Ľubomír. Effect of repeated fasting/refeeding on obesity development and health complications in rats arising from reduced nest. In *Digestive Diseases and Sciences*, 2015, vol. 60, p. 354-361. (2.613 - IF2014). (2015 - Current Contents). ISSN 0163-2116.
15. MOZEŠ, Štefan - ŠEFČÍKOVÁ, Zuzana - BUJŇÁKOVÁ, Dobroslava - RAČEK, Ľubomír. Effect of antibiotic treatment on intestinal microbial and enzymatic development in postnatally overfed obese rats. In *Obesity*, 2013, vol. 21, no. 8, p. 1635-1642. (3.922 - IF2012). (2013 - Current Contents). ISSN 1930-7381.
16. MOZEŠ, Štefan - ŠEFČÍKOVÁ, Zuzana - RAČEK, Ľubomír. Long-term effect of altered nutrition induced by litter size manipulation and cross-fostering in

suckling male rats on development of obesity risk and health complications. In *European Journal of Nutrition*, 2014, vol. 53, p. 1273-1280. (3.840 - IF2013). (2014 - Current Contents). ISSN 1436-6207.

17. PLEVA, P. - BUŇKOVÁ, L. - LAUKOVÁ, Andrea - LORENCOVÁ, Eva. - KUBÁŇ, V. - BUŇKA, F. Decarboxylation activity of enterococci isolated from rabbit meat and staphylococci isolated from trout intestines. In *Veterinary Microbiology*, 2012, vol. 159, p. 438-442. (3.327 - IF2011). (2012 - Current Contents). ISSN 0378-1135.
18. STROMPFOVÁ, Viola - KUBAŠOVÁ, Ivana - FARBÁKOVÁ, J. - GANCARČÍKOVÁ, Soňa - MUDROŇOVÁ, Dagmar - MAĎARI, Aladár - LAUKOVÁ, Andrea. Experimental application of Lactobacillus fermentum CCM 7421 in combination with chlorophyllin in dogs. In *Applied Microbiology and Biotechnology*, 2015, vol. 99, p. 8681-8690. (3.337 - IF2014). (2015 - Current Contents). ISSN 0175-7598. DOI 10.1007/500253-015-6724-9.
19. ŠOLC, Peter - BARAN, Vladimír - MAYER, Richard M. - BÖHMOVÁ, Tereza - PANENKOVÁ, G. - ŠAŠKOVÁ, A. - SCHULTZ, R.M. - MOTLÍK, Jan. Aurora kinase A drives MTOC biogenesis but does not trigger resumption of meiosis in mouse oocytes matured in vivo. In *Biology of Reproduction*, 2012, vol. 87, no. 4, p. 1-12. (4.009 - IF2011). (2012 - Current Contents). ISSN 0006-3363.
20. VANÍKOVÁ, Slavomíra - NOSKOVÁ, Alena - PRISTAŠ, Peter - JÚDOVÁ, Jana - JAVORSKÝ, Peter. Heterotrophic bacteria associated with Varroa destructor mite. In *Apidologie*, 2015, vol. 46, no.3, p. 369-379. (1.676 - IF2014). (2015 - Current Contents). ISSN 0044-8435.
21. WENCELOVÁ, Monika - VÁRADYOVÁ, Zora - MIHALIKOVÁ, Katarína - GUOTHOVÁ, Lucia - JANŠTOVÁ, J. - ČERTÍK, Milan - HOMOĽOVÁ, Lucia - PRISTAŠ, Peter - JALČ, Dušan - KIŠIDAYOVÁ, Svetlana. Substrates enriched by the fungus Cunninghamella echinulata: an/in vitro study of nutrient composition, sheep rumen fermentation and lipid metabolism. In *Journal of Applied Microbiology*, 2014, vol. 117, p. 930-939. (2.386 - IF2013). (2014 - Current Contents). ISSN 1364-5072, DOI 10.1111/jam.12594.
22. PLACHÁ, Iveta - CHRASTINOVÁ, Ľubica - LAUKOVÁ, Andrea - ČOBANOVÁ, Klaudia - TAKÁČOVÁ, Jana - STROMPFOVÁ, Viola - CHRENKOVÁ, Mária - FORMELOVÁ, Zuzana - FAIX, Štefan. Effect of Thyme oil small intestine integrity and antioxidant status, phagocytic activity and gastrointestinal microbiota in rabbits. In *Acta Veterinaria Hungarica,* 2013, vol. 61, no. 2, p. 197-208. (1.173 - IF2012). (2013 - Current Contents). ISSN 0236-6290.
23. STROMPFOVÁ, Viola - POGÁNY SIMONOVÁ, Monika - GANCARČÍKOVÁ, Soňa - MUDROŇOVÁ, Dagmar - FARBÁKOVÁ, J. - MAĎARI, Aladár - LAUKOVÁ, Andrea. Effect of Bifidobacterium animalis B/12 administration in healthy dogs. In *Anaerobe*, 2014, vol. 28, p. 37-43. (2.364-IF2013), (2014-Current Contents), ISSN 1075-9964.
24. WENCELOVÁ, Monika - VÁRADYOVÁ, Zora - MIHALIKOVÁ, Katarína - ČOBANOVÁ, Klaudia - PLACHÁ, Iveta - PRISTAŠ, Peter - JALČ, Dušan - KIŠIDAYOVÁ, Svetlana. Rumen fermentation pattern, lipid metabolism and the microbial community of sheep fed a high-concentrate diet supplemented with a mix of medicinal plants. In *Small Ruminant Research : the journal of the International Goat Association*, 2015, vol. 125, p. 64-72. (1.125 - IF2014). (2015 - Current Contents). ISSN 0921-4488.
25. GREŠÁKOVÁ, Ľubomíra - ČOBANOVÁ, Klaudia - FAIX, Štefan. Selenium retention in lambs fed diets supplemented with selenium from inorganic or organic sources. In Small Ruminant Research : the journal of the International Goat Association, 2013, vol. 111, no. 1-3, p. 76-82. (1.124 -

IF2012). (2013 - Current Contents). ISSN 0921-4488.DOI 10.1016/j.smallrumres.2012.10.009.

2.1.3 List of monographs/books published abroad

ABC Chapters in scientific monographs published abroad

ČIKOŠ, Štefan. Adiponectin and its receptors in preimplantation embryo development. In *Vitamins and hormones : Adiponectin*. - Oxford, UK : Elsevier, 2012, p. 211-238. ISBN 978-0-12-398313-8.

FAIX, Štefan. Patofiziologija respiratornog sistema. In BOŽIĆ, Tatjana et al. *Patološka fiziologija domaćih životinja*. 2. izd. - Beograd : Naučna KMD, 2012, p. 319-339. ISBN 978-86-6021-051-9. (Pathophysiology of respiratory system – in English)

FAIXOVÁ, Z. - FAIX, Štefan - GREŠÁKOVÁ, Ľubomíra - MIKLÓSOVÁ, Lucia - LENG, Ľubomír. Effect of feeding grains naturally contaminated with Fusarium mycotoxins with and without an organic mycotoxin adsorbent on blood biochemistry of broiler chickens. In *Xenobiotics : Soil Food and Human Health Interactions*. - Rzeszów : Wydawnictwo Uniwersytetu Rzeszowskiego, 2012, p. 226-234. ISBN 978-83-7338-785-0.

KMEŤ, Vladimír - STRAKOVÁ, Eva. Identification of resistance mechanisms in coagulase-negative staphylococci of food and animal origin. In *Industrial, medical and environmental applications of microorganisms : Current status and trends*. - Madrid : Wageningen Academic Publishers, 2014, p. 321-324. ISBN 978-90-8686-243-6.

KOLESAR FECSKEOVÁ, Lívia - IVAN, Jozef - JAVORSKÝ, Peter - PRISTAŠ, Peter. Putative role of recombination in spreading and evolution of *Selenomonas ruminantium* plasmids. In *Advances in genetics research*. Vol. 7. - Nova Publishers, 2012, p. 153-174. ISBN 978-1-61324-868-3.

LAUKOVÁ, Andrea. Potential Applications of probiotic, bacteriocin-producing enterococci and their bacteriocins. In *Lactic acid bacteria : Microbiological and functional aspects*. 4th edition. - CRC Press, Taylor a. Francis Group, 2012, p. 39-61. ISBN 978-1-4398-3677-4.

2.1.4. List of monographs/books published in Slovakia

FAIX, Štefan. Essential oils in poultry nutrition. University of Veterinary Medicine and Pharmacy in Košice, 2014, pp.62, ISBN-978-80-8077-404-2 (in Slovak)

2.1.5. List of other scientific outputs specifically important for the institute, max. 10 items

N/A

2.1.6. List of patents, patent applications, and other intellectual property rights registered abroad, incl. revenues

N/A

2.1.7. List of patents, patent applications, and other intellectual property rights registered in Slovakia, incl. revenues

Country :Slovakia
Patent number: PV287950
Authors:Viola Strompfová, Andrea Lauková
Title of the invention:Probiotic feed additive for dogs
Owners: Viola Strompfová, Andrea Lauková
Registered 6.6.2012 by The Industrial Property of the Slovak Republic, street Jána Švermu 43, 974 04 Banská Bystrica, Slovakia

2.1.8. Table of research outputs (as in annual reports). Papers from international collaborations in large-scale scientific projects (Dwarf team, ALICE Collaboration, ATLAS collaboration, CD Collaboration, H1 Collaboration, HADES Collaboration, and STAR Collaboration) have to be listed separately.

Scientific publications	2012			2013			2014			2015			total			
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	averaged number per year	av. No. / FTE	av. No. / salary budget
Scientific monographs and monographic studies in journals and proceedings published abroad *(AAA, ABA)*	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	**0,0**	**0,0**	**0,000**	**0,000**
Scientific monographs and monographic studies in journals and proceedings published in Slovakia *(AAB, ABB)*	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	**0,0**	**0,0**	**0,000**	**0,000**
Chapters in scientific monographs published abroad *(ABC)*	5,0	0,123	0,013	0,0	0,000	0,000	1,0	0,029	0,003	0,0	0,000	0,000	**6,0**	**1,5**	**0,040**	**0,004**
Chapters in scientific monographs published in Slovakia *(ABD)*	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	**0,0**	**0,0**	**0,000**	**0,000**
Scientific papers published in journals registered in Current Contents Connect *(ADCA, ADCB, ADDA, ADDB)*	22,0	0,541	0,057	25,0	0,633	0,107	28,0	0,805	0,074	21,0	0,623	0,054	**96,0**	**24,0**	**0,646**	**0,069**
Scientific papers published in journals registered in Web of Science Core Collection and SCOPUS *(ADMA, ADMB, ADNA, ADNB)*	6,0	0,147	0,016	5,0	0,127	0,021	6,0	0,172	0,016	5,0	0,148	0,013	**22,0**	**5,5**	**0,148**	**0,016**
Scientific papers published in other foreign journals (not listed above) *(ADEA, ADEB)*	0,0	0,000	0,000	4,0	0,101	0,017	5,0	0,144	0,013	4,0	0,119	0,010	**13,0**	**3,3**	**0,087**	**0,009**
Scientific papers published in other domestic journals (not listed above) *(ADFA, ADFB)*	19,0	0,467	0,050	3,0	0,076	0,013	5,0	0,144	0,013	9,0	0,267	0,023	**36,0**	**9,0**	**0,242**	**0,026**
Scientific papers published in foreign peer-reviewed proceedings *(AEC, AECA)*	4,0	0,098	0,010	0,0	0,000	0,000	2,0	0,057	0,005	1,0	0,030	0,003	**7,0**	**1,8**	**0,047**	**0,005**
Scientific papers published in domestic peer-reviewed proceedings *(AED, AEDA)*	13,0	0,319	0,034	15,0	0,380	0,064	13,0	0,374	0,034	17,0	0,504	0,044	**58,0**	**14,5**	**0,390**	**0,042**
Published papers (full text) from foreign and international scientific conferences *(AFA, AFC, AFBA, AFDA)*	0,0	0,000	0,000	9,0	0,228	0,038	1,0	0,029	0,003	3,0	0,089	0,008	**13,0**	**3,3**	**0,087**	**0,009**
Published papers (full text) from domestic scientific conferences *(AFB, AFD, AFBB, AFDB)*	9,0	0,221	0,023	6,0	0,152	0,026	11,0	0,316	0,029	1,0	0,030	0,003	**27,0**	**6,8**	**0,182**	**0,020**

- **Supplementary information and/or comments on the scientific outputs of the institute.**

The strategy of the Institute is to publish papers in high-quality journals ranked by WOS in Veterinary Sciences (median 0.871 in 2015) and Agriculture, Dairy and Animal Science (median 0.769 in 2015). This strategy arises from the unique orientation of the Institute (to promote research in the field of veterinary, biological and agricultural sciences) embedded in the mission statement.

2.2. Responses to the research outputs (citations, etc.)

2.2.1. Table with citations per annum.

Citations of papers from international collaborations in large-scale scientific projects (Dwarf team, ALICE Collaboration, ATLAS collaboration, CD Collaboration, H1 Collaboration, HADES Collaboration, and STAR Collaboration) have to be listed separately.

Citations, reviews	2011		2012		2013		2014		total		
	number	No. / FTE	number	No. / FTE	number	No. / FTE	number	No. / FTE	number	averaged number per year	av. No. / FTE
Citations in Web of Science Core Collection (1.1, 2.1)	367,0	9,017	350,0	8,861	312,0	8,966	234,0	6,944	**1263,0**	**315,8**	**8,494**
Citations in SCOPUS (1.2, 2.2) if not listed above	66,0	1,622	81,0	2,051	124,0	3,563	97,0	2,878	**368,0**	**92,0**	**2,475**
Citations in other citation indexes and databases (not listed above) (3.2,4.2,9,10)	3,0	0,074	10,0	0,253	9,0	0,259	5,0	0,148	**27,0**	**6,8**	**0,182**
Other citations (not listed above) (3, 4, 3.1, 4.1)	49,0	1,204	59,0	1,494	16,0	0,460	17,0	0,504	**141,0**	**35,3**	**0,948**
Reviews (5,6)	0,0	0,000	0,0	0,000	0,0	0,000	0,0	0,000	**0,0**	**0,0**	**0,000**

2.2.2. List of 10 most-cited publications, with number of citations, in the assessment period (2011 – 2014).

1. ČIKOŠ, Štefan - BUKOVSKÁ, Alexandra - KOPPEL, Juraj. Relative quantification of mRNA: comparison of methods currently used for real-time PCR data analysis. In *BMC Molecular Biology* [elektronický zdroj], 2007, vol.8, art. no.113. (3.500 - IF2006). ISSN 1471-2199 (Electronic). doi:10.1186/1471-2199-8-113, **(82)**
2. JUHÁS, Štefan - ČIKOŠ, Štefan - CZIKKOVÁ, Soňa - VESELÁ, Jarmila - IĽKOVÁ, Gabriela - HÁJEK, Tomáš - HOROSOVÁ, Katarína - DOMARACKÝ, Miloš - BUJŇÁKOVÁ, Dobroslava - REHÁK, Pavol - KOPPEL, Juraj. Effects of borneol and thymoquinone on TNBS-induced colitis in mice. In *Folia biologica*, 2008, vol. 54, p. 1-7. (0.596 - IF2007). ISSN 0015-5500. **(23)**

3. LATORRE-MORATALLA, M.L. - VECIANA-NOGUES, T. - BOVER-CID, S. - GARRIGA, M. - AYMERICH, T. - ZANARDI, E. - IANIERI, A. - FRAQUEZA, Maria Joao - PATARATA, L. - DROSINOS, E.H. - LAUKOVÁ, Andrea - TALON, R. - VIDAL-CAROU, M.C. Biogenic amines in traditional fermeted sausages produced in selected European countries. In *Food chemistry*, 2008, vol. 107, no. 2, p. 912-921. (3.052 - IF2007). ISSN 0308-8146. **(28)**

4. STROMPFOVÁ, Viola - MARCIŇÁKOVÁ, Miroslava - SIMONOVÁ, Monika - GANCARČÍKOVÁ, Soňa - JONECOVÁ, Zuzana - SCIRANKOVÁ, Luboslava - KOŠČOVÁ, J. - BULECA, Viktor - ČOBANOVÁ, Klaudia - LAUKOVÁ, Andrea. Enterococcus faecium EK 13 - an enterocin A - producing strain with probiotic character and its effect in piglets. In *Anaerobe*, 2006, vol. 12, no. 3, p. 242-248. (2.364-IF2013), ISSN 1075-9964. **(23)**

5. STROMPFOVÁ, Viola - LAUKOVÁ, Andrea - SIMONOVÁ, Monika - MARCIŇÁKOVÁ, Miroslava. Occurence of the structural Enterocin A,P,B, L50B genes in Enterococci different origin. In *Veterinary Microbiology*, 2008, vol.132, no. 3-4, p. 293-301. (2.010 - IF2007). ISSN 0378-1135. **(24)**

6. GÁL, Peter - VIDINSKÝ, B. - TOPORCER, T. - MOKRÝ, M. - MOZEŠ, Štefan - LONGAUER, F. - SABO, Ján. Histological assessment of the effect of laser irradiation on skin wound healing in rats. In *Photomedicine and laser surgery*, 2006, vol. 24, no. 4, p. 480-488. ISSN 1549-5418. **(22)**

7. MOZEŠ, Štefan - ŠEFČÍKOVÁ, Zuzana - LENHARDT, Ľudovít - RAČEK, Ľubomír. Obesity and changes of alkaline phosphatase activity in the small intestine of 40-and 80-day old rats subjected to early postnatal overfeeding or monosodium glutamate. In *Physiological Research*, 2004, vol. 53, no.2, p. 177-186. (0.939 - IF2003). ISSN 0862-8408. **(16)**

8. KALOUS, Jan - ŠOLC, Peter - BARAN, Vladimír - KUBELKA, M. - SCHULTZ, R.M. - MOTLIK, J. PKB/AKT is involved in resumption of meiosis in mouse oocytes. In *Biology of the Cell*, 2006, vol. 98, no. 2, p. 111-123. ISSN 0248-4900. **(19)**

9. FABIAN, Dušan - SABOL, M. - HOROSOVÁ, Katarína - BUJŇÁKOVÁ, Dobroslava. Essential oils-their antimicrobial activity against Escherichia coli and effect on intestinal cell viability. In *Toxicology in vitro: the official journal of the European Society for Toxicology in Vitro*, 2006, vol. 20, no. 8, p. 1435-1445. (2.540-IF2006), ISSN 0887-2333. **(35)**

10. KURICOVÁ, Silvia - BOLDIŽÁROVÁ, Klaudia - GREŠÁKOVÁ, Ľuba - BOBČEK, R. - LEVKUT, M.-
LENG, Ľubomír. Chicken selenium status when fed a diet supplemented with se-yeast.In *Acta Veterinaria Brno*, 72(3), 339346. **(20)**

2.2.3. List of most-cited authors from the Institute (at most 10 % of the research employees with university degree engaged in research projects) and their number of citations in the assessment period (2011– 2014).

MVDr. Andrea Lauková, CSc. – 493

Prof. MVDr. Juraj Koppel, DrSc. – 300

Doc. RNDr. Peter Javorsky, DrSc. - 151

- **Supplementary information and/or comments on responses to the scientific output of the institute.**

  Our citation rate corresponds to the average citation rate in the two main fields of our interest. We expect higher numbers of citations in the future reflecting increasing quality of our papers. (During previous four years, both the mean IF of our papers and the proportion of our papers with IF higher than 1.0 have been rising).

2.3. Research status of the institute in international and national contexts

- **International/European position of the institute**

2.3.1. List of the most important research activities demonstrating the international relevance of the research performed by the institute, incl. major projects (details of projects should be supplied under Indicator 2.4). Max. 10 items.

- Collaboration with **University of Martin Luther (UML) in Halle/Salle, Germany**, was carried out in the framework of the DAAD-SAS exchange program and covered by the project: "Hormonal dysregulations in a diabetic pregnancy“ (Dr. Čikoš, Dr. Fabian)
- Cooperation with the **Institute of Animal Physiology and Genetics, Academy of Sciences, Czech Republic** focused on the study of molecular mechanisms of DNA integrity control in oocytes and early embryos. (Dr. Baran)
- Cooperation with the **Faculty of Veterinary Medicine, University of Lisbon, Lisbon, Portugal** focused on detection of genes for production of bacteriocin – plantaricin and testing of L. plantarum isolated from animals. (Dr. Lauková)
- Cooperation with the **Kielanowski Institute of Animal Physiology and Nutrition in Jablonna near Warsaw, Poland** focused on microbial profiling and enzymatic activities testing in the caecal content of rabbits, faeces of horses and dogs from Polish regions after application of our probiotic strains. (Dr. Lauková)
- Cooperation with the **University of Manchester, UK**, was covered by the European Science Foundation (ESF) in the framework of the European network for gastrointestinal health research and focused on the improvement of conditions and optimization of GIT health. (Dr. Lauková)
- Collaboration with the **Institute of Animal Nutrition and Functional Plant Compounds in Vienna**, **Austria**, focused on investigation of essential oil absorption in the blood plasma and tissue of broiler chickens after consumption of feed with different EO concentrations. (Dr. Ocelova)
- Cooperation with the **Institute of Sciences of Food Production, Italian National Research Council, Italy** focused on the study of plant extracts and essential oils as feed additives in animal nutrition, mainly their effects on meat quality and intestinal physiology (Dr. Plachá).

Numerous experiments were performed in foreign institutes within the short-term scientific missions (STSM) in the framework of COST ACTIONs. For example:

ACTION FA1201 EPICONCEPT “Epigenetics and Periconception Environment“ – PhD visits to the **Department of Anatomy and Cell Biology, Martin Luther University**

Faculty of Medicine, Halle/Saale, **Germany** focused on investigation of the role of adiponectin in the regulation of glucose transport in mouse preimplantation embryos (Dr. Burkuš) and on evaluation of glucocorticoid receptor expression in bovine preimplantation embryos (Dr. Kubandová).

COST ACTION FA1302 METHAGENE **"**Large-scale methane measurements on individual ruminants for genetic evaluations“ – PhD visit to the **Institute of Agricultural Sciences, Animal Nutrition, ETH Zurich, Switzerland,** focused on analysis of potential differences in methane emissions within and between genotypes of animals. (Dr. Pisarčíková)

For more details see the List of scientific missions of our PhD students in 2.5.2.

2.3.2. List of international conferences (co)organised by the institute.

25th Days of Animal Physiology, 17th - 19th October 2012, Košice, Slovakia (78 participants from the Czech Republic, Slovakia and Poland)

Live-cell confocal microscopy – a new dimension for the 21st century, 11th March 2015, Košice, Slovakia (58 participants from the Czech Republic and Slovakia)

2.3.3. List of edited proceedings from international scientific conferences.

Book of abstracts from 25th Days of Animal Physiology: 17-19th October 2012, Košice, Slovakia. Ed. Dušan Fabian, Košice, Institute of Animal Physiology Slovak Academy of Sciences, 2012. pp. 215, ISBN 978-80-968618-8-0.

25th Days of Animal Physiology, 17-19th October 2012, Košice, SR: international scientific conference. Eds. D. Fabian, Š. Faix, P. Javorský, J. Koppel. In: Folia veterinaria, Suppl.II (2012), p. 9-74.

2.3.4. List of journals edited/published by the institute:

2.3.4.1. WOS (IF of journals in each year of the assessment period)

2.3.4.2. SCOPUS

2.3.4.3. other databases

2.3.4.4. not included in databases

N/A

- **National position of the institute**

2.3.5. List of selected projects of national importance

See 2.3.6.

2.3.6. Projects of the Slovak Research and Development Agency (APVV)

APVV-0009-10 Beta lactamase genes of enterobacteria in the animal environment and bioaerosols, coordinator - Dr. Vladimir Kmeť, 05/2011-10/2014, 174 804.-€

APVV-0237-10, Control mechanisms of oocyte and preimplantatiopn development, coordinator – Dr. Vladimír Baran, 05/2011-10/2014, 200 173.-€

APVV-0667-12, Zinc in animal nutrition and consumer safety, coordinator - Dr. Klaudia Čobanova, 10/2013-09/2017, 247 900.-€

APVV-0815-11, Mother and embryo: the influence of maternal obesity and stress on preimplantation embryo development, coordinator – Dr. Štefan Čikoš, 07/2012-12/2015, 153 730.-€

APVV-14-0763, Xenobiotics and preimplantation embryo developmen, coordinator – Dr. Juraj Koppel, 07/2015-06/2019, 249 470.-€

LPP-0045-09, Antimicrobial resistance of Escherichia coli as a biohazard for food, coordinator - Dr. Vladimir Kmeť, 09/2009 -08/2013, 83 000.-€

APVV-14-0169, Anthelmintic resistance of parasites – challenges, perspectives and solutions, partner - Dr. Zora Váradyová, 07/2015-06/2019, 98 329.-€

APVV-0302-11, Probiotic microorganisms and regulation of cytokine response in prevention of imunopathologic changes during bacterial infections in poultry, partner - Dr. Andrea Lauková, 01/07/2012-31/10/2015, 30 000.- €

APVV-14-0274, Small mammals as a potential source of zoonotic bacteria and resistance to antibiotics, partner – Dr. Vladimír Kmeť, 07/2015-06/2019, 33 883.-€

2.3.7. Projects of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

VEGA: 2/0010/10 - The effect of essential oils on physiological processes in the intestine of animal, coordinator – Dr. Štefan Faix, 2010-2012, 7636.-€

VEGA: 2/0066/11 - Genomics and biotechnology exploitation of Enterococcus faecalis bacteriophage genomes, coordinator – Dr. Peter Pristaš, 2011-2013, 14242.-€

VEGA: 2/0001/11 - The use of microorganisms for influence the conjugated linoleic acid production in ruminants, coordinator – Dr. Dušan Jalč, 2011-2013, 34483.-€

VEGA: 2/0002/11, Bacteriocin-producing microbiota, their bacteriocins and poultry health, coordinator – Dr. Andrea Lauková, 2011-2013, 25942.-€

VEGA: 2/0005/11, Mechanisms of acquired antibiotic resistance in enterobacteria and staphylococci, coordinator – Dr. Vladimír Kmeť, 2011-2013, 9201.-€

VEGA: 2/0019/11, Microbial and functional gut changes in relation to food intake and growth of animals, coordinator – Dr. Štefan Mozeš, 2011-2013, 15369.-€

VEGA: 2/0049/11, Disorders of fertility and preimplantation embryo development associated with obesity, coordinator – Dr. Dušan Fabian, 2011-2013, 12071.-€

VEGA: 2/0016/12, New methods of biological protection from bees microbial diseases, coordinator – Dr. Peter Javorský, 2012-2014, 19520.-€

VEGA: 2/0029/12, The role of selected cell receptors in preimplantation embryogenesis, coordinator – Dr. Štefan Čikoš, 2012-2014, 25613.-€

VEGA: 2/0045/12, Manganese in animal nutrition and consumer safety, coordinator – Dr. Klaudia Čobanová (Boldižárová), 2012-2014, 33390.-€

VEGA: 1/0581/11, Time- space trends of wood decays in intravilans during last three decades, coordinator – Dr. Peter Pristaš, 2011-2013, 1804.-€

VEGA: 1/0859/11, Study of the effect of essential oils and their bioactive compounds on metabolism and protective mucus barrier in the intestine of animals, coordinator – Dr. Štefan Faix, 2011-2013, 1791.-€

VEGA: 2/0014/13, Functional and metabolic properties of animal gastrointestinal lactic acid bacteria, coordinator – Dr. Dobroslava Bujňáková, 2013 -2015, 16510.-€

VEGA: 2/0052/13, The effect of essential oils on physiological processes in animal intestine and their role in antioxidant protection of organism, coordinator – Dr. Iveta Plachá, 2013 -2015, 25797.- €

VEGA: 2/0056/13, Occurence and impact of the genus Bifidobacterium in dogs, coordinator – Dr. Viola Strompfová, 2013-2015, 15478.-€

VEGA: 2/0001/14, The effect of female body condition on preimplantation embryo development and success of biotechnological techniques in reproductive practice, coordinator – Dr. Dušan Fabian, 2014-2017, 23226.-€

VEGA: 1/0374/14, Vplyv éterických olejov a minerálnych látok na fyziologické procesy v čreve a na antioxidačnú ochranu u zvierat, coordinator – Dr. Štefan Faix, 2014-2016, 21715.-€

VEGA: 2/0009/14, Possibilities of using additives especially of phytogenic origin to influence ruminal fermentation, coordinator – Dr. Svetlana Kišidayová, 2014-2016, 36128.-€

VEGA: 2/0004/14, Bacteriocins produced by probiotic strains of Firmicutes and their use to improve the health of food animals, coordinator – Dr. Andrea Lauková, 2014-2016, 15482.-€

VEGA: 2/0087/14, Genetic ecology of antibiotic resistance: resistance, resistance genes and its spreading in wild living animals, coordinator – Dr. Peter Pristaš, 2014-2016, 18549.-€

VEGA: 2/0011/14, Effect of early nutrition on food intake control, growth and intestinal enzyme activity in juvenile and adult animals, coordinator – Dr. Zuzana Šefčíková, 2014-2016, 14192.-€

VEGA: 2/0039/15, Molecular mechanisms of preimplantation embryo adaptation, coordinator – Dr. Juraj Koppel, 2015-2018, 10971.-€

2.3.8. Projects of SAS Centres of Excellence

N/A

2.3.9. National projects supported by EU Structural Funds

1, Centre of excellence for research of gastro intestinal tract physiology CEFT II phase, ITMS: 26220120043, 05/2010-02/2013, 2 042 065.-€, coordinator

2, Competence Centre for biomodulators and nutritional supplements, ITMS: 26220220152, 09/2011-12/2015, 6 436 658.-€, coordinator

3, Isolation, identification and characterization of lactic acid bacteria for application in dairy industry, ITMS: 26220220065, 01/2010-12/2013, 189 015.-€, partner

4, Centre of excellence of biomedical technologies, ITMS: 26220120066, 08/2010-10/2013, 491 952.-€, partner

5, Centre of excellence for neuroregenerative research, ITMS: 26220120108, 08/2010-08/2013, 26 520.-€, partner

2.3.10. List of journals (published only in the Slovak language) edited/published by the institute:

2.3.10.1. WOS (IF of journals in each year of the assessment period)

2.3.10.2. SCOPUS

2.3.10.3. Other databases

2.3.10.4. Not included in databases

N/A

- **Position of individual researchers in an international context**

2.3.11. List of invited/keynote presentations at international conferences, as documented by programme or invitation letter

Dr. Andea Lauková: Potential application of enterocin-producing strains and their enterocins in animal husbandry- International Conference Bacteriocins and Antimicrobial Peptides-BAMP 2012, 21.2-23.2. 2012, Košice, Slovakia, www.bacteriocin-conference.net (p. 26, ISBN 978-80-89589-02-9)

Dr. Andrea Lauková: Can bacteriocins (Enterocins) support animals health? International Scientific Conference on Bacteriocins and Antimicrobial Peptides-BAMP 2013, 21.-23.5.2013, Košice, Slovakia, (p. 18. ISBN 978-80-89589-05-0)

Dr. Peter Pristaš: Bacteria from extreme environments and their use in biotechnology applications. 4th International Scientific Conference Applied Natural Sciences, 2013, Applied Natural sciences in V4 Countries, 2.- 4.10. 2013, Nový Smokovec, Vysoké Tatry, Slovakia, (p. 203-208, ISBN 978-80-8105-502-7)

Dr. Vladimír Kmeť: Development trends of antimicrobial resistance. In: 6th Central European Veterinary Congress, 1.-2.4. 2014, Brno, Exhibition centre, Czech Republic, www.bvv.cz.

Dr. Juraj Koppel: From stathmin to preimplantation embryo development. Les relais de la signalisation intracellulaire, 3.11. 2014, Paris, France

Dr. Štefan Čikoš: Maternal stress and preimplantation embryo development, 15.10.2015, Anatomische koloquium Martin Luther University, Halle, Germany.

Dr. Dušan Fabian: The effect of maternal obesity on development of preimplantation embryos and somatic parameters of offspring., Anatomische kolloquium, Martin Luther University, Halle, Germany, 15.10.2015.

Dr. Andrea Lauková: Beneficial effect of bacteriocin-producing bacteria with probiotic character and their bacteriocins in food-producing animals for quality meat production. Portuguese traditional meat products: strategies to improve safety and quality, 9.6.2015, Lisbon, Faculty of Veterinary Medicine, University of Lisbon, Portugal

2.3.12. List of researchers who served as members of the organising and/or programme committees

Dr. Andrea Lauková: International Scientific Conference on Bacteriocins and Antimicrobial Peptides BAMP 2012, 21-23 February 2012, Košice, Slovakia, www.bacteriocin-conference.net, Organizing and Scientific Committee

Dr. Peter Pristaš: 8th International Meeting on Anaerobic Microbiology (ISAM8), Innsbruck, Austria, June 12-15, 2013, Organizing Committee.

Dr. Andrea Lauková: International Scientific Conference on bacteriocins and Antimicrobial peptides BAMP 2013, 21-23 May 2013, Košice, Slovakia, www.bacteriocin-conference.net, Organizing and Scientific Committee

Dr. Andrea Lauková: International Scientific Conference Probiotics and Prebiotics, IPC 2013, 11.-13.6. 2013, Košice, Slovakia, www.probiotic-conference.net, Scientific Committee

Dr. Peter Pristaš: 9th International Meeting on Anaerobic Microbiology (ISAM9), Portoroz, Slovenia, June 25-27, 2015, Organizing Committee

Dr. Štefan Faix: XVII International congress on Animal Hygiene 2016, June 7-11, 2015 Košice, Slovakia, Scientific committee

Dr. Dušan Fabian: 25th days of animnal physiology, 17-19. October 2012, Košice, Organizing and Programme Committee

- **Position of individual researchers in a national context**

2.3.13. List of invited/keynote presentations at national conferences, as documented by programme or invitation letter

Kmeť, V., Kmeťová, M.: Detection of resistance genes of environmental E. coli via PCR and DNA microarray. In Abstract proceedings –XXIII Conference SKM SLK and SSKM SLS, 16.-18.3. 2012, Dudince, Slovakia In: Letters of Clinic Microbiology, Vol. XII, no. SA2012, p. 20, ISSN 1335-8219 (in Slovak)

Kmeť, V. et al.: Molecular detection of pathogenic factors and mechanisms of antibiotic resistance in enterobacteriae. Abstracts of lectures XIII. Prowazekove days 25.-26.10. 2012, Komárno, Slovakia. In Letters of Clinic Microbiology Vol. XII, No. SB 2012, p. 13-14, ISSN 1335-8219 (in Slovak)

Kmeť, V.: Metanogenomic and metanoproteomic in bacterial diagnostic. „Physicians and laboratory:- -Synlab Slovakia, s. r.o. 13.11. 2012, Yasmin hotel, Košice. (in Slovak).

Lauková A. et al.: Benefits of bacteriocin-producing bacteria and their bacteriocins. Conference of young scientists, Štrbské Pleso, 13.-16.3. 2014, Slovakia, In Abstracts from Conference of young scientists - What is new in microbiology? p. 24. ISBN 978-80-971422-1-6 (in Slovak)

Kmeť V.: Pyrosesequencing in bacterial diagnostics. VII. Conference SSKM SLS, 24.-26. 10. 2014, Nový Smokovec, Slovakia, (in Slovak) Proceedings of Abstracts In: Letters of Clinical Microbiology, Vol. XVI., SA2014, p. 66. www.sskm.tym.sk (in Slovak)

Pristaš, P.: Non-ferrous metal industry waste disposal sites as a source of polyextremotolerant bacteria. In 3rd International Scientific Conference Biotechnology and Metals-2014, Košice, Slovakia, 17.9.-18.9.2014 (in Slovak)

Fabian D.: Relationship between the occurrence of apoptosos and disorders in preimplantation embryo environment. Conference “Animal Biotechnology 2015”, Nitra, 10.12. 2015. (in English)

Pristaš, P., Stramová, Z.: What is hidden in the drainage water of aluminium production plant brown mud disposal site near Žiar nad Hronom? The 5th International

Scientific Conference Applied Natural Sciences 2015, Perspectives in V4 Countries, Jasná, Nízke Tatry, Slovakia, 30.9.-2.10. 2015, http://ans2015.ucm.sk (in English)

Faix, Š.: Eteric oils in chicken nutrition. In 11th International Scientific conference Animal Physiology 2015, 1.-3.6. 2015, Crocus-Kežmarské Žľaby, Slovakia (in Slovak)

2.3.14. List of researchers who served as members of organising and programme committees of national conferences

Dr. Dušan Fabian: Conference of PhD students dedicated to prof. Boďa memory (7th memorial of Academician Boďa), 10th-11th of september 2012, Košice, Slovakia, main organizing person (main organizer)

Dr. Dušan Fabian: Conference of PhD students dedicated to prof. Boďa memory (8th memorial of Academician Boďa), 10th-11th of september 2013, Košice, Slovakia, main organizing person (main organizer)

Dr. Štefan Faix: 2nd Congress of biomedicine in oro-maxilofacial area. 11.-15. 9.2013, Košice, Slovakia, (scientific committee)

Dr. Dušan Fabian: Conference of PhD students dedicated to prof. Boďa memory (9th memorial of Academician Boďa), 9th-10th of September 2014, Košice, Slovakia, main organizing person (main organizer)

Dr. Dušan Fabian: Conference of PhD students dedicated to prof. Boďa memory (10th memorial of Academician Boďa), 8th-9th of September 2015, Košice, Slovakia, main organizing person (mai organizer)

Dr. Vladimír Baran: Live cell confocal microscopy - new dimension for 21st century, 11th March 2015, Košice, Slovakia (58 participants from Czech Republic and Slovakia) main organizing person (main organizer)

- **Supplementary information and/or comments documenting the international and national status of the Institute**

The importance of our Institute in the national context is documented by the fact that our Institute was coordinator of the ERDF project named Competence Centre for Biomodulators and Nutritional Supplements. Our Institute, as the only one from Section II of SASci, coordinated such type of ERDF projects.

2.4. Tables of project structure, research grants and other funding resources

- **International projects and funding**

2.4.1. Major projects within the European Research Area and other important project – Framework Programmes of the EU, ERA-NET, European Science Foundation, NATO, COST, INTAS, etc. (here and in items below please specify: type of project, title, grant number, duration, total funding and funding for the institute, responsible person in the institute and his/her status in the project, e.g. coordinator "C", work package leader "W", investigator "I"),

	Project title	Typ / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Epigenetics and Periconception Environment – Periconception environment as an epigenomic lever for optimising food production and health in livestock.	COST FA1201	10/2012-10/2016	4000/year	I-Juraj Koppel
	Maternal interaction with gametes and embryos	COST FA0702	11/2008-02/2012	1667	I-Juraj Koppel
	European network for gastrointestinal health research	ESF	05/2010-05/2014	3345/year	I-Andrea Lauková
2013					
2014	European network on the factors affecting the gastro-intestinal microbial balance and the impact on the health status of pigs.	COST FA1401	10/2014-10/2018	4000/year	I-Andrea Lauková
	Large-scale methane measurements on individual ruminants for genetic evaluations	COST FA1302	10/2014-12/2017	4000/year	I-Zorka Varadyová
2015					

2.4.2. Other international projects, incl. total funding and funding for the institute

Project title: Hormonal dysregulationsin a diabetic pregnancy.
Type: DAAD (Deutcher Akademischer Austauschiendst) - SAV (Slovak Academy of Sciences) Exchange Programme
Duration: 1.1.2015 – 31.12. 2016.
Funding in 2015: 5935 Euro funded for Slovak participants, 3262 Euro funded for German participants.
Coordinators: Štefan Čikoš (Institute of Animal Physiology SAS, Košice, Slovakia), Anne Navarrete Santos (University of Martin Luther, Halle-Wittenberg, Germany).

2.4.3. Other important, international projects and collaborations without direct funding (max. 10 projects)

- Cooperation with the **Biology Center of the Academy of Sciences of the Czech Republic, Institute of Parasitology, Ceske Budejovice, Czech Republic**, in which we contributed to the study of the impact of hindgut chimpanzee ciliate Troglodytella abrassarti to the chimpanzee fiber digestion. (Dr. Kisidayova).
- Cooperation with **Poznan University of Life Sciences, Department of Animal Nutrition and Feed Management, Poznan, Poland**: The use of non-traditional vegetable oils high in unsaturated fatty acids. (Dr. Kisidayova).
- Cooperation with the **Institute of Soil Biology, Biology Centre ASCR, České Budějovice, Czech Republic**, in which we studied the physiology of commensal ciliates of the genus Nyctotherus from the intestine of soil millipede Archispirostreptus gigas and their methanogenic prokaryotic symbionts. (Dr. Kisidayova).
- Cooperation with the **Lethbridge Research Centre for Agriculture and Agri-Food, Canada**, in which we contributed to the development and testing of the fluorescence *in situ* hybridization (FISH) technique, and identifying and quantifying simultaneously the methanogenic populations colonizing Entodinium spp. in the rumen of cows fed on different forages. (Dr. Kisidayova).
- The PhD visit to the **DiRPA AGRIS Località Bonassai, Italy** was covered by EU Erasmus+ and focused on evauation of the effects of polyphenol-oxidase and vernolic acid on lipolysis, biohydrogenation and gas production (methane and carbon dioxide) *in vitro* in the rumen environment. (Dr. Wencelová)
- The PhD visit to the **Drug Discovery and Development Department, Auburn University Harrison School of Pharmacy, USA** was covered by SAIA and focused on study of the stability, metabolism and bioavailability of bioactive natural products using LC-MS. (Dr. Pisarčíková)
- Cooperation with the **Institute of Animal Physiology and Genetics, Academy of Sciences, Czech Republic** was focused on the study of molecular mechanisms of DNA integrity control in oocytes and early embryos. (Dr. Baran)
- Cooperation with **the Faculty of Veterinary Medicine, University of Lisbon, Lisbon, Portugal** focused on detection of genes for production of bacteriocin–plantaricin and testing of L. plantarum isolated from animals. (Dr. Lauková)
- Cooperation with the **Kielanowski Institute of Animal Physiology and Nutrition in Jablonna near Warsaw, Poland** focused on microbial profiling and enzymatic activity testing in the caecal content of rabbits, faeces of horses and dogs from Polish regions after our probiotic strains applications. (Dr. Lauková)
- Collaboration with the **Institute of Animal Nutrition and Functional Plant Compounds in Vienna**, **Austria**, focused on investigation of essential oil absorption in blood plasma and tissue of broiler chickens after the consumption of feed with various EO concentrations. (Dr. Ocelova)

- **National projects and their funding**

2.4.4. Projects supported by the Slovak Research and Development Agency (APVV)

Role of the Institute e.g. coordinator “C”, investigator “I”.

	Project title	Typ / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Antimicrobial resistance of Escherichia coli as a biohazard for food,	LPP-0045-09	09/2009-08/2013	83000	C-Vladimir Kmeť
	Beta lactamase genes of enterobacteria in the animal environment and bioaerosols	APVV-0009-10	05/2011-10/2014	174 804	C-Vladimir Kmeť
	Control mechanisms of oocyte and preimplantatiopn development	APVV-0237-10	05/2011-10/2014	200 173	C-Vladimír Baran
	Mother and embryo: the influence of maternal obesity and stress on preimplantation embryo development	APVV-0815-11	07/2012-12/2015	153 730	C-Štefan Čikoš
	Probiotic microorganisms and regulation of cytokine response in prevention of imunopathologic changes during bacterial infections in poultry	APVV-0302-11	07/2012-10/2015	30 000	I-Andrea Lauková
2013	Zinc in animal nutrition and consumer safety	APVV-0667-12	10/2013-09/2017	247 900	C-Klaudia Čobanová
2014					
2015	Small mammals as a potential source of zoonotic bacteria and resistance to antibiotics	APVV -14-0274	7/2015-6/2019	33883	I-Vladimír Kmeť
	Xenobiotics and preimplantation embryo development	APVV -14-0763	07/2015-06/2019	249 470	C-Juraj Koppel
	Anthelmintic resistance of parasites – challenges, perspectives and solutions	APPV-14-0169	07/2015-06/2019	98 329	I-Zora Váradyová

2.4.5. Projects supported by the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA) for each year, and their funding

VEGA	2012	2013	2014	2015
Number	12	14	12	10
Funding in the year (EUR)	95680	102971	106840	86538

[1]

- **Summary of funding from external resources**

2.4.6. List of projects supported by EU Structural Funds

Isolation, identification and characterization of lactic acid bacteria for application in the dairy industry. ITMS: 26220220065

Centre of excellence for research of gastro intestinal tract physiology - CEFT II phase. ITMS: 26220120043

Centre of excellence of biomedical technologies. ITMS: 26220120066

Competence Centre for biomodulators and nutritional supplements. ITMS: 26220220152

Modernization of infrastructure and internal equipment of classroom for better conditions of education. ITMS: 26250120013

Centre of excellence for neuroregenerative research, ITMS: 26220120108

[1] Excluding projects for the popularisation of science

2.4.7. Summary of external resources of the EU Structural Funds (ERDF/ESF)

Role of the Institute in the project, e.g. coordinator "C", work package leader "W", investigator "I".

Year	Project title	Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute
2012	Isolation, identification and characterization of Lactic acid bacteria for application in dairy industry	26220220065	48	251613,29	Partner
	Centre of excellence for research of gastro intestinal tract physiology - CEFT II phase	26220120043	22	2233239,28	Coordinator
	Centre of excellence of biomedical technologies	26220120066	39	534820	Partner
	Competence Centre for biomodulators and nutritional supplements	26220220152	36	1931696,53	Coordinator
	Modernization of infrastructure and internal equipment of classroom for better conditions of education	26250120013	36	542802,14	Partner
	Centre of excellence for neuroregenerative research	26220120108	36	26 520	Partner

External resources	2012	2013	2014	2015	total	average
External resources (milions of EUR)	1,597	3,200	1,270	0,852	**6,920**	**1,730**
External resources transfered to coooperating research institute (milions of EUR)	0,048	1,075	0,300	0,550	**1,973**	**0,493**

- **Supplementary information and/or comments on research projects and funding sources**

It is necessary to point out that resources obtained from EU Structural Funds were used predominantly for the improvement of Institute's infrastructure (i.e for the purchase of scientific instruments, information technologies and reconstructions). In Slovakia, the calls for projects allowing the direct usage of EU Funds for scientific work (i.e. for the purchase of materials, operation expenses, human resources, etc.) are still missing.

2.5. PhD studies and educational activities

2.5.1. List of accredited programmes of doctoral studies, period of validity

1. Biochemistry 4.1.22 (Faculty of Science, Pavol Jozef Šafárik University in Košice) 2012-2015

2a. Animal physiology 4.2.10 (Faculty of Science, Pavol Jozef Šafárik University in Košice) 2012-2015

2b. Animal physiology 4.2.10 (Faculty of Science, Comenius University in Bratislava) 2012-2015

3. Veterinary morphology and physiology 6.3.3 (University of Veterinary Medicine and Pharmacy in Košice) 2012-2015

4. Microbiology 4.2.7 (University of Veterinary Medicine and Pharmacy in Košice) 2012-2015

2.5.2. Summary table on doctoral studies (number of internal/external PhD students; number of foreign PhD students, number of students who successfully completed their theses, number of PhD students who quit the programme*)*

PhD study	31.12.2012			31.12.2013			31.12.2014			31.12.2015		
Number of potential PhD supervisors	13			16			15			11		
PhD students	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted
Internal	12,0	2,0	0,0	11,0	4,0	0,0	11,0	5,0	0,0	12,0	0,0	0,0
External	0,0	1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Other supervised by the research employees of the institute	3,0	0,0	0,0	3,0	0,0	0,0	3,0	1,0	0,0	2,0	1,0	0,0

Scientific missions of our PhD students (and early post-docs) at foreign institutions:

Name	Year	Days	Country	Host institution	Type and theme of mission
Martina Kačmarová	2015	20	Germany	University of Martin Luther in Halle/Salle	Experimental Research: Hormonal dysregulations in a diabetic pregnancy
Janka Kubandová (pd)	2015	30	Germany	University of Martin Luther in Halle/Salle	Experimental Research: Hormonal dysregulations in a diabetic pregnancy
Jana Pisarčíková	2015	60	Malta	University of Malta, Department of Chemistry	Experimental research: Application of chromatographic methods (GC, UPLC, LC/MS/MS) to

					measure secondary metabolites of natural compounds
Vladimíra Oceľová	2015	87	Austria	University of Veterinary Medicine in Vienna	Experimental Research: Detection of thymol in animal tissues
Jana Pisarčíková	2015	54	Switzerland	Institute of Agricultural Sciences, Animal Nutrition, ETH in Zurich	Experimental research: Screening of post-mortem rumen fluid for detectability of differences in methane emission potential
Jana Pisarčíková	2015	95	USA	Auburn University Harrison School of Pharmacy	Experimental research: Determination of thymol metabolites in biological samples by method UHPLC-MS
Monika Wencelová	2015	4	Poland	Department of Genetics and Animal Breeding & Department of Animal Nutrition and Feed Management, Poznan University of Sciences	METHAGENE training school on large scale methane data handling, analysis and interpretation
Monika Wencelová	2015	4	Netherlands	Wageningen UR Livestock Research Animal Breeding and Genomics Centre	METHAGENE workshop on selection low methane emitting animals and reduce the carbon footprint of livestock
Monika Wencelová	2014 2015	86 21	Italy	DiRPA AGRIS-Department of Animal Sciences, Olmedo Sassari, Sardegna	Experimental research: Influence of polyphenol oxidase and coronaric acid on lipolysis and biohydrogenation of fatty acids
Vladimíra Oceľová	2014	91	Austria	University of Veterinary Medicine in Vienna	Experimental Research: Detection of thymol in animal tissues
Janka Kubandová	2014	60	Denmark	University of Copenhagen, Copenhagen	Experimental research: Identification of glucocorticoid receptor in bovine

					preimplantation embryo
Ján Burkuš (pd)	2013	30	Germany	University of Martin Luther in Halle/Salle	Experimental research: Adiponectin and glucose uptake in mouse blastocyst
Eva Straková	2013	5	Czech Republic	University of veterinary and pharmaceutical sciences in Brno	Training school: Methods for the study of interactions between pathogen and host
Anna Kandričáková	2012	5	Czech Republic	Institute of Animal Physiology and genetic, Czech Academy of Sciences, Praha-Uhřineves	Training: Testing of phytase activity in bacterial strains isolated from pheasants and ostriches
Jana Imrichová	2012	5	Czech Republic	Institute of Animal Physiology and genetic, Czech Academy of Sciences, Praha-Uhřineves	Training: Testing of phytase activity in bacterial strains isolated from pheasants and ostriches
Anna Kandričáková	2012	4	Poland	The Kielanowski Institute of Animal Physiology and Nutrition, Jablonna near Warsaw	Training: Testing of enzymatic activity in lactobacilli and enterococci isolated from ostriches and pheasants
Jana Imrichová	2012	4	Poland	The Kielanowski Institute of Animal Physiology and Nutrition, Jablonna near Warsaw	Training: Training: Testing of enzymatic activity in lactobacilli and enterococci isolated from ostriches and pheasants

Scientific missions of foreign PhD students (and post-docs) at the Institute of Animal Physiology:

Name	**Year**	**Days**	**Country of origin**	**Home institution**	**Type and theme of mission**
Tom Seeling	2015	37	Germany	University of Martin Luther in Halle/Salle	Experimental research: Hormonal dysregulations in a diabetic pregnancy
Thomas Schmidt	2013	14	Germany	Private Universität Witten/Herdecke in Witten	Training school: Mouse embryo culture
Stanislava Semanová	2014	27	Czech Republic	Biology Centre CAS,	Experimental

				Institute of Soil Biology	research: Protozoa and their endosymbionts in the digestive tracts of invertebrates
Renata Miltko (pd)	2013	6	Poland	The Kielanowski Institute of Animal Physiology and Nutrition, Jablonna near Warsaw	Exchange study/training: Testing of bacteriocin-like activity from bacterial strains isolated from Castor fiber
Renata Miltko (pd)	2014	4	Poland	The Kielanowski Institute of Animal Physiology and Nutrition, Jablonna near Warsaw	Exchange study/training: Testing of microbial profile from faeces of roe deer
Renata Miltko (pd)	2015	5	Poland	The Kielanowski Institute of Animal Physiology and Nutrition, Jablonna near Warsaw	Exchange study/training: Testing of microbial profile from faeces of red deer

2.5.3. Summary table on educational activities

Teaching	2012	2013	2014	2015
Lectures (hours/year)[2]	**148**	**143**	**106**	**84**
Practicum courses (hours/year)[2]	**490**	**73**	**113**	**83**
Supervised bachelor theses (in total)	**3**	**5**	**4**	**2**
Supervised diploma theses (in total)	**6**	**6**	**5**	**3**
Supervised PhD theses (in total)	**19**	**19**	**17**	**12**
Members in PhD committees (in total)	**6**	**6**	**6**	**3**
Members in DrSc. committees (in total)	**1**	**2**	**3**	**0**
Members in university/faculty councils (in total)	**1**	**1**	**1**	**1**
Members in habilitation/inauguration committees (in total)	**3**	**3**	**2**	**1**

2.5.4. List of published university textbooks

SOPKOVÁ, D. - VLČKOVÁ, R. - STANÍKOVÁ, A. - ONDRAŠOVIČOVÁ, S. - FAIX, Štefan. Aplikovaná fyziológia zvierat (in Slovak). Košice, UVLF, 2013. 161 s. ISBN 978-80-8077-353-

FAIX, Štefan. Patofiziologija respiratornog sistema. In BOŽIĆ, Tatjana et al. Patološka fiziologija domaćih životinja. 2. izd. - Beograd : Naučna KMD, 2012, p. 319-339. ISBN 978-86-6021-051-9 (in English)

FAIXOVÁ, Z. - PIEŠOVÁ, E. - MAKOVÁ, Z. - ŠVORC, P. - FAIX, Štefan - GREŠOVÁ, S. - NIŠTIAROVÁ, A. - ŠTIMMELOVÁ, Judita. Fyziológia a patologická fyziológia pre farmaceutov (in Slovak). Košice, Univerzita veterinárskeho lekárstva a farmácie, 2012. 373 s. ISBN 978-80-8077-317-

SOPKOVÁ, D. - STANÍKOVÁ, A. - VLČKOVÁ, R. - ONDRAŠOVIČOVÁ, S. - KOPPEL, Juraj - FAIX, Štefan. Veterinary physiology II (in Slovak). Košice, Univerzita veterinárskeho lekárstva a farmácie, 2012, 142 s. ISBN 978-80-8077-322-9.

2.5.5. Number of published academic course books

VLČKOVÁ, R. - ONDRAŠOVIČOVÁ, S. - ANDREJČÁKOVÁ, Z. - SOPKOVÁ, D. - FAIX, Štefan. Practical exercises and seminars in physiology (in English). Košice, UVLF, 2015. 147 p. ISBN 978-808077-470-7.

2.5.6. List of joint research laboratories/facilities with universities

- Joint laboratories/facilities of Competence Centre for biomodulators and nutritional supplements with University of Veterinary Medicine and Pharmacy in Košice and Medical Faculty of University of Pavol Jozef Šafárik in Košice.
- Joint laboratories/facilities with National Reference Laboratory for Pesticides of the University of Veterinary Medicine and Pharmacy Košice
- Joint laboratory of environmental microbiology with Matej Bell University Banská Bystrica
- Joint laboratories/facilities with Faculty of Natural Sciences, University of Pavol Jozef Šafárik in Košice

- **Supplementary information and/or comments on doctoral studies and educational activities**

We have good experience in doctoral study educational cooperation with the universities in Košice. Our scientific workers act as external supervisors for PhD students at these universities, creating possibilities for us in educational activities there. In year 2015 our Institute signed an agreement on the establishment of a joint research workplace with the University of Pavol Jozef Šafarik in Košice. One of the subjects of shared activity in this Centre is the education of students on magister and doctoral study courses.

In the period 2012-2015, 11 PhD students supervised by research staff of the Institute successfully defended their PhD theses. Three of them acquired postdoctoral or research positions at the Institute, while others utilized their

acquired skills in the laboratories of commercial companies, universities or state organisations in Slovakia and abroad.

Moreover, at our Institute, the student from Ukraine, Oxana Ivanišinova (Morkalenko) realizes her PhD study.

2.6. Social impact

2.6.1. List of the most important results of applied research projects. Max. 10 items

The probiotic strain *Lactobacillus fermentum* CCM 7421 (AD1) combined with the plant extract *Eleutherococcus senticosus* were experimentally applied in dogs. Beneficial effects on the intestinal microflora and immune system were found. STROMPFOVÁ, Viola – PLACHÁ, Iveta – ČOBANOVÁ, Klaudia – GANCARČÍKOVÁ, Soňa – MUDROŇOVÁ, D. – LAUKOVÁ, Andrea. Experimental addition of Eleutherococcus senticosus and probiotic to the canine diet. In Central European Journal of Biology, 2012, vol. 7, no. 3, p. 436-447.. ISSN 1895-104X.

In examining the fermentation of fungal substrates in the rumen, we found that cereal-enriched diets with fungal gamma-linolenic acid (GLA) did not affect biohydrogenation of fatty acids, but significantly influenced the concentration of GLA in rumen fluid. Substrates enriched with *C. echinulata* were used for the first time in sheep nutrition. WENCELOVÁ, M. – VÁRADYOVÁ, Z. – MIHALIKOVÁ, K. – GUOTHOVÁ, L. – JANŠTOVÁ, J. – ČERTÍK, M. – HOMOĽOVÁ, L. – PRISTAŠ, P. – JALČ, D. – KIŠIDAYOVÁ, S.: Substrates enriched with the fungus Cunninghamella echinulata: an *in vitro* study of nutrient composition, sheep rumen fermentation and lipid metabolism. In Journal of Applied Microbiology, 2014, vol., 117, p. 930-939. doi:10.1111/jam.12594.

We tested the usability of chlorophyll as a acid-base balance modulator in probiotic preparations containing lactic acid bacteria. We optimalised applicable concentrations, and then we demonstrated the beneficial effect of a food additive containing a combination of probiotic bacteria and chlorophyll in dogs. STROMPFOVÁ, Viola – KUBAŠOVÁ, Ivana – FARBÁKOVÁ, J. – GANCARČÍKOVÁ, Soňa – MUDROŇOVÁ, Dagmar – MAĎARI, Aladár – LAUKOVÁ, Andrea. Experimental application of Lactobacillus fermentum CCM 7421 in combination with chlorophyllin in dogs. In Applied Microbiology and Biotechnology, 2015, vol. 99, p. 8681-8690. DOI: 10.1007/s00253-015-6724-9

We identified *Staphylococcus nepalensis* in the guano of bats (a mixed *Myotis myotis* and *M. blythii* summer roost colony). Our results indicate that guano accumulating near or directly in human dwellings and buildings may represent a significant risk for human health. VANDŽUROVÁ, Anna – BAČKOR, Peter. – JAVORSKÝ, Peter – PRISTAŠ, Peter. Staphylococcus nepalensis in the guano of bats (Mammalia). In Veterinary Microbiology, 2013, vol., 164, p. 116-121. http://dx.doi.org/10.1016/j.vetmic.2013.01.043

2.6.2. List of the most important studies commissioned for the decision-making authorities, the government and NGOs, international and foreign institutes

Expert's reports for the government and NGOs:

Title of expertise: Analysis of selenium status of wild fish in Slovakian waters
Recipient of expertise: Ministry for the Environment of the Slovak Republic
Compiled by: Dr. Lubomir Leng

Title of expertise: PCR diagnostics of carbapenemase genes
Recipient of expertise: Public Health Authority in Bratislava - National reference centre for monitoring of antibiotic resistance.
Compiled by: Dr. Vladimir Kmeť

Title of expertise: The application of bacteriophages as tracers in analyses of hydraulic communication in selected caves in Slovakia.
Recipient of expertise: State Nature Conservancy of the Slovak Republic.
Compiled by: Dr. Pristaš Peter

Participation of experts in the evaluation of international projects:

Name	Programme/scheme	Number of evaluated projects
2012:		
Fabian Dušan	Sciex (Swiss-Slovak scholarship fund)	1
Koppel Juraj	ERC	65
2013:		
Čikoš Štefan	National Science Centre, Poland	1
Koppel Juraj	ERC	50
	SoMoPro (South Moravian Programme for Distinguished Researchers)	12
2014:		
Koppel Juraj	ERC	19
	Horizont 2020	29
	SoMoPro	6
2015:		
Čikoš Štefan	Bilateral mobility project Czech AS – Slovak AS	1
Fabian Dušan	SAIA (Slovak Academic Information Agency)	1
Koppel Juraj	ERC	60
	Horizont 2020	3
	So Mo Pro	8

2.6.3. List of contracts and research projects with industrial and other commercial partners, incl. revenues

Cooperation with a commercial animal rendering plant (VAS, s.r.o., Mojšova Lúčka, Žilina, a partner for implementation of applied research covered by the project APVV 0009-10). We accomplished the monitoring of antimicrobial resistance of enterobacteria in the rendering plant environment during 2011.

The results were presented as an invited lecture at the clinical microbiology conference of the Slovak Medical Society and in the Slovak Veterinary Journal in 2012 (Dr.Vladimír Kmeť).

Cooperation in the investigation of pathogenity and antibiotic resistance in animal *Escherichia coli* with the company VetServis, s.r.o., Nitra (from 2014, Dr. Vladimír Kmeť).

The International Probiotic Company (InProCo) s.r.o. produces probiotic products containing our probiotic and bacteriocin-producing strains *Lactobacillus fermentum* AD1-CCM7421 included in the preparation ProBioDog (for dogs) and rabbit strain *Enterococcus faecium* EF2019-CCM7420 included in the preparation ProRabbit (for rabbits and small rodents) (Dr. Andrea Lauková, Dr. Viola Strompfová, Dr. Monika PogánySimonová).

Cooperation with the human microbiology company, HPL, s.r.o. We accomplished the PCR diagnostics of selected antibiotic resistance genes (e.g. betalactamase OXA-61, quinolone efflux cmeB and tetracycline genes) in Campylobacters (Prof. Kmeť)

Cooperation with the commercial Dairy Research Institute Žilina, a.s. (within the framework of the ITMS project entitled "Isolation, identification and characterization of lactic acid bacteria for their application in the dairy industry“). We tested several bacteria isolated from ewes' milk or ewes' lump cheese for their beneficial probiotic properties and bacteriocin activity. (Dr. Andrea Lauková, Dr.Viola Strompfová, Dr. Dobroslava Bujnakova).

Cooperation with the company Agrokonsult, s.r.o. Branovo for the production of ecological foods: production of bio-eggs enriched with selenometionin (Dr. Ľubomír Leng).

2.6.4. List of licences sold abroad and in Slovakia, incl. revenues

In 2012 (continuing in 2013, 2014, 2015) a licence agreement (§ 508, Law No. 513/1991 Coll.) was signed between the Institute of Animal Physiology Slovak Academy of Sciences and the International Probiotic Company, s.r.o. Košice, Slovakia. Both organizations agreed to incorporate scientific results into commercial use, specifically the use of a bacterial strain deponed in the Czech Culture Collection of Masaryk University in Brno (Czech Republic). Based on the agreement, the donor (our Institute) gives the recipient (InproCo) permission to use the strain in industry as a biological material to be incorporated in a probiotic product for rabbits. The recipient is a commercial producer and the product will be sold in the market network as ProRabbit (Dr. Andrea Lauková, Dr. Monika Pogány Simonová)

2.6.5. List of most important social discourses under the leadership or with significant participation of the institute (max. 10 items)

Dr. Peter Pristaš: “The thousand-year war”. TEDx independent event, Kosice, September 9, 2014. The talk on the history, present and future of antibiotics.

2.6.6. Summary of relevant activities, max. 300 words

The majority of applied research is performed at the Department of Digestive Tract Physiology. It is focused on the development of biomodulators and nutritional supplements of bacterial or plant origin which could be used to improve food quality of animal origin.

Tasks studied at the Department of Developmental Physiology are predominantly directed on basic-research. However, the majority of results are very important for practice, mostly in the area of veterinary and human reproductive medicine.

Published data contribute to the definition of possible health risks for both animals and humans. Some results are also helpful for improvement of biotechnological techniques used in livestock breeding or human assisted reproductive technologies.

2.7. Popularisation of Science (outreach activities)

2.7.1. List of the most important popularisation activities, max. 20 items

1. A documentary presenting the research activities of the Institute of Animal Physiology: "Animal health - healthy food - healthy people“, shown on a national television channel. Monarch Agency, 2.2.2012
2. Dr. Štefan Čikoš, Presentation of the Laboratory of Reproduction and Embryology results on Radio Regina, 29.1.2012
3. Dr. Dušan Fabian, Popularization lecture on embryos: „Skôr ako sa narodíme – O strastiplných cestách embryí“ (The hardships embryos go through before we are born) in the Science Café in Košice, 3.4.2012
4. Dr. Vladimír Kmeť, Antibiotic Resistance, results presentation on Radio Regina. 13.12.2012
5. Dr. Vladimír Kmeť, Presentation of the APVV project results on Radio Regina, 16.12.2012
6. Dr. Vladimír Kmeť, Resistant bacteria - Escherichia coli, results presentation on Radio Regina, 18.12.2012
7. Dr. Vladimír Kmeť, Presentation of the APVV and LPP project results on Radio Regina, 6.2.2013
8. Dr. Vladimír Kmeť, Presentation of the Probiotech project results on Radio Regina, 10.2.2013
9. Dr. Peter Pristaš, Popularization lecture on bacteria: „Čo robia baktérie keď ich nevidíme“ (What are bacteria doing when we can't see them?) for high school students and teachers, 14.11.2013
10. Dr. Dobroslava Bujňáková, Talk on the subject of potential probiotic bacteria, RTVS radio programe, 20.2.2014
11. Dr. Vladimír Kmeť, Popularization of the project (LPP) results about Antibiotic Resistance on Radio Regina, 7.2.2014
12. Dr. Peter Pristaš, Popularization lecture: "The thousand-year-old war against bacteria“. TEDx Košice 2014, 6.9.2014
13. Dr. Vladimír Kmeť, Poster presentation "Lactobacilli from goat's milk“. Agrokomplex exhibition Nitra, 21.8.2014.

14. Dr. Štefan Čikoš and Dr. Dušan Fabian, Interview for Wissenschaftsblog der Universitätsmedizin Halle, 14.10.2015
15. Dr. Štefan Faix, Presentation of the research activities of the Institute of Animal Physiology on Radio Regina, 14.4.2015
16. Dr. Ľubomíra Grešáková, Popularization of science for elementary school children (Polianska Street, Košice), 1.4.2015
17. Dr. Peter Pristaš, Popularization lecture on bacteria: „Čo robia baktérie, keď ich nevidíme“ (What are bacteria doing when we can't see them?) in the Science Café in Košice, 28.4.2015

2.7.2. Table of outreach activities according to institute annual reports

Outreach activities	2012	2013	2014	2015	total
Articles in press media/internet popularising results of science, in particular those achieved by the Institute	4	2	5	0	11
Appearances in telecommunication media popularising results of science, in particular those achieved by the Institute	5	3	3	1	12
Public popularisation lectures	3	0	2	2	7

- **Supplementary information and/or comments on popularisation activities, max. 300 words**

The majority of employees of the Institute are involved in the dissemination of their results to the general public in several ways:

1. through regular press conferences of the Institute of Animal Physiology organised annually (European Week of Science) at the Slovak Syndicate of Journalists in Košice; these press conferences are characterised by broad attendance of journalists from printed and electronic media;
2. in the framework of the Annual Open Day of the Institute aimed at the general public, including high school and university students;
3. in the framework of the Night of Scientists, an annual public scientific show organized by the Slovak Academy of Sciences and Slovak Organisation for R&D activities in Košice, consisting of numerous parallel oral, audio-visual, poster and stand presentations of scientific results or laboratory practice.

2.8. Background and management. Human resources and implementation of recommendations from previous assessment

2.8.1. Summary table of personnel

Personnel	2012	2013	2014	2015
All personnel	54,0	53,0	49,0	45,0
Research employees from Tab. Research staff	29,0	29,0	26,0	24,0
FTE from Tab. Research staff	28,700	28,500	23,800	21,700
Average age of research employees with university degree	47,4	48,0	48,6	49,2

2.8.1.1. Professional qualification structure (as of 31.12. 2015) FEMALE

FEMALE	AGE								
Number of	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
DrSc. / prof.	0	0	0	0	0	0	0	0	0
II.a / Assoc. prof.	0	0	1	4	0	3	2	0	0
Other researchers PhD./CSc.	1	2	0	0	0	0	0	0	0
doc. / Assoc. prof.	0	0	0	0	0	0	0	0	0

2.8.1.2. Professional qualification structure (as of 31.12. 2015) MALE

MALE	AGE								
Number of	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
DrSc. / prof.	0	0	0	1	0	0	1	2	2
II.a / Assoc. prof.	0	0	0	0	0	1	1	0	1
Other researchers PhD./CSc.	0	1	0	0	0	0	0	0	0
doc. / Assoc. prof.	0	0	0	0	0	1	0	0	0

2.8.2. Postdoctoral and mobility scheme

2.8.2.1. Postdoctoral positions supported by national and international resources

RNDr. Jan Burkus, PhD. - supported by APVV project

RNDr. Janka Kubandová, PhD. – supported by APVV project

MVDr. Renata Szaboová, PhD. – supported by Probiotech – project supported by EU Structural Funds

2.8.2.2. Postdoctoral positions supported by external funding

N/A

2.8.2.3. SAS stipends and SASPRO stipends

N/A

2.8.2.4. Internal funding - the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz

N/A

2.8.3. Important research infrastructure *(max. 2 pages)*

Department of Developmental Physiology

- Leica TCS SP5 confocal microscope with “live-cell imaging” system for real-time studies of functional morphology in living cells
- Nikon Ti-E inverted fluorescence microscope with micromanipulation equipment (Eppendorf) for micromanipulation techniques on cell level
- DXR Raman spectrometer with microscope (Thermo Fisher Scientific) for metabolomic analysis of cells and biological fluids
- EchoMRI 700 whole-body composition analyzer (Echo Medical System) for the measurement of body fat in laboratory animals
- Agilent 2100 capillary microelectroforetic system for automatic electroforetic analysis of DNA, RNA and proteins.

Department of Digestive Tract Physiology

- Atomic Absorption Spectrophotometer (AAS) for quantitative analysis of macro- and microelements.
- High Performance Liquid Chromatograph (HPLC 3000 Ultimate, Dionex, Sunnyvale, CA, USA)
- Mass Spectrometer (API 2000 AB Sciex, Framingham, MA)
- Cell-Dyn 3700 hemanalysator (Abott Lab. Slovakia, s.r.o.), functioning with a combination of impedency and laser flow cytometry.
- MALDI TOF – Biotyper for rapid bacteria and yeast identification and biodiversity analysis based on protein spectra comparisons.
- DCode Universal Mutation Detection System for DGGE analysis.

List of all scientific equipments is announced on web of our Institute; they are available for all scientists/researchers of SASci, Universities and regional researches companies.

2.8.4. Description of how the results and suggestions of the previous assessment were taken into account

The Institute of Animal Physiology strictly adheres to the principles of Good Scientific Practice as well as to the national legislation relevant to animal welfare and ethics in animal research. The Institute has all necessary autorisations for research in restricted areas, e.g. animal research, GMO, infectious agents and hazardous chemical and biological substances.

The Institute has a long-term plan for human resources management based on the inevitably important age balance of research personnel, and has adopted an optimal strategy for increasing the proportion of PhD and DrSc students and young postdoctoral scientists. These efforts are limited only by budgetary restrictions, which moreover have been partly overcome through our active search for other financial resources.

All researchers are regularly evaluated at yearly intervals and the evaluation results are also reflected in the variable part of their remuneration.

The organizational structure of the Institute is flexible. The research groups cooperate intensively together as well as with other research institutions in Slovakia and abroad, and their high level of fruitful collaboration is also reflected in the list of publications.

The active policy of the Institute management is based on universal support focusing mainly on international projects and large national projects in all stages, starting at the proposal stage, through negotiation of contracts, implementation and execution of projects, management of financial aspects, assistance with reports, intellectual property, copyrights, patents, licences, and technology transfer. All major research projects are considered and approved by the Research Council of the Institute.

The head of the Institute is in permanent contact with the project leaders, and exchange is based not only on formal/informal meetings but also on electronic communications, because the Institute is based at two separated locations in Košice. Broadband internet connection is assured in both locations, including VoIP facilities.

Comments, objections to organization`s activities in form of suggestions and specific tasks which must be performed by organization befor next regular evaluation:

1) *It is advisable to focus publication strategy on high-quality international peer-reviewed journals reflecting improved infrastructure*. - The mean IF of papers has increased from 1.337 in 2012 to 1.497 in 2015. The ratio of papers with IF higher than 1.0 was 46% in 2012 and 68% in 2015.
2) *It is necessary to work on personnel management including DrSc*. During the last period two researchers obtained the degree of DrSc (achieved at age 40 and 56) and two researchers achieved the rank of Professor.
3) *In the future research topics and visions should be discussed and developed by permanent discussions within the institute.* – regular monthly meetings for all researchers are organised at the Institute
4) *Concentration of the institute in one place should help for the further development and provide synergy*. – Joining of research teams in one place is our dream and preference. So far our effort to obtain funding has been unsuccessful (we applied for two projects), but we will continue in this activity.

- **Supplementary information and/or comments on management, research infrastructure, and trends in personnel development**

3. Research strategy and future development of the institute for the next five years (2016-2020) (Recommended 3 pages, max. 5 pages)

3.1. Present state of the art in both the national and the international contexts

Research at the **Department of Digestive Tract Physiology** focuses on gastrointestinal microflora modulation as well as the physiology of animal digestion. We study various additives as compensation for EU-banned antibiotics and other chemicals used in animal nutrition. We study the effects of phytogenic and fungal additives in animal nutrition, in hen nutrition influencing small intestine function and general animal antioxidative status, and in ruminant nutrition influencing the rumen environment (rumen digestion, microbiome and metabolic profile) to alleviate the unfavourable effects of high production dietary regimes for animals (Plachá et al. 2014,). We examine the impact of various microelement organic sources (Zn, Mn, Se) on absorption, retention, excretion, distribution and deposition in hens, ruminants and rabbits, and use them as additives in feed for farm animals (Venglovská et al. 2014). The phylum *Firmicutes* dominates among the microbiota related to physiology. Some species from the phylum *Firmicutes* (mainly the lactic acid bacteria group) possess beneficial effects for food production, but also for companion and sport animals. We achieve results *in vitro* and *in vivo* related to the effects (metabolic and probiotic) of promising beneficial strains to apply them or their bacteriocins into food-animal husbandries or individual animals to maintain their health condition (Pogány Simonová et al. 2015, Váradyová et al. 2013). The increase in antibiotic resistance is a major cause for concern in isolates of the *Enterobacteriaceae* family, *staphylococci* and *lactobacilli*. We showed the presence of ESBLs (CTX-M, CMY-2) and plasmid quinolone resistance (qnrS) in indicator strains of *E.coli* isolated from poultry (Drugdová, Kmeť 2013), wild animals and municipal waste water. Methicilin-resistant coagulase-negative *staphylococci* were isolated from pigs, bovine milk and ovine cheese (Kmet, Strakova 2014). Moreover, gentamicin-resistant intestinal lactobacilli with aac(6')Ie-aph(2″)Ia gene were isolated from poultry (Bujnakova et al. 2014). Our results confirm that animal intestinal and food microflora may be reservoirs of bacterial antibiotic resistance for the human population.

Research at the **Department of Developmental Physiology** focuses on the study of early embryo development in connection with the problem of fertility decline.

In developed countries significant decline in fertility in humans as well as in farm animals is observed. Although the exact reason for the decreased reproductive efficiency of farm animals is not known, it is supposed to be connected with the increased productivity achieved by improved management, over-nutrition and intense genetic selection. In humans, modern life style causing some typical disorders (such as obesity and stress) can be among the reasons for the fertility decline. The preimplantation development period is one of the most sensitive stages in mammalian ontogenesis, and failure at this developmental stage may cause unsuccessful gravidity. It has been proved that maternal health status and the environment in which the mother lives could considerably modify oocyte maturation, fertilization and subsequent embryonic development.

Experimental studies performed at the Department of Developmental Physiology have analysed the effect of maternal obesity and stress on preimplantation development. Molecular mechanisms involved in the regulation of

early embryo development under physiological as well as unfavourable conditions have been studied as well. Results obtained on an animal model simulating natural development of obesity in mammals showed that highly-elevated body fat deposits in female mice negatively correlated with quality of oocytes, production of zygotes, developmental abilities of preimplantation embryos and quality of blastocysts. Furthermore, excessive body fat had an impact on the somatic development and behaviour of delivered offspring. On the other hand, slight elevation of body fat deposits did not affect the majority of evaluated reproductive parameters and was even accompanied by increased number of obtained oocytes and embryos (Kubandová et al., 2014; Fabian et al., 2015). To answer the question whether maternal stress can directly affect the early embryo, we examined expression of adrenergic receptors and identified several subtypes of these receptors in oocytes and preimplantation embryos of three mammalian species (Čikos et al., 2014). Our in vitro and in vivo experiments have indicated detrimental effects of maternal stress on preimplantation embryo development. Moreover, we have demonstrated that alterations in the early embryo development caused by prenatal stress can have long-term consequences reaching even into adult life (Čikoš et al. 2007, Burkuš et al., 2015). Our study of molecular mechanisms regulating early embryo development focused on the role of key protein kinases in the first embryo cleavage. We demonstrated that Akt/PKB kinase plays the role of apoptosis relay on entry into first mitosis of the mouse embryo, and that Aurora kinase A is essential for correct chromosome segregation in the mouse zygote. We also demonstrated that Polo-like kinase 1 is essential for the first mitotic division in the mouse embryo, and showed that this kinase regulates spindle formation kinetics and APC/C activation in the mouse zygote (Baran et al. 2015, Kovaříková et al. 2015).

3.2. Research strategy of the institute in the national and the international contexts, objectives and methods

In last four years, Institute was very successful in application for EU Structural funds. During the realization of Research & Development Operational Programme funded by the ERDF wide spectrum of up-to date devices and instruments were obtained. The improved research infrastructure and the foundation of the Competence Centre for biomodulators and nutritional supplements are the milestones of our future development. Competence Centre helps us to perform more educative activities (e.g. training courses for undergraduate and PhD students), to extend cooperation with regional universities (UVMP and UPJŠ in Košice), to widen applied research in the cooperation with commercial sphere (Imuna a.s., Šarišské Michaľany and VÚM a.s. Žilina), and, primarily, gives us possibility for the establishment certified laboratory focused on expert analyses connected with food safety.

Research strategy of the **Department of Digestive Tract Physiology** will be focused on continuing research into the effects of trace elements, natural plant additives, beneficial bacterial strains and antibiotic resistance on animal health and productivity. Possible interactions will be examined between trace elements and essential oils and their impact on physiological functions of animals. In addition, the effects of trace elements (from various sources) in combination with essential oils will be studied in relation to morphology, metabolic and functional processes in the small intestine, as well as their role in the antioxidant protection of animals. Feed supplemented with natural additives will be studied to reduce methane using

biotechnological approaches following the feed conversion, animal health status, milk and meat qualities. In vitro fermentation of rumen content will be screened by the use of bioactive substances (secondary plant metabolites) which are known to have effect on methane production (especially tannins, saponins, oils and sulphur-containing compounds). Effect of beneficial strains (mainly the lactic acid bacteria group of the phylum *Firmicutes*) will be studied *in vitro* and *in vivo* in food-animal husbandries or individual animals to maintain their health condition. Antibiotic resistance of animal intestinal microflora (enterobacteriae and coagulase-negative staphylococci) in small mammals (mainly species *Apodemus*) will be investigated as a possible source of antibiotic resistance genes (mecA, mecC, CMY-2, CTX-M, IMP, KPC, PMQR) for human population. Inhibition of biofilms by microbial preparations, natural additives and essential oils represents a new way to combate antibiotic resistance of pathogenic and commensal bacteria. *Lactobacillus* biosurfactants and cell free supernatants inhibited biofilm formation of carbapenemase resistant enterobacteriae.

Research strategy of the **Department of Developmental Physiology**. In the next five years, the study of embryo-maternal interactions under physiological conditions as well as under unfavorable conditions of maternal health or environment will continue. We will use in vitro models (mouse preimplantation embryos, mouse embryonic stem cells) and in vivo models (mainly mouse) to identify alterations in embryonic and maternal physiology, and to reveal the molecular mechanisms involved. Besides continuing with our present study (the effects of maternal obesity and stress on preimplantation development), we will spread our research into a new area: the effects of selected xenobiotics on early embryo development. This research will focus on two groups of substances with oral poisoning potential for farm and domestic animals or humans: insecticides and food additives.

To discover the molecular mechanisms involved we will study the cell receptors through which oocytes and early embryos communicate with the surrounding environment. Our research will focus on receptors capable of mediating the incidence of unfavorable maternal health or environment on the early embryo. Effectiveness of endogenous and exogenous receptor ligands will be tested, and signaling pathways triggered by activated receptors will be examined. Possible effects on genome integrity will be investigated as well. Maintaining genome integrity during the onset of embryonic development is the basic condition for successful embryo development. Structural damage of the DNA molecule is in general mutagenic and its potential spread may compromise the viability of the entire organism. Our research objectives will be the detection of protein incidence/activity associated with the site of embryonal DNA damage, and repair of the embryonic genome during activation. We will further study the phenotypic changes in early stage embryos after a defined induction of stress response in the maternal organism. Analyses will focus on the expression of genes relevant to the repair of damaged DNA.

In the context of the future transformation of SAS, it is highly advisable to form larger research centres covering broader scientific areas with higher degrees of synergy and complementarity. From this point of view we are considering fusion of our Institute and the Institute of Parasitology of SAS in Kosice.

On the basis of joint projects and very good scientific cooperation, the research teams will study interactions between gut microbiota, immune system and pathogens, describing the host gut as a complex ecosystem where all

components play a relevant role in modulating each other and in maintaining the homeostasis important for the health of the host.

Animal Nutrition and Parasites. The interactions between composition of feed or pastures, minerals and ruminant nematode infections have been studied and it was confirmed that certain forages reduce the establishment of incoming nematodes or reduce existing worms. We will answer the question whether the enrichment of feeding diet with plant mixtures rich in bioactive compounds can affect the health and parasitostatus of grazing animals.

Gut microflora and parasites. Intestinal parasites interact with the microflora (and microbial preparations or natural additives) modifying the host homeostasis. Gut microbiota represents a relevant factor that may strongly interfere with the pathophysiology of parasitic infections, determining parasite survival and disease outcome.

Fertility and Parasites. Parasitic worms are known to have direct and indirect impacts on autoimmune diseases, intestinal microbiome and also various organ systems in the host organism, including reproductive organs. Concerning the latter, co-evolution of parasites with their hosts can result in negative as well as positive effects of some helminth species on female fecundity. In order to better understand this aspect of reproduction, the effects on fertility of selected intestinal parasites and anti-parasitic drugs will be investigated using a mouse model. Besides general reproductive parameters, we will focus on oocyte fertilization capacity, development of preimplantation embryo and embryo implantation.

Project proposals submited to 7RP or H2020	2012	2013	2014	2015
Institute as coordinator				
Institute as participant				

4. Other information relevant for the assessment

In 2013 the Department of Developmental Physiology (leader: Dr. Koppel) was awarded the Medal marking the occasion of the 60th anniversary of SAS. Furthermore in 2013 the same research group was nominated for the Award of SAS for preimplantation embryo development studies.