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 Parasitology, Slovak Academy of Sciences
Hlinkova 3, 04001 Košice, Slovakia

1.2. URL of the institute web site

http://www.saske.sk/pau/

1.3. Executive body of the institute and its composition

Directoriat	Name	Age	Years in the position
Director	Assoc. Prof. Dr. Branislav Peťko, D.Sc.	62	8
Deputy director	Assoc. Prof. Dr. Ingrid Papajová, PhD.	41	4
Scientific secretary	Dr. Marta Špakulová, D.Sc.	65	17

1.4. Head of the Scientific Board

Dr. Samuel Velebný, PhD. (till 02/2013)
Dr. Ivica Hromadová, PhD. (since 03/2013)

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	42.0	33.960	42.0	32.880	42.0	34.160	38.0	32.610	**164.0**	**41.0**	**33.403**
Number of PhD students	14.0	12.000	16.0	13.000	14.0	10.000	15.0	12.000	**59.0**	**14.8**	**11.750**
Total number	56.0	45.960	58.0	45.880	56.0	44.160	53.0	44.610	**223.0**	**55.8**	**45.153**

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	42.0	33.960	42.0	32.880	42.0	34.160	38.0	32.610	**41.0**	**33.403**
Department of Systematics	10.0	8.086	10.0	7.829	10.0	8.133	10.0	8.582	**10.0**	**8.158**
Department of Parasitic Diseases	12.0	9.703	10.0	7.829	11.0	8.947	10.0	8.582	**10.8**	**8.765**
Department of Vector-borne diseases	9.0	7.277	11.0	8.611	11.0	8.947	9.0	7.723	**10.0**	**8.140**
Department of Experimental Pharmacology	5.0	4.043	6.0	4.697	6.0	4.880	4.0	3.433	**5.3**	**4.263**
Department of Environmental and Plant Parasitology	6.0	4.851	5.0	3.914	4.0	3.253	5.0	4.290	**5.0**	**4.077**

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]*	423.831	406.409	402.575	474.513	**426.832**
Other Salary budget *[thousands of EUR]*	107.583	145.898	156.839	36.958	**111.820**

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

The Institute develops research activities in the fields of biological, medical, pharmaceutical, agricultural, and forestry sciences.

The Institute focuses on the research of parasites and parasite-induced diseases of humans, animals and plants, as well as interrelations of parasites to hosts, rezervoars, vectors and environment; it conducts research of life cycles and manifestations of parasitic organisms and studies therapeutic and prophylactic manipulation of parasite-borne diseases.

The Institute undertakes implementation activities towards rapid introduction of new knowledge into practice.

The Institute develops co-operation with similarly oriented Institutes of the Slovak Academy of Sciences (SAS), Universities and other research organisations in Slovakia and abroad.

The Institute provides a scientific education as an external educational institution and participates in other levels and forms of the under-gradual and post-gradual study.

The Institute organizes educational and popularisation activities associated with the implementation of results into practice.

The Institute ensures publication of scientific results through the periodical and non-periodical press.

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 research activities of the **Institute of Parasitology of the SAS** (IP SAS) are the result of its mission in the scope of national research with broad support from international cooperation. The obtained original outcomes predominantly have the character of basic research focusing on taxonomy, biodiversity, host-parasite relationships, population genetics and immunology. A smaller proportion of the research is directed toward applications, mainly in medically and biologically important parasites and the problems of their transmission, as influenced by the global climatic and ecological changes. Some research branches have a long tradition, but the Institute also adopts new approaches and directions. The contributions and new knowledge acquired in period 2012-2015 can be characterised as follows, taking into account five research Departments:

The **Department of Systematics** applies a multidisciplinary approach to research on the taxonomy, phylogeny, biogeography and ecology of helminths (multicellular parasitic worms), using cross-disciplinary studies on morphology, ultrastructure, molecular data and karyotypes. The most valuable results have involved the description of new genera, species and karyotypes, the preparation of new identification keys and the detection of novel structural characteristics and original markers for molecular taxonomy and population genetics (rDNA, mtDNA, microsatellites). The department continually maintains its leading position in systematic parasitology both in Slovakia and abroad, collaborating broadly with European, Asian and North American research teams.

Comprehensive research has been done in the field of systematics of the evolutionarily important, non-segmented fish tapeworms of the order Caryophyllidea (Platyhelminthes: Cestoda). The frequently occurring conflict between morphological and DNA-based taxonomic markers and correct species delimitation turned out to be a major problem in contemporary systematic parasitology and was identified in nearly all caryophyllideans studied to date. Complex studies on the morphological and genetic variability of this systematic group resulted in the description of a new genus, *Lobulovarium* g. n., three new fish tapeworm species – *Lobulovarium longiovatum* sp. n., *Khawia abbotinae* sp. n. and *Paracaryophyllaeus vladkae* sp. n. – and several complexes of multiple species in the genera *Caryophyllaeus* and *Paracaryophyllaeus*. A systematic revision of the genus *Caryophyllaeus*, which revealed the intraspecific morphological variability of the two most widespread species, is about to be completed, with significant support of ongoing analyses of microsatellite loci developed on the basis of multiplex panels using a next-generation sequencing approach. Ultrastructural assemblies, such as newly discovered lamellar structures and lipids linked to the cytoplasm of mature vitellocytes, and original data on the reproductive biology of numerous caryophyllidean representatives contributed to a better understanding of the phylogenetic position of the order Caryophyllidea among higher taxa of the class Cestoda.

Atractolytocestus huronensis (Caryophyllidea) is an invasive tapeworm of not yet resolved origin. It is a parasite of the common carp and is distributed on four continents (Asia, Europe, North America, and Africa). Genetic analyses of distant geographic populations of the species resulted in the development of new species-specific markers which enabled its differentiation from other congeneric taxa. In addition, intragenomic ITS variants (ITS paralogues) mutually linked with other exceptional genetic features, such as polyploidy (triploid karyotype) and parthenogenesis (aberrant spermatogenesis shown both by cytogenetic and ultrastructure analyses), were discovered in *A. huronensis*.

Another highly interesting model is the veterinarily important giant liver fluke *Fascioloides magna*, an oversized parasite up to 80 mm long, which forms parenchymatous pseudocysts within the liver of wild and domestic ruminants. The fluke is among invasive species indigenous to North America and introduced to Europe, where it has established several permanent natural foci. Phylogenetic analysis of all recent North American populations of *F. magna* revealed, using mitochondrial (*cox*1, *nad*1) markers, two major evolutionarily distinct lineages occurring in the western and eastern regions of the continent. The genetic makeup of the parasite correlated with data on the historical distribution of its definitive hosts, the white-tailed deer in the eastern and the wapiti in the western parts of the United States and Canada. Furthermore, molecular

genotyping of the newly emerging populations of *F. magna* in Europe (Poland and Croatia) revealed their origin to be in already established European foci (Czech Republic-Poland and the Danubian floodplain forests, respectively) and the probable method of transmission. The recently *de-novo* designed microsatellite loci have been applied in population genetics of *F. magna* from all European and North American localities and for determining the migratory routes of this parasite on both continents.

Among the results obtained in the scope of karyology, the existence of an extraordinarily unbalanced chromosomal set was revealed in a fish gill parasite of the genus *Paradiplozoon* (Monogenea, Platyhelminthes), *P. homoion*. While all other species of the family Diplozoidae are linked to specific host fish and have a stable karyotype, *P. homoion* is a euryxenous parasite species with a wide host range. Its chromosome sets vary from 10-14 elements (forming five cytotypes), without any evident link to the fish host, but differing slightly between geographically distant populations. The polymorphism is associated with Robertsonian fusions of acrocentric chromosomes, which might support the monobrachial fusion model (the hypothesis that isolated subpopulations become independently fixed for different centric fusions), which individually cause little or no loss of fertility in heterozygotes.

Fish parasites are also gaining increasing interest from an environmental point of view. Our studies demonstrated a close relationship between parasitism and ecological conditions in a particular environment. The region of Eastern Slovakia is among the hot-spots of areas most dangerously contaminated by heavy metals and polychlorinated biphenyls (PCBs) worldwide. Even today, high quantities of stock pollutants are gathered in the sediments of reservoirs and accumulated in aquatic organisms. We found that certain parasites, particularly those that parasitize the fish intestine, accumulate pollutants at concentrations that are orders of magnitude higher than those in their fish hosts; therefore, this property might be used for biomonitoring purposes. Eco-toxicological information obtained through parasitic organisms can also enlarge our knowledge of ecosystem function and integrity.

The research program of the **Department of Parasitic Diseases** is mainly focused on zoonoses – diseases transmissible between animals and humans. Its research activities address aspects of epidemiology and molecular characterization of zoonotic agents (including unicellular and multicellular parasites), as well as the immune responses of vertebrate hosts, including humans.

Comprehensive serological and molecular research on parasites occurring in farm and wild ruminants confirmed the high prevalence of neosporosis and toxoplasmosis, zoonotic diseases caused by the intracellular coccidians *Neospora caninum* and *Toxoplasma gondii* (Alveolata: Apicomplexa), respectively. Neosporosis is primarily a disease of cattle, with dogs and related canids as definitive hosts. On the other hand, toxoplasmosis is primarily a disease of humans, sheep and goats, with felids as the only definitive hosts. The infections are a major cause of repeated abortion and neonatal mortality in livestock and spontaneous abortions or neurological disorders (such as blindness and mental retardation) in humans. A high prevalence of toxoplasmosis (56.9%) and neosporosis (15.5%) in monitored livestock and goats was detected during large-scale epidemiological surveys conducted in Slovakia within the accreditation period. From a methodological point of view, a great contribution for diagnostics is *in vitro* cultivation of the first Slovak bovine *N. caninum* isolate. Additionally, the molecular evidence of *N. caninum* in a brown bear from Slovakia represented the first finding of neosporosis in this wild animal in Europe.

A fundamental part of the Department's research extends into the realm of public health and deals with infections transmissible to humans. The human alveolar echinococcosis caused by larval cysts of the tapeworm *Echinococcus multilocularis* (Platyhelminthes: Cestoda) is generally considered to be the most lethal helminth infection in the Northern Hemisphere. Highly endemic foci in several northern regions of Slovakia were revealed in the course of an epidemiological study of this disease conducted during the accreditation period. In endemic localities, the prevalence of the parasite in its final hosts – red foxes – reached up to 40-60%. Out of 50 thus far recorded human cases of echinococcosis, the majority were detected in northern endemic regions of Slovakia, which correlates with the highest prevalence of *E. multilocularis* in foxes.

The roundworm *Dirofilaria repens* (Nematoda: Spirurida) is an etiological agent of the mosquito-borne subcutaneous dirofilariasis of carnivores (fox, dog etc.) and accidentally also

man. The disease is regularly manifested by subcutaneous nodules in animals and pulmonary nodules in humans. However, we originally discovered that human infection with *D. repens* can be connected with *larva migrans cutanea* syndrome, which is presented as a creeping eruption associated with severe pain, burning and erythema of the adjacent skin. An infected patient came from south-eastern Slovakia, where the overall prevalence of canine dirofilariosis surpassed 30%.

The economically important roundworm *Ascaris suum*, adapted to pigs, and the medically important *Ascaris lumbricoides*, adapted to human beings (Nematoda: Ascaridida) were investigated in several aspects. Data on the potential of both parasites for cross-transmission between pigs and humans and information on the frequencies of interspecific hybridization are important for better understanding the evolution of the parasite and for implementing control programs. Cross-transmission could lead to higher morbidity of non-specific hosts, which are less adapted to the parasite. Using nuclear rDNA analysis, an increased occurrence of cross-infection and introgressive hybridization of *A. suum* and *A. lumbricoides* were found in pigs in eastern Slovakia. The results indicated hyperendemicity and high environmental contamination with *Ascaris* eggs in the concerned areas. Endemic *Ascaris* locations were prevailingly affiliated with the proximity of settlements of marginalized Roma communities. All analyzed patients from Slovakia were infected by "human" *A. lumbricoides* roundworm, which was also recorded in 18.5% of pigs in both pure and hybrid form with *A. suum*. The obtained data suggested that *Ascaris* circulation in Slovakia is primarily mediated by "human-human" and "pig-pig" transmissions and interestingly, in some eastern Slovakia foci, also by "human-pig" anthroponotic transfer.

The parasite–host–environment interactions were evaluated regarding aspects of heavy metal intoxication (Pb, Cd, Hg), immunogenicity of parasitic agents (*Ascaris suum*) and host immune capacity (mouse) in the development of parasitic infection. The changes in the Th1/Th2 cytokine profile caused by heavy metal intoxication played an important role in the establishment of successful immune reactions against parasite infection. The host Th1 immune response was suppressed, and larval migration was not controlled by the host in the case of lead pollution. In contrast, cadmium stimulated the Th1 response, which was affiliated with a more destructive effect on the larvae and restricted development of parasite infection. Mercury pollution might also decrease the prevalence of the parasite, but this was probably caused by the pure host physiological status. Experimental data suggested different metal effects on the parasite status of the host and different risk of parasite infection depending on the metal pollution.

The research at the **Department of Vector-borne Diseases** is aimed at the study of the structure and dynamics of arthropod-borne (mainly tick-borne) pathogens of bacterial and parasitic origin, with an emphasis on different environmental, climatic and ecological factors of natural foci. Research on ecology of ticks was focused on current distribution of ixodid ticks in urban and mountainous areas of Slovakia, in the Alpine regions, as well as in selected coastal areas of the Black and Mediterranean Seas.

Research on zoonotic bacterial pathogens was focused on the medically significant model *Borrelia burgdorferi* s.l. (Spirochaetes), known as a frequent causative agent of Lyme borreliosis, transmitted primarily by ticks (Ixodida). The molecular survey also confirmed the occurrence of the bacteria in two species of blood-sucking fleas (Siphonaptera) and five species of obligate hematophagous and facultative parasitic mites (Mesostigmata), as well as in the non-parasitic predatory mite *Euryparasitus emarginatus*, which is also found on rodents (*Apodemus flavicollis, Clethrionomys glareolus*). The findings newly revealed that circulation patterns of the borreliae within natural foci are more complex, involving various arthropod groups including mites and fleas.

Bayesian phylogenetic analyses of four selected genes (16S rRNA, msp4, groESL, DOV1) showed that the causative agent of human granulocytic anaplasmosis, *Anaplasma phagocytophilum* (Proteobacteria), occurs in Europe in two distinct clade-ecotypes, which circulate in two separate natural cycles. The first ecotype is related to *Ixodes ricinus* ticks (Arthropoda: Ixodida) and plenty of hosts, such as humans, ungulates, birds and dogs, while the second ecotype comprises solely *Ixodes trianguliceps* ticks and small rodents.

For the first time, a related tick-borne pathogen potentially infectious for humans, the rickettsia *Candidatus* Neoehrlichia mikurensis (Proteobacteria), was detected in *Ixodes*

*triangulicep*s ticks feeding on rodents in Slovakia. Moreover, 11% of fleas also feeding on rodents were found to be infected with rickettsiae (*Rickettsia helvetica, R. felis*), which are associated with both human and animal diseases.

Another vector-borne disease, induced by the unicellular protozoan parasite *Babesia microti* (Apicomplexa), occurs in temperate zones mainly as the haemolytic disease with malaria-like symptoms in infected humans. Two different genotypes of *B. microti* infecting small rodents were revealed by molecular genotyping: the pathogenic genotype prevailed 92% of the time, belonging to the zoonotic so-called Jena strain. The molecular evidence of this protist in a rodent foetus pointed out the possibility of transplacental transmission as an alternative route for the spread of infection among rodents. In Slovakia, another blood parasite, *Babesia gibsoni,* was found in dogs for the first time. We optimized an inexpensive PCR-RFLP diagnostic method in order to distinguish *B. gibsoni* from the more abundant *B. canis* in clinical samples. The new methodology is beneficial for veterinary diagnosis.

The unicellular haemogregarines *Hepatozoon* and *Karyolysus* (Apicomplexa) are widespread but neglected blood parasites of reptiles. *Hepatozoon* spp. were detected in snakes originating from Africa, Asia and the Americas, while European lizards were found to be infected with the species *Karyolysus latus* and *K. lacazei*. Bayesian and Maximum Likelihood analyses based on 18S rDNA sequences revealed the high heterogeneity of representatives of both genera and showed the necessity of taxonomical revision of the Hepatozoidae and Karyolysidae families.

A broad international team created distribution models of parasites on the hosts based on comprehensive analysis of host-parasite relationships in small mammals, fleas (Siphonaptera) and obligate and facultative parasitic mites (Mesostigmata) in three different Old World biomes. In Central Europe, the model of higher frequency of infestation of male hosts universally prevailed. This model was not, however, observed in Middle East and in South Africa. Our findings suggest that host sex and body mass are common determinants of parasite infestation in mammalian hosts, but neither of them follows universal rules.

The research program of the **Department of Experimental Pharmacology** is focused on research of molecular pharmacology, immunology and host-parasite interactions, as well as anthelmintic resistance of ruminant parasites.

In the course of research of anthelmintic resistance, the drug flubendazole, which has highly lipophilic properties, was found to be able to penetrate into the sensitive and resistant parasitic nematode of small ruminants, *Haemonchus contortus*. Significantly higher levels of flubendazole metabolites and detoxification enzymes were measured in the resistant *H. contortus* strain, as compared with those obtained from susceptible parasites. The high levels of enzymes are supposed to protect resistant parasites against the lethal effect of the drug and allow the development of anthelmintic resistance to parasites.

The emergence and rapid spatial expansion of resistant parasites resulted in the development of a number of *in vitro* and *in vivo* methods for detection of anthelmintic resistance. According to current knowledge, most methods are not able to detect a low level of resistant individuals within the parasite population due to low sensitivity and reproducibility. Our task was therefore not only to choose the most sensitive and reliable method for detection of resistance to macrocyclic lactones but also to modify methods able to distinguish between resistant and susceptible strains. Use of the drug ivermectin aglycone and interpretation of results by a discriminating dose of LD99 significantly affected the sensitivity of the larval development test. We confirmed that the probability of detecting a resistant parasite was very high, even with a low level (2-4%) of resistant parasites in a population. The test was able to reveal a relatively small proportion of resistant worms in the population, and its sensitivity also had the potential to determine resistance in field tests. The results are important for the application of measures to prevent the further spread of resistance.

Within the framework of international projects and cooperation on anthelmintic resistance, two surveys were carried out to reveal the prevalence of resistant parasites in sheep and goat farms in Italy and Lithuania. The results confirmed the high prevalence of resistant parasites in both countries (40% of farms in Italy and 76% in Lithuania with resistant parasites).

Using the model tapeworm *Mesocestoides vogae* (Cestoda: Platyhelminthes) in experimental infections of mice, the benefits of combination therapy with the anthelmintic drug praziquantel (PZQ) and the flavonoid silymarin (SIL) were demonstrated. Co-administration of

both drugs significantly enhanced the efficacy of treatment in both the liver and peritoneal cavity of mice. In the liver, SIL potentiated the anthelmintic effect of PZQ indirectly via suppression of oxidative damage and normalization of GSH redox balance, resulting in down-regulation of fibrogenesis and increased bioavailability of the drug for the larvae. SIL co-administration modulated the effector functions of innate immunity cells and the proportions of Th1/Th2/Treg lymphocyte populations, reflected by diminished suppressive TGF-beta and IL-10 cytokines and elevated pro-inflammatory IFN-gama in serum. Our data indicated that silymarin has multiple positive effects involving several molecular targets during the chronic inflammatory disease caused by parasitic cestodes.

The biological and antiparasitic activities of the secondary lichen metabolite atranorin (ATR) were tested on *M. vogae* larvae *in vitro* and *in vivo* in mice for the first time. ATR showed a direct and rapid larvicidal effect on larvae *in vitro* at a concentration ≥ 100μM in both hypoxic and aerobic incubations. This effect was mediated by overstimulation of complex II enzymes in mitochondria, the accumulation of glycogen and lipids, followed by an imbalance in neuromuscular control of larval motility and finally the loss of physiological/metabolic homeostasis in larvae. *In vitro* (at a concentration ≤ 20μM), ATR simulated spleen cells proliferation and did not induce apoptosis, whereas after *in vivo* administration of ATR to mice, it had strong anti-apoptotic, hepato- and cytoprotective effects on host's cells.

Research at the **Department of Environmental and Plant Parasitology** was aimed at the study of environmental parasitology, ecotoxicology and plant parasitology. As part of environmental parasitology, the detection of parasites of humans and animals living in different environmental and socioeconomic conditions was carried out. Attention was also paid to effective methods for reducing the epidemiologically significant contamination of urban and rural ecosystems by causative parasitic agents, focusing on marginalized groups of the human population.

The long-term monitoring for the presence of parasitic germs in dogs, children and soil from two neighbouring communities with different levels of hygiene and socioeconomic conditions was performed. A lower incidence of endoparasitic germs in dogs and the soil was recorded in localities with a higher standard of living, better personal and communal hygiene and greater care for the dogs, while no parasitic diseases were quoted in this paediatric population. In localities with a lower socioeconomic status (Roma settlements), we observed a high prevalence of endoparasites not only in canines, but also in children throughout the year. The frequent finding of geohelminth nematode (*Toxocara canis*, *Toxascaris leonina* and *Trichuris vulpis*) eggs in dog faeces and the occurrence of *Toxocara* spp. and *Ascaris* spp. eggs represent important epizootiological and epidemiological problems.

In the scope of ecotoxicological studies, a comparison of soil nematode communities, supported by chemical analysis, clearly proved a close link between intensive anthropogenic activities (mining, ore processing) and gradual degradation of the soil and health. In localities where high concentrations of heavy metals (As, Cd, Cr) were the main ecological issues, nematode communities exhibited a significant decrease in most of the community parameters (abundance, diversity, ecological indices) near the pollution source. In more remote localities, the complexity and connectedness of the soil ecosystem showed a significantly higher degree as well as higher soil health. Distinctions in the prevalence of various stress-resistant nematode species at sites with a different level of pollution could be a helpful, quick and low-cost tool in environmental hazards and risk management. These results are based on investigation of the most significantly polluted regions in Slovakia (Krompachy, Jelšava, Istebné).

The specific reactions of soil nematodes to particular heavy metals (As, Cd, Cr, Cu) were experimentally tested. The most severe effect was observed under application of chromium, while the effects of arsenic and cadmium were negligible. The application of copper showed both: a positive reaction under low doses and a negative reaction under heavy contamination, probably due to biological importance of copper for living organisms. The experiments helped to select nematode species with specific bioindication properties.

Research on alternative methods for controlling economically important plant-parasitic nematode species was initiated. Along with the study of pathogenicity and distribution of representatives of the genera *Globodera* (serious pathogens of potatoes) and *Meloidogyne* (parasites of various vegetables), alternative and environmentally friendly approaches to plant protection were studied. One effective tool seems to be the nematophagous activity of fungal

isolates of the genera *Stropharia* and *Arthrobotrys* (Fungi: Agaricomycetes), which were found in ongoing experiments to be effective killers of the root-knot nematode *Meloidogyne hapla*.

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 75% / Applied research 25%

International 60% / Regional 40%

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

Throughout the Questionnaire, IP SAS researchers are underlined.

Department of Systematics

[1] HANZELOVÁ, Vladimíra - OROS, Mikuláš - BARČÁK, Daniel - MIKLISOVÁ, Dana - KIRIN, Diana - SCHOLZ, Tomáš. Morphological polymorphism in tapeworms: redescription of *Caryophyllaeus laticeps* (Pallas, 1781) (Cestoda: Caryophyllidea) and characterisation of its morphotypes from different fish hosts. In Systematic Parasitology, 2015, vol. 90, no. 2, p. 177-190. (1.336 - IF2014). (2015 - Current Contents). ISSN 0165-5752.

[2] OROS, Mikuláš - ASH, A. - BRABEC, Jan - KAR, P.K. - SCHOLZ, Tomáš. A new monozoic tapeworm, *Lobulovarium longiovatum* n. g., n. sp (Cestoda: Caryophyllidea), from barbs *Puntius* spp. (Teleostei: Cyprinidae) in the Indomalayan region. In Systematic Parasitology, 2012, vol. 83, no. 1, p. 1-13. (1.250 - IF2011). (2012 - Current Contents). ISSN 0165-5752.

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[5] BRÁZOVÁ, Tímea - HANZELOVÁ, Vladimíra - MIKLISOVÁ, Dana - ŠALAMÚN, Peter - VIDAL-MARTÍNEZ, Victor M. Host-parasite relationships as determinants of heavy metal concentrations in perch (*Perca fluviatilis*) and its intestinal parasite infection. In Ecotoxicology and environmental safety, 2015, vol. 122, p. 551-556. (2.762 - IF2014). (2015 - Current Contents). ISSN 0147-6513.

[6] BOMBAROVÁ, Marta - ŠPAKULOVÁ, Marta - KOUBKOVÁ, Božena. New data on the karyotype and chromosomal rDNA location in *Paradiplozoon megan* (Monogenea, Diplozoidae), gill parasite of chubs. In Parasitology Research, 2014, vol. 113, no. 11, p. 4111-4116. (2.327 - IF2013). (2014 - Current Contents). ISSN 0932-0113.

[7] KRÁLOVÁ-HROMADOVÁ, Ivica - BAZSALOVICSOVÁ, Eva - OROS, Mikuláš - SCHOLZ, Tomáš. Sequence structure and intragenomic variability of ribosomal ITS2 in monozoic tapeworms of the genus *Khawia* (Cestoda: Caryophyllidea), parasites of cyprinid fish. In

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Department of Parasitic Diseases

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2.1.3 List of monographs/books published abroad

[1] HRČKOVÁ, Gabriela - VELEBNÝ, Samuel. *Pharmacological potential of selected natural compounds in the control of parasitic diseases*. Vienna: Springer, 2013, pp. 125, Springer Briefs in Pharmaceutical Science α Drug Development. ISBN 978-3-7091-1325-7.

2.1.4. List of monographs/books published in Slovakia

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

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[1] BAZSALOVICSOVÁ, Eva - KRÁLOVÁ-HROMADOVÁ, Ivica - OBERHAUSEROVÁ, Katarína - ŠPAKULOVÁ, Marta. Liver and stomach flukes of wild and domestic ruminants: molecular approach in their discrimination. In *Ruminants: Anatomy, Behaviour and Diseases*. New York: Nova Science Publishers, 2012, p.19-38. ISBN 978-1-62081-064-4.

[2] BRÁZOVÁ, Tímea - HANZELOVÁ, Vladimíra - ŠALAMÚN, Peter. Ecological risk and distribution of polychlorinated biphenyls in fish. In *Emerging pollutants in the environment - current and further implications*. Rijeka: Croatia, InTech, 2015, chapter 1, p. 3-16. ISBN 978-853-51-2160-2.

[3] ČEREVKOVÁ, Andrea. Diversity and distribution of nematode communities in grassland in relation to its establishment age and utilisation. In *Nematodes: morphology, functions and management strategies*. New York: Nova Science Publishers, 2012, p. 213-229. ISBN 978-1614707844.

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[9] ŠALAMÚN, Peter - HANZELOVÁ, Vladimíra - BRÁZOVÁ, Tímea. Heavy metals - soil communities at ecological risk. In *Emerging pollutants in the environment - current and further implications*. Rijeka: Croatia, InTech, 2015, p. 24-51. ISBN 978-853-51-2160-2.

[10] ŠNÁBEL, Viliam. Point mutations, their transition rates and involvements in human and animal disorders. In *Point Mutation*. Rijeka: Croatia, InTech, 2012, p. 3-14. ISBN 978-953-51-0331-8.

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

NONE

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

NONE

2.1.8. Table of research outputs (as in annual reports).

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	1.0	0.022	0.002	0.0	0.000	0.000	0.0	0.000	0.000	**1.0**	**0.3**	**0.006**	**0.001**
Scientific monographs and monographic studies in journals and proceedings published in Slovakia *(AAB, ABB)*	1.0	0.022	0.002	0.0	0.000	0.000	3.0	0.068	0.007	0.0	0.000	0.000	**4.0**	**1.0**	**0.022**	**0.002**
Chapters in scientific monographs published abroad *(ABC)*	6.0	0.131	0.014	0.0	0.000	0.000	3.0	0.068	0.007	4.0	0.090	0.008	**13.0**	**3.3**	**0.072**	**0.008**
Chapters in scientific monographs published in Slovakia *(ABD)*	1.0	0.022	0.002	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000	**1.0**	**0.3**	**0.006**	**0.001**
Scientific papers published in journals registered in Current Contents Connect *(ADCA, ADCB, ADDA, ADDB)*	45.0	0.979	0.106	52.0	1.133	0.128	34.0	0.770	0.084	39.0	0.874	0.082	**170.0**	**42.5**	**0.941**	**0.100**
Scientific papers published in journals registered in Web of Science Core Collection and SCOPUS *(ADMA, ADMB, ADNA, ADNB)*	5.0	0.109	0.012	6.0	0.131	0.015	6.0	0.136	0.015	6.0	0.134	0.013	**23.0**	**5.8**	**0.127**	**0.013**
Scientific papers published in other foreign journals (not listed above) *(ADEA, ADEB)*	2.0	0.044	0.005	2.0	0.044	0.005	1.0	0.023	0.002	3.0	0.067	0.006	**8.0**	**2.0**	**0.044**	**0.005**
Scientific papers published in other domestic journals (not listed above) *(ADFA, ADFB)*	12.0	0.261	0.028	9.0	0.196	0.022	5.0	0.113	0.012	15.0	0.336	0.032	**41.0**	**10.3**	**0.227**	**0.024**
Scientific papers published in foreign peer-reviewed proceedings *(AEC, AECA)*	1.0	0.022	0.002	2.0	0.044	0.005	0.0	0.000	0.000	0.0	0.000	0.000	**3.0**	**0.8**	**0.017**	**0.002**
Scientific papers published in domestic peer-reviewed proceedings *(AED, AEDA)*	27.0	0.587	0.064	15.0	0.327	0.037	13.0	0.294	0.032	8.0	0.179	0.017	**63.0**	**15.8**	**0.349**	**0.037**
Published papers (full text) from foreign and international scientific conferences *(AFA, AFC, AFBA, AFDA)*	3.0	0.065	0.007	4.0	0.087	0.010	3.0	0.068	0.007	0.0	0.000	0.000	**10.0**	**2.5**	**0.055**	**0.006**
Published papers (full text) from domestic scientific conferences *(AFB, AFD, AFBB, AFDB)*	1.0	0.022	0.002	15.0	0.327	0.037	28.0	0.634	0.070	9.0	0.202	0.019	**53.0**	**13.3**	**0.293**	**0.031**

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

The scientific outputs of IP SAS correlate with the proportions of **basic** and **applied** research. The majority of results obtained are of **international importance** and are published in peer-reviewed international journals, mostly in the field of Parasitology (Parasitology Research, Veterinary Parasitology, Parasitology International, Parasitology, Systematic Parasitology, Journal of Helminthology, Journal of Parasitology, etc.). The Impact Factors of these journals are in a range of or above the median impact factor (MIF) in the field of Parasitology (1.566 - 2.154 in period of accreditation; Thompson Reuters, InCites Journal Citation Reports). In addition, IP SAS researchers are encouraged to publish in journals with an Impact Factor above the MIF in Parasitology; journals with an IF ≥ 3 of both parasitological (International Journal for Parasitology, Parasites & Vectors) and general interests (PLoS ONE, PLoS Neglected Tropical Diseases, Oecologia, Annals of Agricultural and Environmental Medicine, Journal of General Virology, Emerging Infectious Diseases, The American Naturalist, Infection Genetics and Evolution, Ecography) are highly appreciated.

Since IP SAS is the key parasitological research institution in Slovakia collaborating with a wide range of public health and decision-making authorities, **applied research** mainly of **national impact** plays an important role in the scientific orientation of the Institute. Outputs of this type of research are regularly presented in the form of expert reports and surveillance analyses, which are required by governmental institutions. Further, the results of applied research are also presented in scientific CC journals published in Slovakia and neighbouring Visegrad countries (Poland, Czech Republic), such as Helminthologia, Acta Parasitologica, Folia Parasitologica, etc. Their Impact Factor is mostly below the MIF in Parasitology; however, the data of narrower regional interest displayed in those journals are directly transmitted to the target group of specialists, including physicians, veterinarians, practical parasitologists and others.

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)	467.0	10.161	463.0	10.092	506.0	11.458	521.0	11.679	**1957.0**	**489.3**	**10.836**
Citations in SCOPUS (1.2, 2.2) if not listed above	10.0	0.218	24.0	0.523	32.0	0.725	31.0	0.695	**97.0**	**24.3**	**0.537**
Citations in other citation indexes and databases (not listed above) (3.2,4.2,9,10)	37.0	0.805	38.0	0.828	25.0	0.566	0.0	0.000	**100.0**	**25.0**	**0.554**
Other citations (not listed above) (3, 4, 3.1, 4.1)	45.0	0.979	47.0	1.024	44.0	0.996	55.0	1.233	**191.0**	**47.8**	**1.058**
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] KENYON, Fiona - GREER, A.W. - COLES, Gerald - CRINGOLI, Giuseppe - PAPADOPOULOS, Elias - CABARET, Jacques - BERRAG, Boumadiane - VÁRADY, Marián - VAN WYK, Jan - THOMAS, Eurion - VERCRUYSSE, Jozef - JACKSON, Frank. The role of targeted selective treatments in the development of refugia-based approaches to the control of gastrointestinal nematodes of small ruminants. In Veterinary Parasitology, 2009, vol. 164, no. 1, p. 3-11. (2.039 - IF2008). (2009 - Current Contents). ISSN 0304-4017.
Citations: 58

[2] MEDLOCK, Jolyon - HANSFORD, Kayleigh M - BORMANE, A. - DERDÁKOVÁ, Markéta - ESTRADA-PEÑA, Agustín - GEORGE, Jean-Claude - GOLOVLJOVA, I. - JAENSON, Thomas G.T. - JENSEN, Jens-Kjeld - JENSEN, Per M. - KAZIMÍROVÁ, Mária - OTEO, José A. - PAPA, A. - PFISTER, Kurt - PLANTARD, Olivier - RANDOLPH, S.E. - RIZZOLI, Annapaola - SANTOS-SILVA, Maria Margarida - SPRONG, H. - VIAL, Laurence - HENDRICKX, Guy - ZELLER, H. - VAN BORTEL, Wim. Driving forces for changes in geographical distribution of *Ixodes ricinus* ticks in Europe. In Parasites & Vectors, 2013, vol. 6, iss. 1, p. 1-11. (3.246 - IF2012). ISSN 1756-3305.
Citations: 41

[3] ŠNÁBEL, Viliam - ALTINTAS, Nazmiye - D'AMELIO, S. - NAKAO, M. - ROMIG, T. - YOLASIGMAZ, A. - GUNES, K. - TURK, M. - BUSI, M. - HUTTNER, M. - ŠEVCOVÁ, Danica - ITO, A. - ALTINTAS, N. - DUBINSKÝ, Pavol. Cystic echinococcosis in Turkey: genetic variability and first record of the pig strain (G7) in the country. In Parasitology Research, 2009, vol. 105, no. 1, p. 145-154. (1.473 - IF2008). (2009 - Current Contents). ISSN 0932-0113.
Citations: 37

[4] BULLOVÁ, Eva - LUKÁŇ, Martin - STANKO, Michal - PEŤKO, Branislav. Spatial distribution of *Dermacentor reticulatus* tick in Slovakia in the beginning of the 21st century. In Veterinary Parasitology, 2009, vol. 165, no. 3-4, p. 357-360. (2.039 - IF2008). (2009 - Current Contents). ISSN 0304-4017.
Citations: 36

[5] BUSI, M. - ŠNÁBEL, Viliam - VARCASIA, A. - GARIPPA, G. - PERRONE, V. - DE LIBERATO, C. - D AMELIO, S. Genetic variation within and between G1 and G3 genotypes of *Echinococcus granulosus* in Italy revealed by multilocus DNA sequencing. In Veterinary Parasitology, 2007, vol. 150, no. 1-2, p. 75-83. (1.900 - IF2006). (2007 - Current Contents). ISSN 0304-4017.
Citations: 33

[6] RUSŇÁKOVÁ - TARAGEĽOVÁ, Veronika - KOČI, Juraj - HANINCOVÁ, Klára - KURTENBACH, K. - DERDÁKOVÁ, Markéta - OGDEN, Nick H. - LITERÁK, I. - KOCIANOVÁ, Elena - LABUDA, Milan. Blackbirds and song thrushes constitute a key reservoir of *Borrelia garinii*, the causative agent of Borreliosis in Central Europe. In Applied and Environmental Microbiology, 2008, vol. 74, no. 4, p. 1289-1293. (4.004 - IF2007). (2008 - Current Contents). ISSN 0099-2240.
Citations: 33

[7] LEVRON, Celine - MIQUEL, Jordi - OROS, Mikuláš - SCHOLZ, Tomáš. Spermatozoa of tapeworms (Platyhelminthes, Eucestoda): advances in ultrastructural and phylogenetic studies. In Biological Reviews, 2010, vol. 85, no. 3, p. 523-543. (6.625 - IF2009). (2010 - Current Contents). ISSN 1464-7931.
Citations: 23

[8] LUKÁŇ, Martin - BULLOVÁ, Eva - PEŤKO, Branislav. Climate warming and tick-borne encephalitis, Slovakia. In Emerging Infectious Diseases, 2010, vol. 13, no. 3, p. 524-526. (6.794 - IF2009). (2010 - Current Contents). ISSN 1080-6040.
Citations: 22

[9] DERDÁKOVÁ, Markéta - LENČÁKOVÁ, Daniela. Association of genetic variability within the *Borrelia burgdorferi* sensu lato with the ecology, epidemiology of Lyme Borreliosis in Europe. In Annals of Agricultural and Environmental Medicine, 2005, vol. 12, no. 2, p. 165-172. (1.590 - IF2004). (2005 - Current Contents). ISSN 1232-1966.
Citations: 21

[10] DERDÁKOVÁ, Markéta - BEATI, L. - PEŤKO, Branislav - STANKO, Michal - FISH, D. Genetic variability within *Borrelia burgdorferi* sensu lato genospecies established by PCR-single-strand conformation polymorphism analysis of the rrfA-rrlB intergenic spacer in *Ixodes ricinus* ticks from the Czech Republic. In Applied and Environmental Microbiology, 2003, vol. 69, no. 1, p. 509-516. (3.691 - IF2002). (2003 - Current Contents). ISSN 0099-2240.
Citations: 21

[10a] VON SAMSON-HIMMELSTJERNA, Georg - COLES, Gerald - JACKSON, Frank - BAUER, Christian - BORGSTEEDE, Fred - CIRAK, Veli Y. - DEMELER, Janina - DONNAN, Alison - DORNY, Peirre - EPE, Christian - HARDER, Achim - HOGLUND, Johan - KAMINSKY, Ronal - KERBOEUF, Dominique - KUETLER, Ulla - PAPADOPOULOS, Elias - POSEDI, Janez - SMALL, John - VÁRADY, Marián - VERCRUYSSE, Jozef - WIRTHERLE, Nicole. Standardization of the egg hatch test for the detection of benzimidazole resistance in parasitic nematodes. In Parasitology Research, 2009, vol. 105, no. 3, p. 825-834. (1.473 - IF2008). (2009 - Current Contents). ISSN 0932-0113.
Citations: 21

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).

[1] Pavol Dubinský, 391 citations
[2] Marián Várady, 315 citations
[3] Branislav Peťko, 251 citations
[4] Magdaléna Bruňanská, 232 citations

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

From the long-term perspective, the number of citations of papers published by the IP SAS has shown a stable and slowly upward trend. In general, several fields of parasitology (e.g. (systematics, ecology, immunology of parasites) are rather specific, studied by limited number of research teams worldwide or linked to unique parasitic models. This is also a case of traditional taxonomy. All of this has significantly influenced the number of responses to our scientific outputs. On the other hand, greater attention has been given to the hot topics of human parasitic diseases, parasitic zoonoses (P. Dubinský), vector-borne diseases (B. Peťko), problems of veterinary parasitology and anthelmintic resistance (M. Várady), which evidently received higher numbers of citations in a very short time. In future, IP SAS will encourage researchers to focus on more general questions published in journals of broader readership and scientific interest.

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.

[1] The IP SAS was involved in a National Science Foundation (USA) project, which represents a collaborative effort among cestode experts around the world. The primary goal of the project is to make new discoveries through the examination of vertebrate hosts and geographic regions

that have not previously been explored for tapeworms and to provide a database system for effective host-parasite data tracking.
Project Title: *From the Planetary Biodiversity and Inventory Project: A Survey of the Tapeworms (Cestoda: Platyhelminthes) from the Vertebrate Bowels of the Earth*
Grant scheme: National Science Foundation (USA), (no. 0818696 and 0818823)
https://sites.google.com/site/tapewormpbi/participants, http://tapeworms.uconn.edu/
Duration: 01/2008 – 04/2015
Funding: annual partial salaries for two postdoctoral fellows (M. Oros, M. Orosová)
Project coordinator: University of Connecticut, USA, (13 cooperating countries worldwide)
Project members from IP SAS: Vladimíra Hanzelová, Mikuláš Oros, Martina Orosová

[2] The IP SAS was involved in research on the anthelmintic resistance of parasites of domestic animals within the EU COST project. The project was aimed at health management for a better understanding of various components explaining the specificities of goat-parasite interactions in order to develop sustainable strategies for the control of parasitic diseases in goats.
Project Title: *Goat-parasite Interactions: from Knowledge to Control*
http://www.cost.eu/COST_Actions/fa/FA0805?management
Grant scheme: COST Action FA0805 (Acronym: CAPARA)
Duration: 01/2009 – 04/2013
Funding (support from SAS/ 2012-13) 8,000 EUR, Total funding 2009-2013: 18,919 EUR
Project coordinator: Veterinary Research Institute, Nagref Campus, Thessaloniki, Greece (20 cooperating EU countries)
Coordinator from IP SAS: Marián Várady

[3] The IP SAS is a subcontractor of the 7th Framework Programme project aimed at research on genetically modified plants. The aims of the project are:
- to improve knowledge on the potential long-term environmental effects of genetically modified plants (GMPs),
- to test the efficacy of the EFSA Guidance Document for the Environmental Risk Assessment (ERA) of GMPs,
- to estimate the compatibility of GMPs with the Integrated Pest Management principles implemented in the EU,
- to provide systematic analysis of the economic aspects of GMPs cultivation in the EU,
- to set up a training and communication plan addressing public concerns about GMPs.
Project Title: *Assessment and monitoring the impacts of genetically modified plants on agro-ecosystems* (http://www.amigaproject.eu/partners/sau/)
Grant scheme: 7FP Action 289706 (Acronym: AMIGA)
Duration: 12/2011 – 05/2016
Project coordinator: Agenzia Nazionale per le Nuove Technologie, l'Energia e lo Sviluppo Economico Sostenible, Italy (21 cooperating EU countries)
Coordinator from IP SAS: Andrea Čerevková

[4] The COST project aimed at vector-borne diseases builds extensive cooperation in education and the research related to arthropod-transmitted infectious diseases of humans and animals, important during a time of global climate change, all integrated under the One Health concept and reflecting the complexity and demands of current high-end research.
Project Title: *European Network for Neglected Vectors and Vector-Borne Infections*
Grant scheme: COST Action TD1303 (Acronym: EURNEGVEC)
http://eurnegvec.org/mc.html
Duration: 11/2013 –11/2017
Total funding (support from SAS/ 2013-15) 8,660 EUR
Project coordinator: University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania (49 cooperating countries)
Coordinator from IP SAS: Viktória Majláthová

[5] The main objective of another COST project is to build an extensive, multidisciplinary network on zoonotic diseases, in particular taeniosis/cysticercosis. Specific aims are the

development of innovative diagnostic and cost-efficient control tools, assessment of disease burden and economic impact and the development of harmonized reporting and management procedures.
Project Title: *European Network on Taeniosis/Cysticercosis*
Grant scheme: COST Action TD1302 (Acronym: CYSTINET)
http://www.cost.eu/COST_Actions/fa/TD1302?management
Duration: 02/2014 – 11/2017
Funding (support from SAS/ 2014-15) 7,400 EUR
Project coordinator: Institute of Tropical Medicine, Antwerp, Belgium (14 cooperating EU countries)
Coordinator from IP SAS: Marián Várady

[6] The main objective of the COST project focused on the epidemiology of foodborne parasites (FBP) is to establish a risk-based control programme for FBP containing robust and appropriate protective strategies. The project uses an interdisciplinary, One Health perspective to assimilate information, coordinate research and harmonize diagnostics, surveillance, analytical methods, potential interventions and mapping of global trends regarding alimentary infections.
Project Title: *European Network for Foodborne Parasites*
http://www.cost.eu/COST_Actions/fa/FA1408?management
Grant scheme: COST Action FA1408 (Acronym: EURO-FBP)
Duration: 03/2015 –03/2019
Funding (support from SAS/ 2015) 2,000 EUR
Project coordinator: Norges Miljo-Og Biovitenskaplige Universitet Parasitology, Food Safety and Infection Biology, Oslo, Norway (36 cooperating EU countries)
Coordinator from IP SAS: Emília Dvorožňáková

[7] The COST project aimed at forming a network of researchers and clinicians studying the immune system's function and the identity and biology of myeloid regulatory cells (MRCs). The project has the goal of establishing a gold standard of common protocols and harmonizing guidelines for the analysis and clinical monitoring of MRCs, including an analytical mouse-monkey-man correlation line. The research will aid the development of cellular biomarkers of human diseases and guide the design of novel therapies.
Project Title: *European Network of Investigators Triggering Exploratory Research on Myeloid Regulatory Cells*
http://www.cost.eu/COST_Actions/bmbs/BM1404?management
Grant scheme: COST Action BM4114 (Acronym: Mye-EUNITER)
Duration: 05/2015 –11/2018
Funding (support from SAS/ 2015) 2,667 EUR
Project coordinator: University Hospital Essen, Department of Otorhinolaryngology, Essen, Germany (41 cooperating EU countries)
Coordinator from IP SAS: Gabriela Hrčková

[8] Two IP SAS researchers (P. Dubinský, Z. Hurníková) are representatives of Slovakia in the International Commission on Trichinellosis (ICT), a member of the World Federation of Parasitologists (http://www.trichinellosis.org/Members.html). The Commission cooperates with national and international organizations (e.g., WHO, OIE, FAO, etc.) concerned with the control of trichinellosis, a serious zoonotic human infection.

[9] Three IP SAS researchers (D. Antolová, Z. Hurníková, M. Miterpáková) are members of a national group of specialists under the European Food Safety Authority (EFSA), which conducts its work in response to requests for scientific advice from the European Commission, the European Parliament and EU Member States. (https://www.efsa.europa.eu/sites/default/files/assets/art36listg.pdf).

[10] In May 2015, D. Antolová and M. Miterpáková became members of the EurEchino Network as persons responsible for Slovakia. The Network is aimed at creating a EurEchino Database summarising comprehensive data on human patients diagnosed with alveolar echinococcosis, a

parasitic life-threatening infection, in the respective EU countries. The initiative represents the basis for a future EU project.

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

[1] Scientific conference: "V4 Parasitological Meeting - Parasites in the Heart of Europe", May 25-30, 2014, Stará Lesná, The High Tatras, Slovakia (organizer).

[2] Scientific conference: „Infection and Parasitic Diseases of Animals: 5th International Conference", September 4 – October 5, 2014, Košice, Slovakia (co-organizer).

2.3.3. List of edited proceedings from international scientific conferences.

[1] V4 Parasitological Meeting - Parasites in the Heart of Europe, Book of Abstracts, May 25-30, 2014, Stará Lesná, The High Tatras, Slovakia. M. Oros, Z. Vasilková (Eds.). Košice: Slovak Society for Parasitology at SAS, 2014, pp. 137. ISBN 978-80-968473-7-2.

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)

[1] Helminthologia, De GRUYTER, Institute of Parasitology SAS, Košice
ISSN: 0440-6605 (Print), 1336-9083 (Online), published quarterly
Volumes 49-52/2012-2015 (IF2011/0.773, IF2012/ 0.783, IF2013/0.776, IF2014/0.678)
Editor-in-Chief: Jindřich Šoltys (since 01/2015); B. Peťko (2014); M. Várady (2012-2013)
Managing Editor: Zuzana Vasilková
Handling Editor: Slavka Barláková
Associate Editor: Marta Špakulová
http://www.saske.sk/pau /Helminth.htm

2.3.4.2. SCOPUS dtto

2.3.4.3. other databases dtto

2.3.4.4. not included in databases NONE

- **National position of the institute**

2.3.5. List of selected projects of national importance

During the accreditation period, the IP SAS coordinated 42 VEGA (the Scientific Grant Agency of the SAS and the Ministry of Education, Science, Research, and Sport of the Slovak Republic), 21 APVV (the Slovak Research and Development Agency, SRDA) projects and six EU Structural Funds projects. To list selected projects of national importance, the two following projects of Structural Funds are mentioned (see 2.4.6. for details):

[1] Centre of Excellence for Parasitology
Grant Scheme: EU Structural Funds, ITMS: 26220120022, 06/2009 – 06/2012
The project enabled intensive improvement of the infrastructure of the Institute and purchase of laboratory equipment (for details see Supplementary information on p. 33).

[2] Application Centre for the Protection of People, Animals and Plants from Parasites
Grant Scheme: EU Structural Funds, ITMS: 26220220018, 09/2009 – 06/2013
In a frame of this project the IP SAS obtained the Certificate of Accreditation granted by the Slovak National Accreditation Service and established specialized laboratories (Laboratory for Diagnostics and Prevention of Human Tissue Helminthoses, Laboratory for Diagnostics and Prevention of Helminthozoonoses and Laboratory for Diagnostics and Prevention of Plant Parasitoses).

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

All bellow mentioned APVV projects were coordinated by the IP SAS. For a total list of APVV projects, see 2.4.4.

[1] Project Title: *Fish parasites in a role of indicators of an environmental pollution*
Grant scheme: LPP-0151-07
Duration: 07/2008 – 06/2012
Funding for IP SAS in 2012: 11,717 EUR, Total funding 2008-2012: 71,266 EUR
Principal investigator: Vladimíra Hanzelová

[2] Project Title: *Karyosystematics of flukes of the family Fasciolidae, important human and ruminant parasites*
Grant scheme: LPP-0126-07
Duration: 07/2008 – 06/2012
Funding for IP SAS in 2012: 11,320 EUR, Total funding 2008-2012: 69,707 EUR
Principal investigator: Marta Špakulová

[3] Project Title: *Systematics of tapeworms of the order Caryophyllidea, parasites of freshwater fish*
Grant scheme: LPP-0171-09
Duration: 09/2009 –08/2012
Funding for IP SAS in 2012: 10,019 EUR, Total funding 2009-2012: 63,314 EUR
Principal investigator: Vladimíra Hanzelová

[4] Project Title: *In vitro detection of ivermectin resistance in sheep parasites*
Grant scheme: LPP-0186-07
Duration: 07/2008 – 06/2012
Funding for IP SAS in 2012: 13,277 EUR, Total funding 2008-2012: 82,985 EUR
Principal investigator: Marián Várady

[5] Project Title: *Resistance of parasites of small ruminants to anthelmintics – can science win?*
Grant scheme: APVV-0539-10
Duration: 05/2011-10/2014
Funding for IP SAS in 2012-2014: 94,007 EUR, Total funding 2011-2014: 106,741 EUR
Principal investigator: Marián Várady

[6] Project Title: *Parasite resistance to anthelmintics - challenges, perspectives and solutions*
Grant scheme: APVV-14-0169
Duration: 07/2015 – 06/2019
Partner Institution: Institute of Animal Physiology SAS
Funding for IP SAS in 2015: 16,249 EUR, Total funding for IP SAS: 149,224 EUR, Total funding for both partners: 247,553 EUR
Principal investigator: Marián Várady

[7] Project Title: *Using soil and plant nematodes as biological indicators for soil health*
Grant scheme: LPP-0085-09
Duration: 09/2009 –12/2013
Funding for IP SAS in 2012-2013: 28,154 EUR, Total funding 2009-2013: 54,801 EUR
Principal investigator: Vladimíra Hanzelová

[8] Project Title: *Structure of foci and emerging diseases with emphasis on role of rodents in urban type of landscape*
Grant scheme: APVV- 0267-10
Duration: 05/2011 – 10/2014
Partner Institutions: Institute of Zoology SAS, Bratislava, Slovakia
Institute of Virology SAS, Bratislava, Slovakia
Institute of Molecular Biology SAS, Bratislava, Slovakia

Funding for IP SAS in 2012-2014: 135,350 EUR, Total funding for all partners: 158,350 EUR
Principal investigator: Michal Stanko

[9] Project Title: *Species boundary delimitation in fish parasites: morphology versus genes and chromosomes*
Grant scheme: APVV-0653-11
Duration: 07/2012 – 12/2015
Total funding for IP SAS in 2012-2015: 222,476 EUR
Principal investigator: Vladimíra Hanzelová

[10] Project Title: *Small mammals as a potential source of zoonotic bacteria and resistence to antibiotic*
Grant scheme: APVV-14-0274
Duration: 07/2015 – 06/2019
Partner Institution: Institute of Animal Physiology SAS
Funding for IP SAS in 2015: 23,027 EUR, Total funding for IP SAS: 96,101 EUR, Total funding for both partners 168,032 EUR
Principal investigator: Michal Stanko

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

The IP SAS was coordinator of 42 VEGA projects in a course of accreditation period 2012-2015; out of them, following nine VEGA projects of different research fields are listed.

[1] Project Title: *Phylogeography and population genetics of newly emerging European and North American populations of Fascioloides magna (Trematoda), an important liver parasite of ruminants*
Grant scheme: VEGA 2/0133/13
Duration: 01/2013 –12/ 2016
Funding in 2012-2015: 20,106 EUR
Principal investigator: Ivica Hromadová

[2] Project Title: *Hidden diversity of fish parasites and biological invasions*
Grant scheme: VEGA 2/0129/12
Duration: 01/2012 –12/2015
Total funding in 2012-2015: 24,724 EUR
Principal investigator: Mikuláš Oros

[3] Project Title: *Ultra-structural characteristics of reproduction and evolution of tapeworms (Cestoda)*
Grant scheme: VEGA 2/0047/11
Duration: 01/2011 –12/2014
Funding in 2012-2014: 13,509 EUR, Total funding: 19,227 EUR
Principal investigator: Magdaléna Bruňanská

[4] Project Title: *The risk of parasitozoonoses for animals and humans in urban and rural regions of Slovakia under the impact of global climatic, ecological and socio-economical changes*
Grant scheme: VEGA 2/0011/12
Duration: 01/2012 –12/2015
Total funding in 2012-2015: 28,750 EUR
Principal investigator: Martina Miterpáková

[5] Project Title: *Modulatory effects of probiotic bacteria on the host immunity to a parasitic zoonosis caused by Trichinella spiralis*
Grant scheme: VEGA 2/0081/15

Duration: 01/2015 –12/2018
Funding in 2015: 5,797 EUR
Principal investigator: Emília Dvorožňáková

[6] Project Title: *Epidemiology of serious parasitozoonoses circulating on the territory of the Slovak Republic and their diagnosis using immunological and molecular approaches*
Grant scheme: VEGA 2/0127/13
Duration: 01/2013 –12/2016
Funding in 2013-2015: 8,667 EUR
Principal investigator: Daniela Antolová

[7] Project Title: *Modelling of host-parasite-pathogen relations and multiparasitic interactions on example of small mammals*
Grant scheme: VEGA 2/0042/10
Duration: 01/2010 –12/2013
Funding in 2012-2013: 10,078 EUR, Total funding: 19,888 EUR
Principal investigator: Dana Miklisová

[8] Project Title: *Antiparasitic and immunomodulatory effects of selected natural substances on human and animal infections caused by the larval stages of helminths*
Grant scheme: VEGA 2/0150/13
Duration: 01/2013 –12/2015
Total funding in 2013-2015: 18,653 EUR
Principal investigator: Gabriela Hrčková

[9] Project Title*: Babesiosis in Slovakia*
Grant scheme: VEGA 2/0113/12
Partner Institution: Catholic University in Ružomberok
Total funding for IP SAS 2012-2015: 35,792 EUR
Duration: 01/2012 –12/2015
Principal investigator: Bronislava Víchová

2.3.8. Projects of SAS Centres of Excellence

NONE

2.3.9. National projects supported by EU Structural Funds

Please see 2.4.6. and 2.4.7.

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) NONE

2.3.10.2. SCOPUS NONE

2.3.10.3. Other databases NONE

2.3.10.4. Not included in databases NONE

- **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

2013:
[1] HRČKOVÁ, Gabriela - VELEBNÝ, Samuel - VENDEĽOVÁ, Emília. Flavonoid silymarin amplifies anthelmintic effects of drug praziquantel against larval stage of cestodes in experimental infection via downregulation of fibrogenesis and abolishment of immunesuppresion. In Drug Discovery & Therapy World Congress 2013, Boston, MA, USA, June 3-6, 2013, Book of Abstracts, 2013, p. 71.

2014:
[2] HRČKOVÁ, Gabriela - VELEBNÝ, Samuel - MUDROŇOVÁ, Dagmar - VENDEĽOVÁ, Emília. Potential of immunomodulatory product Immodin to modulate the key molecular mechanisms during chronic liver diseases - the pre-clinical study. In BIT's 4th Annual World Congress of Molecular Medicine, Haikou City, China, November 13-16, 2014, Book of Abstracts, 2014, p. 310.

[3] HRČKOVÁ, Gabriela - VELEBNÝ, Samuel. Neglected larval cestode infections - current situation and control. In V4 Parasitological Meeting - Parasites in the Heart of Europe. May 25-30, 2014, Stará Lesná, The High Tatras, Slovakia. Ed. Slovak Society for Parasitology at SAS, Book of Abstracts, 2014, p.15-16. ISBN 978-80-968473-7-2.

[4] MINÁRIK, Gabriel - KRÁLOVÁ-HROMADOVÁ, Ivica. The massively parallel sequencing - methodological principles and applications. In V4 Parasitological Meeting - Parasites in the Heart of Europe. May 25-30, 2014, Stará Lesná, The High Tatras, Slovakia. Ed. Slovak Society for Parasitology at SAS, Book of Abstracts, 2014, p. 3-4. ISBN 978-80-968473-7-2.

[5] VÁRADY, Marián - KÖNIGOVÁ, Alžbeta - DOLINSKÁ, Michaela. Can anthelmintics win the fight against parasites? In V4 Parasitological Meeting - Parasites in the Heart of Europe. May 25-30, 2014, Stará Lesná, The High Tatras, Slovakia. Ed. Slovak Society for Parasitology at SAS, Book of Abstracts, 2014, p. 19. ISBN 978-80-968473-7-2.

2015:
[6] PAPAJOVÁ, Ingrid - ŠOLTYS, Jindřich. Relationship between parasitozoonoses of domestic animals, wildlife and changing environment in the Slovak Republic. In Proceedings of International Conference on Parasitology, August 24-26, 2015, Philadelphia, USA. Henderson: OMICS, 2015.

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

[1] HROMADOVÁ I., HURNÍKOVÁ Z., ANTOLOVÁ D., MITERPÁKOVÁ M., VASILKOVÁ Z., OROS M. (Programme/Organizing Committee): V4 Parasitological Meeting - Parasites in the Heart of Europe, May 25-30, 2014, Stará Lesná, The High Tatras, Slovakia

[2] PEŤKO B., JURIŠ P. (members of Scientific Committee), PAPAJOVÁ I. (member of Organizing Committee): XVIIth International Congress on Animal Hygiene ISAH, June 7-11, 2015, Košice, Slovakia

[3] PAPAJOVÁ I. (member of Scientific Committee): International Conference on Parasitology, August 24-26, 2015, Philadelphia, USA.

- **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

[1] PAPAJOVÁ, Ingrid - PIPIKOVÁ, Jana. Environmental contamination with endoparasitic germs in urban and rural settlements in Slovakia. In Parasites in the cities under the influence of global changes: Conference Abstracts, May 28-29, 2015, Institute of Parasitology SAS, 2015, p. 21-22. ISBN 978-80-89707-09-6.

[2] PEŤKO, Branislav. Ticks in Slovakia - past and present. In Parasites in the cities under the influence of global changes: Conference Abstracts, May 28-29, 2015, Institute of Parasitology SAS, 2015, p. 12-13. ISBN 978-80-89707-09-6.

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

[1] DERDÁKOVÁ M. (Organizing Committee), HROMADOVÁ I., PEŤKO B., STANKO M. (Programme Committee), The conference IIIth Labuda´s Days. April 24-25, 2013, Bratislava, Institute of Virology SAS, Institute of Zoology SAS, Institute of Parasitology SAS, Slovak Society for Parasitology at SAS.

[2] DERDÁKOVÁ M. (Organizing Committee), HROMADOVÁ I., PEŤKO B., STANKO M. (Programme Committee), The conference IVth Labuda´s Days. Smolenice, November 4-6, 2015, Institute of Virology SAS, Institute of Zoology SAS, Institute of Parasitology SAS, Slovak Society for Parasitology at SAS.

[3] VÍCHOVÁ B., MITERPÁKOVÁ M., MAJLÁTHOVÁ V., PANGRÁCOVÁ (Blaňarová) L. (Organizing Committee), DUBINSKÝ P., PEŤKO B., STANKO M., PAPAJOVÁ I. (Scientific Committee): The conference Parasites in the cities under the influence of global changes. May 28-29, 2015, Košice, Institute of Parasitology SAS.

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

International status

In terms of basic research, the IP SAS represents an internationally well-acknowledged workplace in several fields of systematic parasitology. The Institute is still involved in the Global Cestode Database (GCD) initiative (http://www.cestodedatabase.org) and a project "Planetary Biodiverzity Inventory: A Survey of the Tapeworms (Cestoda: Platyhelminthes) from Vertebrate Bowels of the Earth (http://tapeworms.uconn.edu/participants.html/), funded by the U.S. National Science Foundation; it represents an ongoing collaboration among 22 experts in cestodology from 13 countries from around the world, including Slovakia, as represented by the IP SAS. It was the principal organizer of international systematic workshops in Slovakia (8th International Workshop on Systematics and Phylogeny of Tapeworms; 2008) and will be the main organizer of the 9th International Acanthocephalan Workshop (2018, http://www.bioone.org/doi/pdf/10.1654/1525-2647-83.1.135). Several senior researchers are honorary members of European scientific bodies, such as the Austrian Society of Tropical Medicine, Parasitology and Migration Medicine (P. Dubinský) and the All-Russian Society of Helminthologists (B. Peťko), or members of the United Nations Industrial Development Organisation UNIDO (G. Hrčková) and the World Association for the Advancement of Veterinary Parasitology (M. Várady, P. Dubinský).

The Institute has successfully competed in efforts to receive grant funds in the European research area (COST, 7th RP). In addition to participation in official international projects, the IP SAS is also involved in bilateral inter-governmental and inter-academic exchange projects and numerous informal collaborations with internationally acknowledged top class parasitological institutions. The broad collaboration and effectiveness of international cooperation is also illustrated by the high rate of joint CC papers (about 50%). The Institute has close collaborations with a spectrum of parasitology institutions and universities worldwide, e.g.:

- Czech Republic - Institute of Parasitology, BC, AS CR, České Budějovice
- Poland - W. Stefanski Institute of Parasitology, Warsaw
- Austria - University of Veterinary Medicine, Institute of Parasitology, Vienna
- France - Institute des Sciences de l´Evolution, University of Monpellier, Montpellier
- Italy – La Sapienza Universita di Roma, Rome
- Israel - Institutes for Desert Research, Ramon
- USA - St. Norbert College, DePere, Wisconsin
  State University of New York at Albany, Albany, New York
  University of Connecticut, Storrs, Connecticut
- Canada - Fisheries and Wildlife Services, Alberta
- China - Freshwater Fisheries Research Center, Chinese Academy of Fishery Sciences, Wuxi
  Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan

On the European scale, the Institute participates in international research and surveys of medically important zoonotic parasites transmissible from animals to humans (*Echinococcus, Trichinella, Taenia*) as well as ticks and tick-borne diseases (*Borrelia, Babesia, Anaplasma, Ehrichlia*, etc.). On the global scale, the IP SAS is involved in the study of alien, invasive animal parasites of economic importance (e.g. the giant liver fluke *Fascioloides magna*), parasites of biologically and/or commercially important fish (e.g. monozoic fish tapeworms), as well as in the study of drug resistance of parasitic helminths representing a major global issue. The outputs of its broad scientific cooperation are regularly published in reputable international journals (see 2.1.2.) and the citation rates correspond well to the overall degree in the field of parasitology.

National status

The IP SAS is a key parasitological Institution in Slovakia which collaborates with a wide range of educational, public-health and decision-making governmental institutions. The results of extensive epidemiological studies covering a broad spectrum of parasitic diseases, mainly of a zoonotic or invasive nature, served as the basis for expert reports and surveillance analyses. Multiple molecular-biological and immunological methods have been developed and standardized by the Institute, which has enabled efficient diagnoses and verification of results to be performed for the purposes of numerous medical facilities, veterinary practices and other research institutions. Such activities have the character of applied research extending into many aspects of public life and underlining the socioeconomic importance of the Institute.

The national significance of the Institute is also documented by following facts:

• The Institute publishes the international journal Helminthologia.

• The Institute represents the Head Office of the Slovak Society for Parasitology at the SAS which brings together more than 120 members from various parasitological bodies in Slovakia. Ivica Hromadová has been president of the Society since 2012, and eight IP SAS employees are members of the Society's ten-member committee.

• The Permanent Commission for the D.Sc. degree award in scientific discipline 010620 - Parasitology operates at the IP SAS. During the accreditation period, four scientists defended their doctoral theses and acquired the degree "research professor".

• Several researchers acted as members of central authorities of SAS, such as the SAS Scientific Collegium for the biological and ecological sciences (V. Hanzelová, B. Peťko, M. Stanko), the SAS Scientific Collegium for molecular biology and genetics (G. Hrčková), and the SAS Editorial Board (M. Špakulová).

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	Goat-parasite Interactions: from Knowledge to Control (CAPARA)	COST Action FA0805	01/2009-04/2013	8000	W / Várady
	Assessment and Monitoring the Impacts of Genetically Modified Plants on Agro-ecosystems (AMIGA)	7th Frame Programme 289706	12/2011-05/2016	0.000	I / Čerevková
2013	European Network for Neglected Vectors and Vector-Borne Infections (EURNEGVEC)	COST Action TD1303	11/2013-11/2017	8660	W / Majláthová
2014	European Network on Taeniosis/Cysticercosis (CYSTINET)	COST Action TD1302	02/2014-11/2017	7400	W / Várady
2015	European Network for Foodborne Parasites (EURO-FBP)	COST Action FA 1408	03/2015-03/2019	2000	W / Dvorožňáková
	European Network of Investigators Triggering Exploratory Research on Myeloid Regulatory Cells (Mye-EUNITER)	COST Action BM 4114	05/2015-11/2018	2667	W / Hrčková

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

The following bilateral projects were funded by APVV agency:

[1] Grant scheme: Slovakia – Bulgaria Inter-Governmental Project, SK-BG-0023-10
Title: *Biodiversity of fish and fish parasites in ecosystems with substantially increased ecological load in Slovakia and Bulgaria*
Duration: 01/2012-12/2014
Partner Institution: Agricultural University, Plovdiv, Bulgaria
Funding for IP SAS: 5,153 EUR
Responsible person: Vladimíra Hanzelová

[2] Grant scheme: Slovakia – Czech Republic Inter-Governmental Project, SK-CZ-0086
Title: *Characteristics of different potato cyst nematode (Globodera rostochiensis, Globodera pallida) populations utilizing molecular biology methods*
Duration: 01/2012-12/2013
Partner Institution: The Crop Research Institute, Prague, Czech Republic
Funding for IP SAS: 1,660 EUR
Responsible person: Marek Renčo

[3] Grant scheme: Slovakia – Poland Inter-Governmental Project, SK-PL-0098-12
Title: *Circulation of parasitic infections in dynamically changing Tatra´s ecosystem under the influence of global changes*
Duration: 01/2013-12/2014
Partner Institution: Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland
Funding for IP SAS: 3,593 EUR
Responsible person: Zuzana Hurníková

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

Out of 19 projects addressed in 2012-2015, majority of them belonged to MAD – inter-academic exchange agreement:

[1] Type: Slovakia – Lithuania MAD Project
Title: *Genetic diversity and prevalence of pathogens in Dermacentor ticks*
Duration: 01/2013 – 12/2015

Responsible person: Michal Stanko

[2] Type: Slovakia – Ukraine MAD Project
Title: *The influence of selected geophysical factors on the mutual parasite-host-environment relationships*
Duration: 01/2014-12/2016
Responsible person: Branislav Peťko

[3] Type: Slovakia – Czech Republic Inter-Institutional Project
Title: *Cytogenetic study of fish parasites of the family Diplozoidae (Monogenea, Platyhelminthes)*
Duration: 04/2012 – 12/2015
Responsible person: Marta Špakulová

[4] Type: Slovakia – Poland MAD Project
Title: *Trichinellosis in wildlife in Poland and Slovakia: a molecular characterisation of Trichinella isolates by ISSR-PCR*
Duration: 01/2010-12/2012
Responsible person: Katarína Reiterová

[5] Type: Slovakia – Hungary MAD Project
Title: *Arthropode-borne pathogens of lizards from the family Lacertidae in model areas of Central Europe*
Duration: 01/2010-12/2012
Responsible person: Viktória Majláthová

[6] Type: Slovakia – Italy MAD Project
Title: *Efficacy of plant-derived tannins for the control of nematode parasites of plants and animals*
Duration: 01/2010-12/2012
Responsible person: Ingrid Papajová

[7] Type: Slovakia – Germany DAAD Project No. 6
Title: *Epidemiology and genetic diversity of echinococcosis in Central Europe*
Duration: 01/2010-12/2012.
Responsible person: Viliam Šnábel

[8] Type: Slovakia – Czech Republic MAD Project
Title: Systematics, molecular taxonomy and ecology of parasitic platyhelminths and acanthocephalans
Duration: 01/2014 – 12/2016
Responsible person: Vladimíra Hanzelová

- **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”

Note: the project type “LPP” means “Human Resources in Research – HRR” provided by APVV (SRDA) Agency.

	Project title	Typ / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Fish parasites in a role of indicators of an environmental pollution	LPP-0151-07	07/2008-06/2012	2012: 11717	C / Hanzelová
	Karyosystematics of flukes of the family Fasciolidae, important human and ruminant parasites	LPP-0126-07	07/2008-06/2012	2012: 11320	C / Špakulová
	In vitro detection of ivermectin resistance	LPP-0186-07	07/2008-06/2012	2012: 13277	C / Várady
	Systematics of tapeworms of the order Caryophyllidea, parasites of freshwater fish	LPP-0171-09	09/2009-08/2012	2012: 10019	C / Hanzelová
	A route of youth towards science - live	LPP-0400-09	09/2009-08/2012	2012: 20185	C / Peťko
	Using soil and plant nematodes as biological indicators for soil health	LPP-0085-09	09/2009-08/2013	2012-13: 28154	C / Hanzelová
	Resistance of parasites of small ruminants to anthelmintics – can science win	APVV-0539-10	05/2011-10/2014	2012-14: 94007	C / Várady
	Structure of foci and emerging diseases with emphasis on role of rodents in urban type of landscape	APVV-0267-10	05/2011-10/2014	2012-14: 135350	C / Stanko
	Species boundary delimitation in fish parasites: morphology versus genes and chromosomes	APVV-0653-11	07/2012-12/2015	2012-2015: 222476	C / Hanzelová
	Biodiversity of fish and fish parasites in ecosystems with substantially increased ecological load in Slovakia and Bulgaria	SK-BG-0023-10	01/2012-12/2014	2012-2014: 5153	C / Hanzelová
	Characteristics of different potato cyst nematode (Globodera rostochiensis, Globodera pallida) populations utilizing molecular biology methods	SK-CZ-0086	01/2012-12/2013	2012-2013: 1660	C / Renčo
2013	Circulation of parasitic infections in dynamically changing Tatra´s ecosystem under the influence of global changes	SK-PL-0098-12	01/2013-12/2014	2013-2014: 3593	C /Hurníková
2014					
2015	Small mammals as a potential source of zoonotic bacteria and resistance to antibiotics	APVV-12-0274	07/2015-06/2019	2015: 23027	C / Stanko
	Parasite resistance to anthelmintics - Challenges, perspectives and solutions	APVV-14-0169	07/2015-06/2019	2015: 16249	C / Várady

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	20	21	19	19
Funding in the year (EUR)	122777	116086	99541	110733

[1]

[1] Excluding projects for the popularisation of science

- **Summary of funding from external resources**

2.4.6. List of projects supported by EU Structural Funds

[1] Project Title: *Centre of Excellence for Parasitology*
Grant Scheme: EU Structural Funds, Action OPVaV-2008/2.1/01-SORO
ITMS: 26220120022
Duration: 06/2009 – 06/2012
Project coordinator: Institute of Parasitology, SAS, Košice, Slovakia
Partner institution: University of Veterinary Medicine and Pharmacy in Košice
Funding for IP SAS/ 2012: 497,167 EUR, Total funding for IP SAS/ 2009-2012: 1,238,490 EUR
Responsible person from IP SAS: Branislav Peťko

[2] Project Title: *Centre of Excellence for Biological Methods of Forest Protection*
Grant Scheme: EU Structural Funds, Action OPVaV-2008/2.1/01-SORO
ITMS: 26220120008
Duration: 05/2009 – 05/2012
Project coordinator: National Forestry Centre, Zvolen, Slovakia
Partner institutions: Institute of Forest Ecology, SAS, Zvolen, Slovakia
Institute of Parasitology, SAS, Košice, Slovakia
Funding for IP SAS/ 2012: 104,600 EUR
Total funding for IP SAS/2009-2012: 137,245 EUR
Responsible person from IP SAS: Marek Renčo

[3] Project Title: *Application Centre for the Protection of People, Animals and Plants from Parasites*
Grant Scheme: EU Structural Funds, Action OPVaV-2008/2.2/01-SORO
ITMS: 26220220018
Duration: 09/2009 – 06/2013
Project coordinator: Institute of Parasitology, SAS, Košice, Slovakia
Funding for IP SAS/ 2012-2013: 182,398 EUR
Total funding for IP SAS/2009-2013: 270,486 EUR
Responsible person from IP SAS: Branislav Peťko

[4] Project Title: *Protection of Environment against Parasitozoonoses under the Influence of Global Climatic and Social Changes*
Grant Scheme: EU Structural Funds, Action OPVaV-2010/4.2/06-SORO
ITMS: 26220220116
Duration: 01/2011 – 06/2015
Project coordinator: Institute of Parasitology, SAS, Košice, Slovakia
Funding for IP SAS/ 2012-2015: 647,771 EUR
Total funding for IP SAS 2011-2015: 719,710 EUR
Responsible person from IP SAS: Ingrid Papajová

[5] Project Title: *Competence Centre for Biomodulators and Nutritional Supplements (Probiotech)*
Grant Scheme: EU Structural Funds, Action OPVaV-2010/4.2/06-SORO
ITMS: 26220220152
Duration: 09/2011 – 10/2015
Project coordinator: Institute of Animal Physiology, SAS, Košice, Slovakia
Partner institutions: Institute of Parasitology, SAS, Košice, Slovakia
Institute of Neurobiology, SAS, Košie, Slovakia
Pavol Jozef Šafárik University in Košice, Slovakia
University of Veterinary Medicine and Pharmacy, Košice, Slovakia
Dairy Research Institute, Ltd., Žilina, Slovakia
IMUNA PHARM, Ltd., Šarišské Michaľany, Slovakia
Funding for IP SAS/ 2012-2015 = Total funding for IP SAS: 210,456 EUR
Responsible person from IP SAS: Emília Dvorožňáková

[6] Project Title: *Parasitological Research and Training Center of SAS*
Grant Scheme: EU Structural Funds, Action OPV 1.2/02-SORO
ITMS: 26110230045
Duration: 02/2012 – 06/2014
Project coordinator: Institute of Parasitology, SAS, Košice, Slovakia
Funding for IP SAS/2012-2014 = total funding: 461,717 EUR
Responsible person from IP SAS: Vladimíra Hanzelová

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	Centre of Excellence for Parasitology	26220120022	06/2009-04/2012	2012: 497167	C
	Centre of Excellence for Biological Methods of Forest Protection	26220120008	05/2009-05/2013	2012-13: 104600	W
	Application Centre for the Protection of People, Animals and Plants from Parasites	26220220018	09/2009-06/2013	2012-13: 182398	C
	Protection of Environment against Parasitozoonoses under the Influence of Global Climatic and Social Changes	26220220116	01/2011-06/2015	2012-15: 647771	C
	Competence Centre for Biomodulators and Nutritional Supplements (Probiotech)	26220220152	09/2011-10/2015	2012-15: 210456	W
	Parasitological Research and Training Center of SAS	26110230045	02/2012-06/2014	2012-14: 461717	C
2013					
2014					
2015					

External resources	2012	2013	2014	2015	total	average
External resources (milions of EUR)	1168.846	691.264	534.595	191.249	**2585.954**	**646.489**
External resources transfered to coooperating research institute (milions of EUR)	92.676	36.366	28.100	21.174	**178.316**	**44.579**

Note: External resources are provided in thousands (not millions) of EUR.

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

The resources obtained from VEGA and APVV projects covered mainly the consumables (chemicals) and services (sequencing, fragment analysis etc.) necessary for routine scientific work. The IP SAS received significant financial support from EU Structural Funds (obtained after 2009), which enabled payment and purchase of items that otherwise would not have been available from the VEGA and APVV projects themselves.

The EU Structural Fund *Centre of Excellence of Parasitology* (CEP) enabled significant innovation of IP SAS infrastructure. The CEP enabled the complete renewal of laboratories, starting with renovation of energy distribution and necessary construction modifications up through furnishing laboratories; it also allowed for the upgrading of computers as well as the light and fluorescent microscopes, the purchasing of most of the currently existing laboratory equipment and the cost of insuring it.

The *Application Centre for the Protection of People, Animals and Plants from Parasites* (AC) allowed the *de-novo* establishment of three specialized laboratories (Laboratory for Diagnostics and Prevention of Human Tissue Helmintoses, Laboratory for Diagnostics and Prevention of Helminthozoonoses and Laboratory for Diagnostics and Prevention of Plant Parasitoses). For the purpose of establishing the laboratories, complex modifications (construction alterations to the property, laboratory furnishing and equipment) were carried out. Consequently, a Certificate of Accreditation (No. S-327) granted by the SNAS (Slovak National Accreditation Service) was obtained in 2012. The majority of IP SAS applied research is provided under the activities of the AC.

The *Protection of the Environment against Parasitosoonoses under the Influence of Global Climatic and Social Changes* (PEP) enabled the re-building of IP SAS infrastructure and supplementing laboratory equipment. The PEP enabled the collection of a broad range of biological material on a European scale (Croatia, Bulgaria, Italy, and Greece) which could provide a complex picture of the distribution of parasites under the impact of environmental changes. Moreover, our researchers actively participated in several important international conferences and symposia (Germany, Romania, Australia and South Africa).

The *Parasitological Research and Training Center of the SAS* (TC) provided the possibility for all post-doctoral students of the IP SAS to attend excellent parasitological institutions worldwide. They acquired valuable novel technologies and methodological approaches, which were directly implemented at the IP SAS. In addition, several European experts in various field of parasitology visited the IP SAS and provided PhD. and postdoctoral students with training related to taxonomy, evolution, ultrastructure, immunology of parasites, and therapy of important parasitic diseases. Two workshops entitled “Graduate studies at the Institute of Parasitology” held in 2012 and 2013 and organized primarily for PhD. students in English (lecturer prof. Tomáš Scholz) were also included in the educational process. As many as 14 methodologically directed textbooks and two educational films presenting our field and laboratory work in detail were also prepared within this project.

All four EU Structural Fund projects significantly contributed to the wage-fund of the permanent staff of the Institute. Furthermore, several experts were employed for the duration of the projects.

The IP SAS was also a partner institution of two additional EU Funds (see Table 2.4.7.), which were focused on immunological research (*Competence Centre for Biomodulators and Nutritional Supplements*) and forest research (*Centre of Excellence for Biological Methods of Forest Protection*). Both funds provided significant financial help in their particular research fields.

2.5. PhD studies and educational activities

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

The IP SAS is an external educational organization of 2 study programmes:

[1] 4.2.5. Zoology, since 2006 – till present, guaranteed by the Faculty of Science, Comenius University in Bratislava, Slovakia

[2] 6.3.7. Infectious and parasitic diseases of animals, since 2005 – till present, guaranteed by the University of Veterinary Medicine and Pharmacy, Košice, Slovakia.

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	27			28			32			29		
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	4.0	2.0	13.0	2.0	1.0	10.0	4.0	2.0	12.0	1.0	1.0
External	2.0	2.0	0.0	3.0	0.0	0.0	4.0	0.0	0.0	3.0	0.0	0.0
Other supervised by the research employees of the institute	2.0	1.0	0.0	2.0	1.0	0.0	3.0	0.0	0.0	2.0	0.0	0.0

2.5.3.Summary table on educational activities

Teaching	2012	2013	2014	2015
Lectures (hours/year)[2]	167	122	159	91
Practicum courses (hours/year)[2]	184	191	93	83
Supervised bachelor theses (in total)	30	12	16	20
Supervised diploma theses (in total)	24	12	15	21
Supervised PhD theses (in total)	21	17	19	15
Members in PhD committees (in total)	16	9	12	4
Members in DrSc. committees (in total)	0	2	2	1
Members in university/faculty councils (in total)	10	11	12	16
Members in habilitation/inauguration committees (in total)	4	2	3	3

2

[2] Do not include time spent with bachelor, diploma or PhD students during their supervising

2.5.4. List of published university textbooks

[1] BRUŇANSKÁ, Magdaléna. *Transmisná elektrónová mikroskopia v parazitológii* [Transmission electron microscopy in parasitology]. 1st edition, Košice, Institute of Parasitology SAS, 2014, pp. 20. ISBN 978-80-971331-9-1.

[2] CAGÁŇ, Ľ. - ČEREVKOVÁ, Andrea - BOKOR, Peter - TÓTHOVÁ, Monika - TÓTH, Peter. *Choroby a škodcovia viniča hroznorodého* [Diseases and pests of common grape vine]. Nitra: Slovak University of Agriculture in Nitra, 2014, pp. 120. ISBN 978-80-552-1258-6.

[3] DVOROŽŇÁKOVÁ, Emília. *Detekcia regulačných a efektorových mechanizmov imunity hostiteľa pri parazitárnej infekcii* [Detection of regulatory and effector mechanisms of host immunity in parasitic infections]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 28. ISBN 978-80-971331-7-7.

[4] HANZELOVÁ, Vladimíra - OROS, Mikuláš. *Svetelná mikroskopia v parazitológii* [Light microscopy in parasitology]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 20. ISBN 978-80-971331-2-2.

[5] HRČKOVÁ, Gabriela - VELEBNÝ, Samuel. *Vybrané metódy hodnotenia farmakologického účinku liečív pri tkanivových helmintózach* [Selected methods for assessing pharmacological effect of drugs in tissue helminthoses]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 36. ISBN 978-80-89707-02-7.

[6] KRÁĽOVÁ-HROMADOVÁ, Ivica. *Molekulárne metódy analýzy DNA v taxonómii parazitov* [Molecular methods of DNA analysis in taxonomy of parasites]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 25. ISBN 978-80-89707-00-3.

[7] HURNÍKOVÁ, Zuzana. *Praktická aplikácia legislatívnych požiadaviek na ochranu zvierat používaných na vedecké účely* [Practical application of legislative requirements for the protection of animals used for scientific purposes]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 44. ISBN 9788089707010.

[8] MAJLÁTHOVÁ, Viktória - VÍCHOVÁ, Bronislava - NOVÁKOVÁ, Mária. *Metodické postupy pri detekcii kliešťami prenášaných nákaz* [Methodology for the detection of tick-borne diseases]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 20. ISBN 978-80-971331-3-9.

[9] MIKLISOVÁ, Dana. *Vybrané štatistické metódy v biológii s dôrazom na parazitológiu* [Selected statistical methods in biology with an emphasis on parasitology]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 28. ISBN 978-80-89707-05-8.

[10] PAPAJOVÁ, Ingrid - ČISLÁKOVÁ, L. - JURIŠ, Peter. *Základy toxikológie a intoxikácie: Drogy a drogová závislosť 2.* [Fundamentals of Toxicology and intoxication. Drugs and Drug Addiction II]. Košice: Harlequin, 2014, pp. 45. ISBN 978-80-89082-42-1.

[11] REITEROVÁ, Katarína. *Vybrané sérologické a molekulárne metódy v diagnostike neosporózy prežúvavcov* [Selected serological and molecular techniques in the diagnosis of neosporosis in ruminants]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 22. ISBN 978-80-971331-6-0.

[12] RENČO, Marek - ČEREVKOVÁ, Andrea. *Metodické postupy pre prácu s pôdnymi a parazitickými nematódami rastlín* [Methodologies for working with soil and plant parasitic nematodes]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 22. ISBN 978-80-971331-4-6.

[13] STANKO, Michal. *Metódy ekologického výskumu drobných cicavcov* [Methods of ecological research of small mammals]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 25. ISBN 978-80-971331-5-3.

[14] ŠALAMÚN, Peter - BRÁZOVÁ, Tímea. *Spektrofotometrická analýza ťažkých kovov v organických a anorganických matriciach* [Spectrophotometric analysis of heavy metals in the organic and inorganic matrices]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 27. ISBN 978-80-971331-8-4.

[15] ŠNÁBEL, Viliam - ŠPAKULOVÁ, Marta. *Genetické prístupy využívané v taxonómii a systematike helmintov* [Genetic approaches applicable in taxonomy and systematics of helminths] 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 25. ISBN 978-80-89707-03-4.

[16] VÁRADY, Marián. *Metodické postupy pre detekciu rezistencie na antihelmintiká u parazitických nematódov* [Methodology for the detection of antihelmintic resistance in parasitic nematodes]. 1st edition, Košice: Institute of Parasitology SAS, 2014, pp. 24. ISBN 978-80-89707-04-1.

2.5.5. Number of published academic course books

[1] ŠPAKULOVÁ, Marta - HOLECOVÁ, Milada. *Vybrané kapitoly z parazitológie: (Parazity ľudí, živočíchov a rastlín)* [Selected chapters of Parasitology: Parasites of humans, animals and plants]. Košice: Institute of Parasitology SAS, 2013, pp. 300. ISBN 978-80-971331-1-5.

2.5.6. List of joint research laboratories/facilities with universities

[1] Partnership Agreement between the IP SAS and Pavol Jozef Šafárik University (UPJŠ) in Košice, since 2014. Besides the IP SAS, the Institute of Animal Physiology, SAS, Košice, and the Institute of Neurobiology, SAS, Košice, are also engaged in cooperation with UPJŠ aimed at joint projects, organizing conferences, carrying out laboratory research and field work and teaching university students.

[2] Cooperation Agreement with the Faculty of Science, UPJŠ, Košice, since 1998, addressing joint projects, research collaboration and management of university courses in Parasitology I and Parasitology II.

[3] Cooperation Agreement with the Faculty of Medicine, UPJŠ, Košice, since 2010, addressing joint projects and research collaboration.

[4] Partnership Agreement between the IP SAS and Prešov University in Prešov, since 2014, focused on the ecology of parasites via operating joint research and cooperation in the education of university students.

[5] Partnership Agreement between the IP SAS and the Faculty of Education, Catholic University in Ružomberok, since 2006, addressing the joint research project VEGA *Babesiosis in Slovakia* focused on studies of animal parasites in the mountain regions of Slovakia.

[6] Partnership Agreement between the IP SAS and the St. Elizabeth University of Health and Social Work in Bratislava, since 2007, a common laboratory for the epidemiology of parasitic zoonoses, cooperation in pre-graduate and post-graduate education, common research projects.

[7] Cooperation Agreement with the Faculty of Science, Comenius University in Bratislava, since 2004; the IP SAS is an external educational organization for the study programme 4.2.5 Zoology, provided by Comenius University. The IP SAS supervised eight internal PhD. students in the period 2012-2015. Four senior researchers were members of the PhD. study Committee.

[8] Cooperation Agreement with the University of Veterinary Medicine and Pharmacy in Košice, since 2004; the IP SAS is an external educational organization for the study programme 4.3.2 Infectious and Parasitic Diseases provided by the University. The IP SAS supervised 22 internal and three external PhD. students in the period 2012-2015. Several researchers were members of the PhD. study Committees and also took part in pre-graduate education.

[9] Cooperation Agreement with Faculty of Social Sciences and Health Care, Constantine the Philosopher University in Nitra, since 2009, training and joint research of the Roma minority.

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

The IP SAS is an external training centre for PhD. study in two study programmes (see 2.5. for details). The number of new PhD. students accepted in each academic year is limited by rules established by the Presidium of the SAS. Each academic year, the interest of new students in the PhD. programme in the Parasitology field exceeds the limits.

From 2012-15, as many as 11 internal and two external PhD. students defended their dissertations. The six most promising young researchers from among them were employed at the Institute. A sufficient number of CC papers supporting a PhD. dissertation, the competitiveness of students in obtaining a Supporting Fund of Stefan Schwarz provided by the Presidium of the SAS, and foreign working stays, are the main strategies of the IP SAS in providing postdoctoral work positions in the next four years. All applicants of the Fund succeeded in inter-academic competition in the period 2012-2015, which indicates the potential personnel structure of young researchers of the IP SAS.

The PhD. students are supported to gain new technical skills and theoretical knowledge during working stays abroad. During the accreditation period 2012-2015, the following working stays of PhD. students were realized: Emília Vendeľová - Institute of Hygiene and Microbiology, University of Würzburg, Germany (9 months); Jasna Kraljik - KIT Biomedical Research, Amsterdam, The Netherlands (3 weeks); Božena Haklová – Institute of Parasitology Biology Centre AS CR, České Budějovice, Czech Republic (1 month); Viktória Čabanová - University of Veterinary Medicine Vienna, Austria (3 weeks); Daniel Barčák - Udonthani Rajabhat University, Thailand (1 month) and University of Nordland, Norway (3 months).

Apart from medium-term stays, many PhD students frequently visit our close partner institutions – Institute of Parasitology AS CR, České Budějovice, Czech Republic; and Institute of Parasitology PAN, Warsaw, Poland. However, we would like to encourage the PhD students to be more active in long-term (more than 6 months) working stays.

Pedagogical activities of IP SAS researchers varied in individual years. In general, collaboration in pregradual education and supervision of bachelor and diploma theses are rather intensive. In 2015, two university professors and four associate professors were employed at the IP SAS. The educational activities have also been extended to nine Universities and faculties in Košice, Bratislava, Prešov, Ružomberok and Nitra (see 2.5.6.).

2.6. Social impact

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

[1] The IP SAS was a main coordinator of the project: “Application Centre for the Protection of People, Animals and Plants from Parasites” (Grant Scheme: EU Structural Funds, Action OPVaV-2008/2.2/01-SORO ITMS: 26220220018). In a frame of the project, the IP SAS obtained in 2012 the Certificate of Accreditation (No. S-327) granted by the SNAS (Slovak National Accreditation Service), endorsed till December 2020. Three specialized laboratories were established:
(i) Laboratory for Diagnostics and Prevention of Human Tissue Helmintoses
(ii) Laboratory for Diagnostics and Prevention of Helminthozoonoses
(iii) Laboratory for Diagnostics and Prevention of Plant Parasitoses.
The establishment of the laboratories facilitated the introduction and standardization of highly specific procedures for the diagnosis of parasitic diseases in humans, animals and plants, which

will be offered as paid services in the near future, beyond the routine diagnostic practices offered by commercial laboratories and superdiagnostics of parasitic infections (verification and confirmation by means of specialized procedures in the case of a doubtful result from other laboratories).

[2] Within the applied part of the research performed under the project "Protection of the Environment against Parasitozoonoses under the Influence of Global Climatic and Social Changes" (Grant Scheme: EU Structural Funds, Action OPVaV-2010/4.2/06-SORO ITMS: 26220220116), large-scale study on the distribution of different ticks and tick-borne pathogens was performed in southern coastal and mountainous Central European biotopes. The results were summarized in the form of informative brochures and maps directed to the general public. The main results were presented several times in the International Agricultural and Food Exhibitions *Agrokomplex Nitra* where the expositions were awarded by the Gold Incheba Price.

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

[1] The IP SAS regularly prepares reports on the occurrence and spread of serious and emerging parasitic diseases (echinococcosis, trichinellosis, dirofilariosis, toxocarosis, anaplasmosis, etc.) for the Public Health Authority of the Slovak Republic and for the National Contact Point of the EFSA (European Food Safety Authority). Reported data are published annually in the *Report of Zoonoses and Aetiological Agents of Zoonoses in the Slovak Republic* and submitted to EU authorities.

[2] The IP SAS has compiled professional reports entitled: *Risk Assessment of Alveolar Echinococcosis in Humans and Animals*, *Risk Assessment of Cestode Infections in the Current Conditions of the Slovak Republic* and *Risk Assessment of Babesiosis in Slovakia* for the Department of Food and Nutrition Safety of the Ministry of Agriculture and Rural Development of the Slovak Republic (MARD SR) with the aim of accomplishing Article 2, Point a) Paragraph 3 of the Agreement between the EFSA and the MARD SR on information exchange regarding continuous risk assessments and opinion preparation for the SVK (www.mpsr.sk).

[3] The IP SAS and the State Veterinary and Food Administration of the Slovak Republic (SVFA SR) have concluded a contract on monitoring activities, genetic specifications and genotyping of parasitic zoonoses agents in animals and humans with a specific emphasis on trichinellosis and alveolar echinococcosis.

[4] Inter-laboratories proficiency tests for the Trichinellosis National Reference Laboratory in the Slovak Republic (SVFA SR) were prepared. Confirmation tests and genotyping of *Trichinella* isolates were performed for the SVFA SR.

[5] According to the requirement of the SVFA SR and within the objective of the professionals involved in the handling and working with animals used for the scientific and educational purposes, educational training was carried out based on the following legislative standards: NV 377/2012, MPRV SR Regulation 436/2012 Coll. of Laws and Act No. 39/2007 Coll. of Laws (Lecturer: Zuzana Hurníková, IP SAS, 2015).

[6] At the request of the Ministry of Defence of the Slovak Republic, the IP SAS performed diagnostics of dirofilariosis and other parasitic infections in military dogs.

[7] The IP SAS under cooperation with the Regional Veterinary and Food Administration in Komárno and Dunajská Streda, Slovakia, provided regular monitoring of the occurrence of the giant liver fluke, *Fascioloides magna*, in red deer (*Cervus elaphus*) and roe deer (*Capreolus capreolus*) in the south-western part of Slovakia. The prevalence and intensity of fascioloidosis infection in the respective region is carried out mainly on free-living ruminants, where the giant liver fluke causes serious veterinary problems.

[8] Monitoring of parasitostatus in wildlife was done on the basis of a contract between the IP SAS and the Tatra National Park (TANAP) Research Station and State Forests of TANAP. Specific emphasis was placed on animal-to-human transmitted diseases (echinococcosis, trichinellosis, and dirofilariosis). In addition, the determination of parasites of Tatra endemites, the Tatra Chamois (*Rupicapra rupicapra tatrica*) and the Tatra Marmot (*Marmota marmota latirostius*) was carried out.

[9] Cooperation with the Zoological parks and dog shelters operated by non-profit organisations (in Bratislava and Košice). Wildlife and exotic animals as well as pets were monitored for new emerging parasitoses, such as dirofilariosis and angiostrongylosis.

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

[1] The IP SAS authorises and validates results obtained from parasitological diagnostic methods (for trichinellosis, toxocarosis, echinococcosis and toxoplasmosis) and commercial diagnostic laboratories (HPL Ltd., Alpha Medical Ltd.).

[2] The IP SAS performs serological diagnostics of toxocarosis, trichinellosis, echinococcosis and toxoplasmosis for Departments of Infectious Diseases and Surgical Departments of hospitals and primary care physicians (through a contract with the Children's Faculty Hospital Košice, cooperation with University Hospital Martin, University Hospital Košice and J. A. Reiman Hospital in Prešov).

[3] In cooperation with private veterinary practices, companion animals are regularly examined for new and emerging parasitic diseases (dirofilariosis, angiostrongylosis, babesiosis, anaplasmosis); preventive and therapeutic measures are taken to prevent their spread. An information brochure on canine dirofilariosis was published with the support of Bayer Animal Health GmbH and distributed to veterinary ambulances in Slovakia.

[4] On the request of the ImunaPharm Company in Šarišské Michaľany, the IP SAS is involved in the design and implementation of specific molecular tests applied in the control of the safety of virus vaccines in humans (the F-PERT test for detection of retroviruses; PCR tests for detection of other pathogens and a karyological test). The IP SAS provided the design and development of modern *in vivo* testing using flow cytometry for monitoring the immuno-normalization effect of Immodin on a drug-induced immunosuppressive model in BALB/c mice, which is an alternative to the Rossete test (request of the State Institute for Drug Control - SUKL).

[5] The IP SAS made available the diagnostics of parasitic infections in sheep/goats and cattle, including examination of suspected cases for anthelmintic resistance in more than 25 private agricultural farms throughout Slovakia. Additionally, a prevalence study on dicrocoeliasis in sheep/cattle farms in Slovakia was carried out with the cooperation of veterinary pharmaceutical enterprises.

[6] The IP SAS provides consulting services in the field of parasitic diseases of both cultured and ornamental fishes and expert assessments in the case of fish deaths with indications of parasitological aetiology for the Slovak Fishing Association and various private institutions and individuals.

[7] Diagnostics of the plant parasitic nematode species *Radopholus similis*, a pest of many agricultural crops, in soil samples and peat on the requests of private producers of organic fertilizers, composts and agricultural products AGRO CS Lučenec, were performed.

[8] Diagnostics of the plant parasitic nematode species *Heterodera schachtii* (sugar beet cyst nematode) was carried out on soil samples on the request of a private sugar refinery (Považský cukor Ltd., Trenčianska Teplá).

[9] The IP SAS performed a comprehensive evaluation of soil nematode communities in forest ecosystems affected by storm and fire in the High Tatras spruce forests in 2004 and 2005. A parasitological examination was performed on permanent grassland soil ecosystems loaded with heavy metal emissions originating from metallurgical plants in Slovakia. Nematode communities were monitored in the Protected Landscape Area Vihorlat Forests, birch forests and selected peat lands of the Protected Landscape Area Horná Orava.

[10] In cooperation with a private producer of organic fertilizer, the IP SAS tested and verified the nematicidal effect of different types of biological materials (vermicompost and aqueous extract of the vermicompost), secondary plant metabolites (tannins), essential oils from *Thymus vulgaris* and *Cinnamomum camphora*, etc.

2.6.4. List of licences sold abroad and in Slovakia, incl. revenues NONE

2.6.5. List of most important social discourses under the leadership or with significant participation of the institute (max. 10 items) NONE

2.6.6. Summary of relevant activities

Social profitability of applied research carried out at the IP SAS involves several public spheres:

a) PUBLIC HEALTH SECTOR in the form of diagnostics and consulting services for human parasitic diseases in hospitals and the other governmental health authorities;

b) VETERINARY PRACTICE through diagnostics of newly emerging parasitic infections with a special emphasis on prophylaxis and treatment and the provision of detailed epidemiological studies; in the form of detection of anthelmintic resistance in farm animals and prophylaxis consultations aimed at reducing economic losses;

c) ENVIRONMENTAL SECTOR by regular monitoring and surveillance of parasitic agents circulating in the environment, as well as in the form of long-term comprehensive study of changes in the structure of soil nematodes in ecosystems affected by various forms of disruption;

d) AGRICULTURE in the form of diagnostics of plant parasitic nematodes in samples of soil and peat on the requests of private producers of organic fertilizers, composts and agricultural products;

e) GOVERNMENT SECTOR in the form of mapping the occurrence of parasitic agents in animals and humans and their genotyping, through preparation of inter-laboratories proficiency and verification tests for state and private institutions, as well as by preparing professional reports for national and international decision-making authorities.

2.7. Popularisation of Science (outreach activities)

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

Books, booklets and internet presentations, movie

[1] MITERPÁKOVÁ Martina: Ďalšie ochorenie líšok – besnota to už nie je [Next disease of foxes – no longer rabies]. Vôňa vedy [Scent of science] (Ed. K. Matejíčková), Vydavateľstvo Matice slovenskej, s.r.o., NEOGRAFIA, Martin, 2015, p. 22-28. ISBN 978-80-8115-206-1.

[2] PEŤKO, Branislav - PAPAJOVÁ, Ingrid: Moderné vyhľadávanie škrkaviek [Advanced search for roundworms] Vôňa vedy [Scent of science] (Ed. K. Matejíčková), Vydavateľstvo Matice slovenskej, s.r.o., NEOGRAFIA, Martin, 2015, p. 40-44. ISBN 978-80-8115-206-1.

[3] PEŤKO, Branislav - PAPAJOVÁ, Ingrid: Parasites in cities in conditions of global change. DOCUMENTARY MOVIE, 26 min., Xlpixel media studio ©2015

[4] PEŤKO Branislav: S kliešťami sa môžeme stretnúť na horských hrebeňoch aj pri mori. [Finding ticks in mountains and at the sea]. Newspaper Korzár. http://kosice.korzar.sme.sk/c/7778586/s-kliestami-sa-mozeme-stretnut-na-horskych-hrebenoch-aj-pri-mori.html

[5] ŠPILOVSKÁ, Silvia - REITEROVÁ, Katarína: Neosporóza: nové nebezpečenstvo psov. [Neosporosis: a new danger for dogs]. Informačný leták pre praktických veterinárnych lekárov a pre majiteľov psov [Information leaflet for practicing veterinarians and dog owners]. 6 pp.

Telecomunication media

[6] DERDÁKOVÁ, Markéta: Živí proti živým. [Alive against alive]. Science Spectrum, Slovak Television RTVS, STV 2, November 30, 2012. 20-minute block

[7] PAPAJOVÁ, Ingrid: Dangerous bacteria in sandpits. Evening television news, RTVS, STV1, May 28, 2012

[8] STANKO, Michal: Ticks are attacting. 2015. Television MARKÍZA, Evening News, http:// vedeckykaleidoskop.cvtisr.sk/e-noviny-2015/3-2015/klieste-utocia.html?page_id=471

[9] HURNÍKOVÁ, Zuzana: A guest of Radio Regina – a parasitologist Dr. Zuzana Hurníková. Radio REGINA, June 9, 2015, www.rtvs.sk/radio/archiv/1541/228408

Selected papers in monthly journals or daily newspapers

[10] DUDLOVÁ, Adriana - PAPAJOVÁ, Ingrid - ČISLÁKOVÁ, Lýdia - JURIŠ, Peter: Parazitárne riziko ohrozenia chovateľov psov (toxokaróza, syndróm *larva migrans visceralis*) [Parasitic risk to dog breeders: toxocarosis, larva migrans syndrom]. In Pes a mačka [Dog and cat], vol. 12, no. 2, 2012, p.17-19.

[11] MITERPÁKOVÁ, Martina: Líščí trýzniteľ [Fox tormentor] Quark, no. 8, 2014, p. 23-25.

Public popularisation lectures

[12] BAZSALOVICSOVÁ, Eva - OROS, Mikuláš: Slovenskí parazitológovia na Ďalekom východe: čo Marco Polo v Číne určite nehľadal [Slovak parasitologists in the Far East: what Marco Polo certainly did not seek in China]. Európska noc výskumníkov [European Night of Researchers] OC Optima, Košice, September 26, 2014.

Participation in exhibitions

[13] PEŤKO, Branislav: Night of the researcher, the festival of science: Science hours in the Cinemax. Exposition and discussions with the public, OPTIMA Business Centre, Košice, September 28, 2012 (annual exhibition).

[14] PEŤKO, Branislav: Exposition of Centres of excellence in research and development in Slovakia. Our exposition: Centre of excellence for parasitology. INCHEBA Bratislava, September 22, 2012 (annual exhibition). GOLD INCHEBA

[15] PEŤKO, Branislav: Important parasites of people, animals and plants in Slovakia. AGROKOMPLEX Nitra, August 22, 2012 (annual exhibition).

[16] PEŤKO, Branislav - PAPAJOVÁ, Ingrid: Parasites of Slovakia under the influence of climate change. In: SLOVMEDICA 2012, Incheba Bratislava, September 26, 2013, GOLD INCHEBA (annual exhibition).

[17] HURNÍKOVÁ, Zuzana - MITERPÁKOVÁ, Martina: Night of Museums and Galleries: Museum of National Park TANAP, May 16, 2015. Exhibition of parasites of wild animals in the region of the High Tatras.

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	7	26	20	37	90
Appearances in telecommunication media popularising results of science, in particular those achieved by the Institute	12	11	17	14	54
Public popularisation lectures	29	12	30	8	79

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

The Institute was one of the leading organisations of the SAS in the popularization of science in a wide range of activities. The Institute organised Press conferences which resulted in television, radio and media reports where researchers presented the latest research results.

The IP SAS has participated annually in Exhibitions (Agrokomplex, Incheba), the Institute Open Days, Festival of Science for the Public, Researchers Night (an EU event) etc. Numerous papers were published in journals, such as Dog and Cat, Quark, Farmer Newspaper, etc. The journalists themselves often asked our researchers for informational contributions; I. Papajová (2013) and Z. Hurníková (2015) were introduced to public in “Portraits of Celebrities”.

The popularisation project (LPP-0400-09) entitled: A Route of Youth Towards Science “Live” was focused on searching talented high school students. Six students, supervised by the IP SAS researchers, were successful both at national and international scales in 2012-2015. The students won several Prices in Slovakia in competitions organized by the Association for Youth, Science and Technology (AMAVET). All of them proceeded in world competitions, such as the I-SWEEP 2013 in Huston, USA; The Intel ISEF 2012 in Pittsburgh, USA; The Intel ISEF 2013 in Phoenix, USA; the Stockholm Junior Water Prize 2012 in Stockholm, Sweden; the Exporecerca Jóve Barcelona in 2014 in Barcelona, Spain; the Russian Vernadsky Nationwide Competition of Secondary School Students 2014 in Moscow, Russia etc.

The high acknowledgement of the Institute’s popularisation activities was expressed by awarding I. Papajová (2012) and B. Peťko (2013) the Award of the Presidium of SAS for science popularisation activities. Further acknowledgements were awarded to B. Peťko in 2014: The Diploma of Russian Academy of Sciences for excellent management of student research works and a Commemorative Medal from the Association for Youth, Science and Technology AMAVET.

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	55.0	55.0	55.0	49.0
Research employees from Tab. Research staff	42.0	42.0	42.0	38.0
FTE from Tab. Research staff	33.960	32.880	34.160	32.610
Average age of research employees with university degree	44.8	45.0	45.3	45.6

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.						1	1	2	1
II.a / Assoc. prof.		2	4	2	3		1	1	
Other researchers PhD./CSc.	2	3	1	1	1				
doc. / Assoc. prof.				1					

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.					1		2	1	1
II.a / Assoc. prof.			1	1		2			
Other researchers PhD./CSc.		1							
doc. / Assoc. prof.									

2.8.2. Postdoctoral and mobility scheme

2.8.2.1. Postdoctoral positions supported by national and international resources

[1] Grant scheme: The FULBRIGHT program for research and educational exchange
Project title: *Fish tapeworms (Cestoda) in North America: species diversity and genetic structure*
Period: 04-07/2013
Host institution: St. Norbert College, De Pere, Wisconsin, USA
Fellowship holder: Mikuláš Oros

[2] Grant scheme: The travel project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Fish parasites in environmentally degraded environment*
Period: 11/2012

Host institution: Institute of Biology of Inland Waters, Russian Academy of Sciences, Borok, Russia
Investigator: Tímea Brázová

[3] Grant scheme: The postdoctoral project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Study of genetic variability of Rupicapra rupicapra tatrica and its parasites*
Period: 12/2013
Host institution: Instituto di Parassitologia, Sapienza Universita di Roma, Rome, Italy
Investigator: Bronislava Víchová

[4] Grant scheme: The postdoctoral project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Acquiring unique immuno-diagnostic and genetic methods for comparison of phylogenetically relative fluke species*
Period: 11/2012
Host institution: Swedish University of Agricultural Sciences, Uppsala, Sweden
Investigator: Eva Bazsalovicsová

[5] Grant scheme: The postdoctoral project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Research on cestode parasites in North America*
Period: 03/2012
Host institutions: Texas State University, Texas, Gulf Coast Research Laboratory in Ocean Springs, Mississippi, and College of Charleston, South Carolina, USA
Investigator: Mikuláš Oros

[5] Grant scheme: The postdoctoral project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Research on chromosomes of cestode parasites in North America*
Period: 03/2012
Host institutions: Texas State University, Texas, Gulf Coast Research Laboratory in Ocean Springs, Mississippi, and College of Charleston, South Carolina, USA
Investigator: Martina Orosová

[6] Grant scheme: The postdoctoral project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Communities of free-living and parasitic nematodes of plants, their ecological and phytopathological importance*
Periods: 08/2012, and 11/2012
Host institutions: Ghent University, Ghent, Belgium and Universidade de Évora, Évora, Portugal
Investigator: Andrea Čerevková

[7] Grant scheme: The postdoctoral project financed by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045
Project title: *Climate Change project*
Period: 01/2014
Host institutions: Humboldt-Universität zu Berlin, Berlin, Germany
Investigator: Peter Šalamún

2.8.2.2. Postdoctoral positions supported by external funding

[1] A total of 70% of salary of the post-doc M. Oros was supported by the APVV project *Systematics of tapeworms of the order Caryophyllidea, parasites of freshwater fish*. Grant number: LPP-0171-09 (the project type “LPP” means “Human Resources in Research (HRP)” provided by the Slovak Research and Development Agency APVV)
Duration: 09/2009-08/2012
Funding for IP SAS/ 2012: 10,019 EUR, Total funding for IP SAS/ 2009-2012: 63,314 EUR

Role of the IP SAS: coordinaror
Responsible person: Vladimíra Hanzelová (supervisor)

[2] A partial salary for post-doctoral position of Mikuláš Oros (09/2013-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[3] A partial salary for post-doctoral position of Bronislava Víchová (03/2012-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[4] A partial salary for post-doctoral position of Eva Bazsalovicsová (03/2012-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[5] A partial salary for post-doctoral position of Andrea Čerevková (03/2012-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[6] A full salary for post-doctoral position of Peter Šalamún (09/2013-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[7] A full salary for post-doctoral position of Tímea Brázová (09/2012-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[8] A full salary for post-doctoral position of Mária Nováková (09/2013-11/2013) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[9] A full salary for post-doctoral position of Michaela Urda Dolinská (11/2013-06/2014) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

[10] A full salary for post-doctoral position of Martina Orosová (03/2012-04/2012) was supported by the Parasitological Research and Training Center of SAS, OPVaV 1.2/02-SORO, 26110230045.

2.8.2.3. SAS stipends and SASPRO stipends NONE

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

[1] Viktória Majláthová, 1.1.2010 – 31.12.2013
[2] Martina Orosová, 1.1.2011 – 31.12.2014 (maternity leave since 04/2011)
[3] Bronislava Víchová, 1.1.2012 – 31.12.2015
[4] Eva Bazsalovicsová, 1.5.2012 – 30.4.2016
[5] Silvia Špilovská, 1.1.2014 – 31.12.2017 (maternity leave since 11/2015)
[6] Michaela Urda Dolinská, 1.5.2015 – 30.4.2019
[7] Peter Šalamún, 1.5.2015 – 30.4.2019

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

Several highly specialized laboratories have been established at the IP SAS and equipped with top-of-the line equipment, purchased largely through EU funding during 2009–2015. All equipment is currently used in a frame of all research projects supported by national VEGA and APVV funds. The IP SAS infrastructure is available on Institute web page. The strategy of SAS is to make the infrastructure accessible to other academic institutions and universities. Reciprocally, several equipment (see the final part of this section) placed in other institutions are utilized by IP SAS researchers.

[1] Laboratory of morphology and electron-microscopy
The research is preferentially aimed at the study of macro- and microstructure, cell functions, cell organelles, tissues and organs of human and animal parasites with additional work in comparative morphology, cytogenetics, taxonomy and evolution.

Equipment of the laboratory:
Scanning electron microscope JEOL JSM-6510LA equipped with EDS system
Fluorescence microscope Leica DM4000
Phase contrast microscope Leica DM5000
Microtome Leica Ultracut EM UC7
Paraffin embedding station EM TP
Light microscope Leica with digital camera and image analysis software
Stereomicroscopes Leica and Olympus

[2] Laboratories of molecular biology
Molecular biology laboratories are used for *de-novo* design of new molecular markers applied in molecular taxonomy and population biology, molecular diagnostics of parasitic diseases, population genetic analyses, molecular approaches for the detection of anthelmintic resistance, etc.

Equipment of the laboratories:
Real-Time PCR and HRM system CFX96
Gradient thermal cyclers
Ultra-low freezer CVF 525/86
Steam steriliser
Lyofilisator PL 3000
Fully automated documentation system for molecular biology DNR LumiBIS
PCR workstations
Ultra-Pure water polisher Purelab Classic UVF for water purification

[**3**] **Immunological laboratories**
Immunological research at the IP SAS is primarily focused on the study of functions of selected proteins and peptides in host-parasite interactions and pathogenesis. Influence of the host immune system by therapy, immunomodulators and various exogenous environmental factors are also studied.

Equipment of the laboratories:
CO_2 incubator CB 150
Western blotting equipment
Ultrasonic tissue homogenizer
Spectrophotometer SPECORD S 600
Electroporator PROTEAN IEF Cell

[**4**] **Laboratories of ecology and ecotoxicology (the latter newly established in 2013)**
Research is focused on the effects of environmental and climate changes on ticks and tick-borne pathogens, microstructure of plant nematodes and biochemical analyses of parasites from polluted environments.

Equipment of the laboratories:
Esri ArcGIS 10.0 Software
Thermovision camera FLIR B365

GPS
Stereomicroscopes Nikon
Climaboxes
Olfactometer
Microwave digestion system Ethos
Atomic absorption spectrometer ZEENIT 700P
Highly specialized light microscope Nikon 90i
Light microscope with digital camera Nikon SMZ 1000

[**5**] **Laboratory of Animal Facility**
The infrastructure of the Institute includes the animal facility accredited by the State Veterinary and Food Administration of the Slovak Republic in compliance with EU and national legislation. All animals (mice and gerbils) are housed under standard pathogen-free conditions required for high-quality research. The facility is used for experimental laboratory work and provides an ideal conditions to perform studies on chosen animal models.

Additionally, IP SAS researchers have access to professional equipment based at partner institutions:

Equipment: *Automated flow cytometer FAC Scan*
Application: immunology, cell fenotypization and phagocytic activity of the cells
Partner institution: Department of Pathology and Pathophysiology, University of Veterinary Medicine and Pharmacy in Košice, Slovakia

Equipment: *Flow cytometer BD FACSCalibur*
Application: genome size measures
Partner institution: Faculty of Medicine, Pavol Jozef Šafárik University in Košice, Slovakia

Equipment: *genetic analyser ABI3130xl*
Application: Sanger sequencing and fragment analysis
Partner institution: Faculty of Science, Comenius University in Bratislava, Slovakia

Equipment: *Compact anechoic chamber (Model 1710-100, Comtest engineering)*
Application: tests of electromagnetic compatibility with biological systems
Partner institution: University Science Park Technicom, The Technical University of Košice, Slovakia

Equipment: *JEOL 1010 transmission electron microscope*
Application: ultrastructural and cytochemical analysis
Partner institution: Institute of Parasitology, Biology Centre of the Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic

Equipment: *Flow cytometer, BD Canto*
Application: immunology (phenotypic analysis of immune cells, cell proliferation and apoptosis, cell functions: phagocytosis and production of ROS)
Partner institution: Institute of Microbiology and Immunology, University of Veterinary Medicine and Pharmacy in Košice, Slovakia

Equipment: *Spectrofluorimeter*
Application: biochemistry (quantification of neutral and polar lipids in larvae and immune cells)
Partner institution: Institute of Microbiology and Immunology, University of Veterinary Medicine and Pharmacy in Košice, Slovakia

Equipment: *Automated veterinary hematology analyzer: The Mindray BC 2800VET*
Application: haematological analyses of experimental animals
Partner institution: Institute of Microbiology and Immunology, University of Veterinary Medicine and Pharmacy in Košice, Slovakia

Equipment: *Automated clinical chemistry analyzer: ELLIPSE, AMS SpA*
Application: determination of biochemical markers in mice blood serum
Partner institution: Institute of Microbiology and Immunology, University of Veterinary Medicine and Pharmacy in Košice, Slovakia

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

As a result of regular evaluation of the period 1 January 2007 – 31 December 2011, the Evaluation Panel for Agricultural, Veterinary and Ecological Sciences issued a Protocol with the following evaluation and proposal for the Institute of Parasitology SAS rating to the evaluation category:
1) Comments on the qualitative evaluation of global indicators, such as excellence, topicality and effectiveness of research, etc.: The wide international recognition of the Institute is manifested by numerous cooperation and joint projects with numerous laboratories abroad. At the national level the Institute fulfils an important role as a unique institution in Slovakia focused on research in parasitology. The Institute has had a number of practical research outputs which have the potential for use in industry but which are also important for public health (including minorities), agriculture and veterinary medicine, including diagnostics, prevention and therapy.
2) Total percentage of points obtained from the maximum number of points with weighting: 83.43%
3) Comments, objections to the organization's activities in the form of suggestions and specific tasks which must be performed by the organization before next regular evaluation, etc.:

1st suggestion: It is advisable to focus the publication strategy on high quality international peer reviewed journals reaching a broader scientific readership

Comment of the IP SAS
This recommendation has been accepted and fulfilled. According to the Thompson Reuters and InCites Journal Citation Reports, the median impact factor (MIF) in the field of Parasitology varied between 1.566-2.154 in the period 2011-2014 (MIF=1.785 in 2014). Journals with an IF ≥ 3 are usually considered to be of high quality in parasitology.

In the previous 5-year accreditation period, 13 high-ranked papers with an IF ≥ 3 were published. In the current period of accreditation (2012-2015), the number of papers published in journals with an IF ≥ 3 increased to a total of 21. Besides journals focused directly on parasitology (International Journal for Parasitology, Parasites & Vectors), IP SAS scientists also published in journals covering broader scientific readership (PLoS ONE, PLoS Neglected Tropical Diseases, Oecologia, Annals of Agricultural and Environmental Medicine, Journal of General Virology, Emerging Infectious Diseases, The American Naturalist, Infection Genetics and Evolution, Ecography).

The future publication strategy of the Institute is to implement motivation tools for researchers to publish in an even higher number of good quality journals.

2nd suggestion: It is necessary to work on personnel management, including the D.Sc. numbers

Comment of the IP SAS
In the previous accreditation period, P. Dubinský, V. Hanzelová, M. Stanko, M. Špakulová and M. Várady were holders of a D.Sc. (Doctor of Science) degree, which equals the highest university degree of "Professor". In 2012-2015, four additional researchers acquired a DrSc. degree – M. Bruňanská, G. Hrčková, B. Peťko and K. Reiterová. Some of the D.Sc. holders are approaching retirement age, but the Institute currently has three potential candidates under consideration. Therefore, a balanced number of research professors in the Institute can be expected.

3rd suggestion: In the future research topics and visions should be discussed and developed by permanent discussions within the institute

Comment of the IP SAS

The scientific board of the IP SAS along with the IP SAS directorate have promptly responded to current scientific and social requirements in the field of parasitology. Beyond the support of fundamental research fields, the strategy of the IP SAS was drawn to the implementation of new scientific topics and up-to-date technologies applied in the research of parasites in recent years. Under cooperation with other institutions, the IP SAS started to apply the newest next generation sequencing approaches in new molecular markers mining. The latest molecular technologies have been applied in population genetic studies, resolution of the biogeography of several parasitic models and the interpretation of complex taxonomic questions. A potential approach in the pharmacological treatment of parasitic disease was acquired by latest research, which focused on combined therapy, applying standard anthelmintic drugs and natural substances that increase the immunological responses of host organisms. A new field of study is ecotoxicology, which focuses on the relationships between the load of heavy metals and/or polychlorinated biphenyls (PCBs) in the environment (water, soil, host organism) and parasites, and their potential use as bioindicators.

Regarding proportionally balanced basic and applied research at the IP SAS, we decided to continue in large-scale epidemiological surveys and highly specific molecular and immunological diagnostics of medically and veterinarily important parasitoses and currently to respond to newly emerging zoonotic and vector-borne diseases and the latest outbreaks of parasitic diseases in Slovakia, and, if requested, also abroad.

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

IP SAS management

The authorities of the IP SAS were represented by the Institute Director B. Peťko, Deputy Director I. Papajová, Scientific Secretary M. Špakulová and a seven-member Scientific Board with I. Hromadová at its head. Additionally, V. Hanzelová represented the Institute in the SAS Assembly, and the department heads (V. Hanzelová, E. Dvorožňáková, B. Peťko, M. Várady and I. Papajová) were members of the advisory body to the Director. Management operated in this structure until the end of the accreditation period. At the end of 2015, the process of elections of a new Director of the Institute began, and I. Hromadová was appointed as the Director on 1 February, 2016. Recently, M. Miterpákova and D. Antolová have become Deputies of the Director, M. Várady the head of the Scientific Board, while other positions remained unchanged.

IP SAS research infrastructure

EU Structural Funds enabled significant innovation in the infrastructure of the IP SAS after 2009 (for details see 2.8.3). Some other specific equipment based at other institutions was used by our researchers under official or unofficial collaborations. This strategy is effective as the *price/frequency of use* ratio is often high, and e.g. yearly insurance costs, regular service expenses, maintenance, software upgrades, etc. would exceed the benefit of rare use of several specific equipment.

Personnel development

The IP SAS had a balanced personnel structure, starting with the number of PhD. students, motivated post-docs, young researchers who came up with latest research strategies, and internationally recognized senior researchers.

PhD. students

The quota for the number of PhD. students is determined by the Presidium of the SAS. The Institute annually fills its limit of 12 students, with minor fluctuations (see 2.5.2.). The number of interested candidates regularly exceeds the limits for admission.

Post-docs

Excellent PhD. students are offered the opportunity to continue their research at the IP SAS and are asked to apply for the SAS Supporting Fund of Stefan Schwarz provided by the Presidium of the SAS. The Institute has been successful in this competition, as seven holders of the Fund worked here as post-docs in the period 2012-2015 and four additional young employees had previously received this support.

Senior researchers
DrSc. degree holders guarantee key research fields and doctoral studies and have importance in international bonds.

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

Currently, the IP SAS deals with both basic and applied research. The prevailing **basic research** is focused on more detailed studies of model parasites from different aspects, with better understanding of taxonomy and systematics of parasites using a multidisciplinary approach, population genetics and cytogenetics, host-parasite interactions and modulation of immunological responses of host organisms, detection of helminth resistance to drugs, ecological studies and ecotoxicology. The majority of basic research can be characterized as research of **international importance**, which can be documented by the numerous formal and informal cooperations with colleagues worldwide and chiefly by the great many research papers published abroad and in collaboration with international teams.

Applied research is usually of **national importance**. Besides information on the changing biodiversity of parasites of free-living and domestic animals in Slovakia, the research is also focused on detailed epidemiological screening and determination of highly specific molecular and immunological methods in order to provide reliable diagnostics and objective knowledge on the occurrence of newly emerging or persisting zoonotic parasitoses important from both a medical and veterinary point of view. Close cooperation with several governmental and non-governmental institutions, private and state subjects, underlines the importance of nationally orientated research.

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

The research strategy of the IP SAS is straightforward: to support existing quality research and encourage new research ideas and current state-of-art methodology. This target applies to all kinds of the research, both basic and applied. An essential tool for ever-better research outputs will apparently be in cooperation with respected institutions in Slovakia and abroad. Regarding research perspectives, a selection is as follows:

• **systematics** From an historical perspective, research on systematics has a long tradition at the Institute and today still represents a sound basis for all other research directions. The discovery, inventorying, delimiting, and describing of new taxa is essential, not only for fully characterizing parasite biodiversity and broader aspects of comparative biology, such as taxonomy, evolution, ecology and biogeography, but also for applied parasitology and recently for mainly understanding the effects of climate changes on ecosystems and the early detection of biological invasions. From almost all of these aspects, temperate zones, particularly Europe, are very well explored; however, there are still scientifically overlooked “blank spots”, particularly in tropical countries, South and South-East Asia and North America, that are worthy of attention and are included in our scientific plans for a near future. *One of the major issues in current parasitology represents the still not yet resolved conflict between morphological and DNA-based taxonomic markers, which is a key issue we will also address. In this research, integrating molecular and morphological approaches for the identification of parasites is fundamental.*

• **molecular biology** Techniques of massive parallel sequencing (MPS), which are provided under commercial services, are becoming more available to a broader spectrum of researchers. Complete genome NGS sequencing has mainly been focused on medically and socio-economically important species of parasites. The principal institution focused on the NGS complete parasite genome sequencing is the Welcome Trust Sanger Institute in Hinxton, UK, which is involved in the so-called “50 Helminth Genomes Initiative”. They are surveying the genomes of parasitic worms that are agents of human and veterinary diseases and cause

significant global health issues particularly in the developing world. However, research on parasitic worms has remained relatively untouched by genomics. *We intend to obtain large-scale data sets on genomes of novel model parasitic organisms which can further be applied in many specialized fields of parasite studies, such as predictions of genes that can be mined for diagnostic markers, mapping anthelmintic drugs resistance and determining the functional proteins associated with parasite invasion and immuno-modulation.*

• **molecular cytogenetics** New perspectives are opened for searching chromosomal homologies among different taxa using fluorescent in situ hybridization, with a focus on better understanding chromosomal evolution as an important supplementary study of the evolution of parasites. In addition, laser microdissection of chromosomes is a promising karyological methodology which will permit the generation of extremely specific markings of the genome, such as centromeric, telomeric and heterochromatic regions of supernumerary chromosomes or even the entire chromosome itself. *The next goal in this research field is to confirm new karyotypes of parasites using traditional and advanced molecular methods. To focus our effort on laser microdissection of parasitic worms with supernumerary B-chromosomes and subsequent generation of a whole chromosome probe to examine the internal structure and specificity of B chromosomes in greater detail and likely enhance the study of B-chromosomes in association with environmental mutagenic factors.*

• **immunology** New prophylactic and therapeutic approaches leading to enhanced drug efficacy, immunomodulation of the immune system and suppressed inflammation of the gastrointestinal tract (GIT) are still relevant. The research is focused on the investigation of alternative methods in parasitic disease prevention, with the ultimate goal of decreasing recent anthelmintics consumption and limiting drug-resistance development. There is a growing interest in explaining the interactions between the microbiota, immune response, inflammatory process and intestinal parasites. *Our strategy is to continue in the examination of environmental mutagenic factors of microbial preparations (lactic acid bacteria supernatants, biosurfactants or bacteriocins) on experimentally induced parasitic diseases of the GIT. Changes in gut microflora and determination of the interactions between microbial preparations and immunoregulatory mechanisms of the host will be examined. The immunomodulative properties of microbial preparations will be studied at the local (GIT), nonspecific (innate) and specific (adaptive) immune response levels. The results will lead to the definition of new microbial preparations with immunogenic properties as novel candidates for prophylactic and therapeutic intervention of parasitic disease outcomes and GIT inflammation. The expected outcome for commercial use is a decrease in the cost of anthelmintic treatment and elimination of drug residua in the food chain. This research will be performed in cooperation with the Institute of Animal Physiology, SAS, Košice.*

• **immunotherapy and pharmacology** Pharmacological treatment of medically important tissue helmithoses, such as echinococcosis and cysticercosis, is often not effective and is accompanied by undesirable side-effects. The immunomodulatory compound Immodin (ImunaPharm, Ltd.) is supposed to influence the activity of cells of innate and adaptive immunity during chronic inflammatory setting (infectious diseases, cancer). *This compound is planned to be tested in vitro and in vivo on mice infected by selected model tapeworms (Cestoda, Platyhelminthes) separately and in combination with standard anthelminthics approved for human therapy (e.g. albendazol). The pre-clinical testing of Immodin will be performed under the collaboration with a private enterprise (ImunaPharm, Ltd.). The preliminary results revealed that co-administration of albendazole and Immodin resulted in higher efficacy in the liver and peritoneal cavity, reduced liver fibrosis as well as diminished immunosuppression.*

The study of myeloid cells endowed with suppressive activity is an active field of research which has particular importance even in infectious diseases, in regard to the negative regulatory capacity of these cells to the hosts' immune response. An increasing amount of evidence shows that expansion of immature myeloid cells is linked to chronic as well as inflammatory processes. In contrast to intracellular pathogens, little is known about the phenotypes of myeloid-derived suppressor cells, the regulation of their activity and extramedullary myelopoesis during infections with multicellular parasites. *We plan to clarify the activity of tissue larvae of the*

tapeworm Mesocestoides vogae *(Cestoda, Platyhelminthes) and its products on myeloid cells during infection in mice and isolated cells. Their impact on expression of selected receptors and other molecules will be determined in correlation with changes in cell functions and phenotypes. Understanding the mechanisms of expansion of suppressive myeloid cells may lead to the development of more effective therapies.*

• **plant nematodology** Invasive alien plants have a negative impact on indigenous ecosystems and lead to homogenization of biota and the elimination of some native species from the ecosystem. *Future research will deal with characterization of the structure of the soil nematodes community, functional diversity of microorganisms and activity of the microbial community in natural ecosystems with the native plant cover and ecosystems affected by the invasion of non-native plant species. The impact of the invasion of different alien plant species on community structure and changes in nematode species diversity will be analysed. A further goal is to assess the soil condition of native and invaded ecosystems using soil nematodes and microorganisms as indicators.*

• **ecotoxicology** The physico-chemical properties of soil (C_{ox}, nitrogen, pH, water content, etc.) and biological aspects play a crucial role in the development of soil in space and time. As these aspects are inseparable parts of the ecosystem, their influence at biomonitoring outputs may be significant. *Therefore, research on soil nematode ecotoxicology is now oriented to optimization of bioindication under different environmental conditions, mainly vegetation covers and processes connected with various phytocoenoses in soil polluted by anthropogenic contamination. Since the most pronounced environmental problem is currently global warming and various impacts of increasing temperature in ecosystems, we will implement these changeable parameters (temperature, precipitation, etc.) in our research and study their effects on soil nematode communities and the soil ecosystem as a whole.*

We have previously found that fish parasites accumulate heavy metals and organic pollutants under natural conditions at ultra-high concentrations and, at the same time, they show a high tolerance (ability to survive quite a long time) to these pollutants. *Our research will now go into a much more detailed experimental study to explain the processes of penetration of these compounds through the surface and their incorporation into the internal structures of model parasites using SEM and Energy-dispersive X-ray spectroscopy (EDS, EDX, or XEDS).*

• **vector-borne diseases** The IP SAS is planning to focus on ongoing comprehensive screening of vector-borne bacterial (*Anaplasma* spp. and *Neoehrlichia* spp.) and protist (*Babesia* sp., *Hepatozoon* spp., *Leishmania* spp.) pathogens with an emphasis on the study of the genetic variability and optimizing the methods for molecular detection by selecting the appropriate conservative and more variable gene markers. *Due to the enormous spread of arthropod-borne parasitoses in Europe in general, we are planning to angle for entomological studies on the abundance and species diversity of mosquitoes in hyper-endemic natural foci of canine dirofilariosis. Canine vector-borne diseases have become a significant problem in medicine and constantly represent an increasing challenge for differential diagnosis and therapy. In addition, the IP SAS is planning to focus also on comprehensive research on ecology of ticks involving a spectrum of biophysical, biochemical, and geophysical approaches. The applied research in the field of vector-borne diseases will be focused on testing functional textiles with modified polypropylene fiber having persistent anti-tick effect. The fiber is aimed for a wide spectrum of utilization in anti-tick protection of human and animals.*

In Slovakia, *Babesia canis* is considered to be the most common unicellular species of piroplasms, responsible for canine babesiosis. The incidence of babesiosis shows a rising trend and this disease frequently end up being fatal for dogs. The circulation of genetically diverse strains of *B. canis* with a distinct pathogenicity complicates the treatment of infection and significantly influences the therapeutic response. *The in vitro cultivation of local canine piroplasms and further isolation of antigens or attenuated strains could help to improve effective immunoprophylaxis of babesiosis and to establish the basis for the development of an effective vaccine*.

• **fish-borne diseases** Fish-borne diseases have currently been expanding into new regions, including well-developed countries of the world, due to growing international markets and demographic and climate changes. One of the most important fish-borne parasitic zoonosis is diphyllobothriosis (Cestoda: Diphyllobothriidea), with about 20 million people being infected worldwide. Although these tapeworms have been recognized for a long time, many aspects of their taxonomy, biology, origin, distribution and epidemiology remain poorly known. *We have the ambition of determining new species-specific characteristics of* Diphyllobothrium spp*. with the broader aim of improving diagnostics of larval stages from fish, preferably those infecting humans and potentially colonizing new geographical areas. We will study the distribution and transmission routes of* Diphyllobothrium spp. *and resolve their origin – whether they are native to Europe or represent the result of trans-continental introduction. In addition, we will also pay attention to other fish-borne diseases transmissible to man, such as the digenetic trematodes* Metagonimus yokogawai *and* Clonorchis sinensis *(Trematoda: Platyhelminthes), and the roundworm* Anisakis simplex complex *(Nematoda).*

• **small rodents as reservoirs of parasitic and bacterial diseases** Rodents serve as reservoirs for several bacterial pathogens – one of the most important groups of zoonotic microorganisms (*Borrelia*, *Anaplasma*, *Bartonella*, *Rickettsia*, *Leptospira*). Small mammals play an important role as hosts of several groups of ectoparasites (ticks, fleas), zoonotic vectors of natural - focal diseases in urban and suburban areas. Wild rodents may also serve as reservoirs of antibiotic resistance (ESBLs, PMQR- plasmid quinolone resistance, carbapenemases) in indicator bacteria *Escherichia coli* and *Pseudomonas aeruginosa* in relation to their contact with domestic animals and wild birds. *Future research will be focused on molecular detection of bacterial pathogens in small mammals and in ticks and fleas sampled from rodents, as well as in ticks collected on vegetation in towns and surrounding forests. The evaluation of the role of small mammals as reservoirs of bacterial resistance to antibiotics will be studied, too. The results will lead to the explanation of parasite-host relationships and the monitoring of hosts and geographical distribution of pathogens in reservoir animals and vectors. This research will be performed in cooperation with the Institute of Animal Physiology, SAS, Košice.*

• **veterinary medicine** Current trends in the production of ecologically clean foods has increased the demand on researchers for a variety of natural resources in the form of alternative products, plant extracts, natural plant compounds and various kind of additives, not only to improve the productivity of livestock, but also for therapeutic purposes. The modern broad-spectrum anthelmintics are currently widely used in prophylaxis and treatment of helminth infections in farm animals. As was seen with antibiotics, the overuse of anthelmintics may result in the development of resistance in the targeted organisms. The problem of resistance to chemotherapeutic drugs has gradually grown from its rather sporadic occurrence to the current status, in which anthelmintic resistance threatens the sustainability of many intensive productions systems. The interactions between composition of feed or pastures, minerals and ruminant nematode infections have been studied and it has been confirmed that certain forages reduce the establishment of incoming nematodes or reduce existing worms*. The future strategy will be to answer the question of whether the enrichment of the feed a diet with plant mixtures rich of bioactive compounds affects the health and parasitostatus of grazing animals. The novelty of our approach is in selecting mixtures of medicinal plants naturally appearing in Central Europe and containing the bioactive compounds that have so far not been tested. Selected medicinal plants will contain a specific mixture of active compound with anti-inflammatory, carminative and antiparasitic properties. We believe that enriching feed rations by adding plant mixtures with bioactive compounds may substitute for the lack of plant diversity on pastures a simultaneously improve animal health and affect the establishment of parasitic infection in animals. This research will be performed in cooperation with the Institute of Animal Physiology, SAS, Košice.*

• **human medicine** *The laboratory of human parasitology is focused on the design of novel somatic and excretory-secretory antigens of different species and developmental stages of medically important parasites (e.g. genera Toxocara, Trichinella, Echinococcus, Dirofilaria). Such antigens will be applied in validation tests and standardization procedures and will be put into practice of highly specific diagnostic approaches of parasitic diseases in humans. The IP*

SAS will thus be able to provide diagnostic services beyond the scope of commercial diagnostic laboratories as well as verification and confirmation of disputable diagnostic outputs of parasitic infections.

Project proposals submited to 7RP or H2020	2012	2013	2014	2015
Institute as coordinator	0	0	0	0
Institute as participant	0	0	0	0

4. Other information relevant for the assessment

The present accreditation questionnaire reflects all the important results and activities of the IP SAS in the period 2012-2015. To conclude, we would like to introduce a SWOT analysis providing a picture of the Institute and also involving our weaknesses. The long-term objective of the Institute of Parasitology SAS is doing quality research, to maintain a leading position in parasitological research in Slovakia and a well-balanced position in Europe. In order to achieve this aim, the following internal and external factors are/are not favourable:

S – Strengths

personnel structure

• a number of research professors and good potential to maintain a balanced human resources state

• favourite age structure; productive researchers mainly in the young or middle-age category (30-45 years)

• motivated post-doctoral students

• maintaining the interest of graduated university students in the parasitology research field, which is reflected in annual filling of the PhD. scholarships quota.

publication activities

• number of published papers (based on a comparison with other Institutes of the Section of Veterinary and Agricultural Sciences SAS)

balanced research structure

• basic research mainly on the international area

• applied research documenting the irreplaceable position of IP SAS in the decision-making sphere

W – Weaknesses

• current passing interest of PhD. students and young IP SAS researchers in general to attend long-term study stays abroad

• number of visits of PhD. students and post-docs from abroad

• necessity to increase even more the number of papers published in journals of broader scientific interests, which would consequently increase the number of citations

• high rate of overhead expenses, service costs and maintenance charges for four buildings, which are run by the IP SAS and have to be covered mainly by research projects

• historically, IP SAS research (former Helminthological Institute SAS) has been focused on basic research of parasitic worms – helminths. Top world class parasitology teams deal with medically important protist groups, such as *Plasmodium*, *Trypanosoma*, *Leishmania,* etc. This fact has also a geographic explanation; the research on parasites is mainly focused on parasitological problems relevant to the country. The biochemical and molecular research on the above protists represents top, high-ranked research in parasitology; the IP SAS is rather handicapped in this regard.

O – Opportunities

• the SAS and sectoral research institutions are in a process of transformation into the public research institutions (so called v.v.i.); in this respect we await on-coming positive changes in function and funding of the SAS institutions, including the IP SAS

• the Presidium of SAS initiated fusions of present SAS institutions into more flexible and competitive Research Centres. Opened discussions regarding potential partners of the IP SAS are still ongoing.

• extra-budgetary means (e.g. EU Funds) are required for maintenance of personnel structure, infrastructure improvement and consumables for research

• to maintain well-established and negotiate new contracts with private and industrial partners to keep up with the future SAS strategy to be a partially financially independent institution and to provide fee-based services

T – Threats

• the handicap of the Institute to compete in project calls which require the participation of applicants with a higher number of employees

• the constant increase of administration costs

In Košice, August 5th, 2016

RNDr. Ivica Hromadová, PhD.
Director of IP SAS