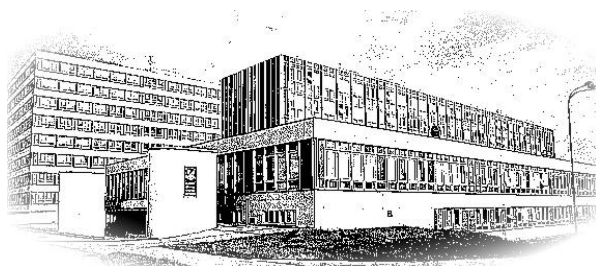


**UNIVERSITY OF DEFENCE BRNO**  
**FACULTY OF MILITARY HEALTH SCIENCES**

**ANNUAL REPORT**

**2018**

**HRADEC KRÁLOVÉ**  
**CZECH REPUBLIC**



**Faculty of Military Health Sciences**

**Hradec Králové**

## EDITORIAL NOTES

*Dear Reader,*

*This publication presents the main activities of the Faculty of Military Health Sciences of the University of Defence.*

*The 27<sup>th</sup> Annual Report includes the principal research and educational activities of the 8 departments, so that it may act as a basis for internal and external evaluation respectively.*

*Should you require more detailed information about our Faculty, it is available on our website <http://fvz.unob.cz> or <http://www.pmfhk.cz>.*

*In case of any suggestions or comments to our activities, do not hesitate to contact us at the address listed below.*

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## CONTENTS

EDITORIAL NOTES .....	3
CONTENTS .....	5
FOREWORD .....	7
INTRODUCTION .....	9
• HISTORY .....	9
• THE MAIN AIMS OF THE FACULTY IN 2018 .....	12
• THE STRUCTURE OF THE FMHS .....	17
THE DEAN OF THE FACULTY AND HIS DEPUTIES .....	18
• MEMBERS OF THE SCIENTIFIC COUNCIL .....	19
• MEMBERS OF THE ACADEMIC SENATE .....	20
• MEMBERS OF THE EDUCATION COMMISSION .....	21
• MEMBERS OF THE EDITORIAL COMMISSION .....	21
DEPARTMENT OF EPIDEMIOLOGY K-301 .....	22
DEPARTMENT OF MILITARY MEDICAL SERVICE ORGANIZATION AND MANAGEMENT K-302 .....	28
DEPARTMENT OF RADIOBIOLOGY K-303 .....	30
DEPARTMENT OF TOXICOLOGY AND MILITARY PHARMACY K-304 .....	37
DEPARTMENT OF MILITARY SURGERY K-305 .....	45
DEPARTMENT OF MILITARY INTERNAL MEDICINE AND MILITARY HYGIENE K-306 .....	49
DEPARTMENT OF EMERGENCY MEDICINE AND MILITARY GENERAL MEDICINE K-307 .....	57
DEPARTMENT OF MOLECULAR PATHOLOGY AND BIOLOGY K-308 .....	60
VIVARIUM .....	68
COMMUNICATION AND INFORMATION SYSTEMS OFFICE .....	70
VISITORS TO THE FACULTY OF MILITARY HEALTH SCIENCES .....	72
VISITS ABROAD .....	75
WORKSHOPS, COURSES, RESIDENCIES AT THE FACULTY .....	83
INTERNATIONAL COOPERATION .....	87
SCIENTIFIC AND RESEARCH ACTIVITIES .....	93
THE REVIEW OF RESEARCH PROJECTS CARRIED OUT AT THE FACULTY OF MILITARY HEALTH SCIENCES .....	98
ARTICLES IN JOURNALS WITH IMPACT FACTOR .....	112
ARTICLES IN OTHERS JOURNALS .....	125

TEXTBOOKS, MONOGRAPHS, ARTICLES IN MONOGRAPHS AND PROCEEDINGS.....	129
ABSTRACTS IN JOURNALS WITH IMPACT FACTOR.....	133
ABSTRACTS.....	135
PRESENTATIONS AND POSTERS .....	140
INDEX .....	161

## **FOREWORD**

The Faculty of Military Health Sciences of the University of Defence in Hradec Kralove represents a center of medical education and research of the Czech Army with long-term history in the Czech Republic. The military medical education began in Hradec Kralove in 1951. The school was established by an order of the President of the Republic as the Military Medical Academy, and later a honorary title of "Jan Evangelista Purkyně" was added. Later on, the name was changed to the Military Medical Research and Postgraduate Institute, but the name was reverted back in 1988. In 2004, during professionalization of the army and reorganization of military education the University of Defence was founded. Since then our Faculty has become an integral part of the University of Defence and has been renamed, once again, the Faculty of Military Health Sciences. At present, the Faculty is the only institution, which provides a military medical education at the university level. The Faculty provides an education in one accredited Bachelor's study program (Military Paramedic), three Master's study programs (Military General Medicine, Military Dentistry, Military Pharmacy) and eight doctoral study programs. However, our role is not only to educate and train all medical, pharmaceutical and nursing specialists and to maintain scientific excellence, but also to provide a general support to the Military Medical Service.

The very fact that the Faculty has survived all reforms and other changes demonstrates its uniqueness, as well as its high educational, professional and research level. The specificity of our educational model lies in a close cooperation with other scientific and educational workplaces. Thus the Faculty enjoys close collegial relationships with the Medical and Pharmaceutical Faculties of Charles University, the University of Hradec Kralove, the Faculty of Health Studies in Pardubice, the Faculty Hospital in Hradec Kralove and the Military Medical Agency. Especially the two faculties of Charles University and the University of Pardubice cooperate closely with our school in providing the education to our students. As a result, our Master degree students graduate both from our Faculty and from the respective Faculty of Charles University. In 2012, the Central Military Hospital in Prague was declared the Military Faculty Hospital. This medical facility, which we cooperate very closely with, creates a good background for military medical practice for our students. Finally, our school could not thrive without a support from representatives of the city of Hradec Kralove, which our school enjoys ever since its foundation.

At present, the Faculty covers the needs of troops concerning medical professional training in all specializations, medical science and research. The Faculty has educated a lot of specialists who have been subsequently awarded key positions both at national and international levels. These positions have been held by former and present faculty personnel in important international institutions such as the NATO Surgeon General Office

## **FOREWORD**

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in Europe, memberships in various NATO and EU bodies, United Nations Security Council, and World Health Organization boards. The Faculty members are engaged in many research projects awarded by both national and foreign military, as well as civilian research agencies. The laboratory compartment houses state-of-the-art laboratory technologies focused mostly on projects advancing our knowledge of protection against CBRN agents. The scientific results are published in many respected international journals, such as the Lancet.

In spite of continuously lowering financial budget and personnel reduction, we aim to continue and even to increase most of our activities. Our scientific production rate is the highest at the entire University of Defence. The Czech (Medical Service) field hospitals are well-known around the world and highly valued among our NATO allies. Our approach is different from the majority of other services. Our training is both long-term and intensive, thus the students gain deeper knowledge and skills as well as awareness of a military life. Education, training and research should be joint and, to provide that, the Faculty strives to create a pool of excellent professors, scientists and teachers. The Faculty of Military Health Sciences is an open body for mutual cooperation with scientists and teachers from all democratic countries. In spite of changing priorities in the Czech Military, we have been still focusing on the specialization of the Czech Armed Forces in the nuclear, biological and chemical protection and we have been engaged in many humanitarian and military deployments of military medical services abroad. Our Faculty will play the key role in this demanding process. We will guarantee the research and fulfilment of training needs for medical corps, specialized forces and for some NATO countries. Nevertheless, our primary concern is to educate and train students and young physicians. This can be hardly possible without our closest partners, international collaborators and friends.

In conclusion, I would like to say that all results and successes I perceive as a consequence of the cooperation of teachers and students and other employees of our Faculty, developing relationships with our graduates and maintaining a close collaboration with our partners. The next period should, hopefully, bring us another step in the successful development of the Faculty and its dedicated employees.

Pavel BOSTIK, MD, PhD

Professor and Dean of the Faculty of Military Health Sciences



## **INTRODUCTION**

### **HISTORY**

The Purkyně Military Medical Academy has been a long-term educational and scientific center of the Czech Army Medical Service. There has been a very long history of systematic education of military medical personnel in our country. Its beginnings lie, as in many European countries, in the 18th century. Large, permanent armies were being built and the military medical service became a normal part of these armies. In 1776 the War Council of the Vienna Court issued an administrative order which definitely prohibited the employment of field surgeons in the armed forces who had not studied anatomy and who had not had their knowledge officially examined. This can be considered the beginning of organized education of military medical personnel in our country lasting up to the present days.

The fundamental milestone in the “Austrian” stage was, however, in 1785 with the establishment of the Military Medical (Surgical) Academy named the Josephinum after its founder, the enlightened monarch and father of many political and social reforms, Emperor Joseph II. He saw the mission of the school as fulfilling these tasks:

- education of qualified military surgeons (physicians)
- creation of a learned society for research in medical science
- creation of a permanent field sanitary commission for solving questions concerning combat casualty care.

A number of renowned physicians of Czech origin significantly contributed to nearly 90 years of the school’s history.

The foundation of the independent Czechoslovak Republic in 1918 meant at the same time the creation of a democratic army. The basic element of career military physician training was represented by the Military Medical School. Its establishment was the result of a decision by the Czechoslovak Republic government which by its resolution of 25 June 1926 defined the principles of recruiting professional medical and pharmaceutical personnel to the army. The Military Medical School provided professional training for military physicians and further qualification growth for the performance of higher command functions in the military medical service structure.

The development of the Czechoslovak Military Medical Service in our country was interrupted by the Second World War. When the army was disbanded a number of physicians and medical students participated in foreign and domestic resistance. The largest number of them were concentrated in England. The British government permitted medical students to complete their studies at British universities. They graduated from Oxford

## **HISTORY**

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University. The Czechoslovak Military Hospital was created at London Hammersmith Hospital. A few courses of the Medical and Pharmaceutical Reserve Officer School were taught in Leamington and Walton-on-the-Naze where the Czechoslovak Brigade's out-patients' department was situated. Thus, the tradition of the Czechoslovak military medical educational system maintained its continuity.

In 1945, the pre-war practice of recruiting professional personnel to the Military Medical Service was rebuilt. The Military Medical School in Prague was renowned. At the same time tendencies referring to the practice of some medical services of the world's leading armies which required the establishment of an independent military medical university were increasing. The results of the Second World War and the growth of new knowledge in the field of medicine and especially military medicine played a significant role in this.

In 1951, a new period began in the development of the Czechoslovak military medical educational system. This period has been permanently connected with Hradec Králové for 55 years. Rapid establishment of the Military Medical Academy (MMA) was possible only due to the fact that it was built on the basis of being a theoretical and clinical part of the Faculty of Medicine – a branch of Charles University established in 1945. Thanks to the reputation of its workers, a majority of whom became employees of the MMA, the school became an educational and scientific center of the Czechoslovak Medical Service and within a short time gained a good reputation both at home and abroad. The MMA has educated a number of outstanding military medical specialists and the first steps of several contemporary top specialists of Czechoslovak medicine were connected with its existence.

Beginning in 1958 and for the next 30 years the military medical system was transformed into the form of the Purkyně Military Medical Research and Postgraduate Institute. Research tasks and activities in the area of further schooling and specialization of military physicians and pharmacists became a fundamental part of its activity. The main portion of a further basic task of the school – the pregraduate training of future military physicians – was taken over by the renewed Faculty of Medicine of Charles University in Hradec Králové. The development of mutual cooperation between these two partner schools, to which the Faculty of Pharmacy of Charles University in Hradec Králové joined in 1976 as a significant guarantee of the education of military pharmacists, has become a part of the military medical system.

In 1988, the school changed its name to the Purkyně Military Medical Academy which, institutionally, reflects more precisely the wide variety of its activities.

In November 1989, the school entered a qualitatively new period of development. It has passed through a transformation which has basically changed some military-professional teaching programs, the organizational

structure of the school, personnel support, the composition of the educational staff and so on.

The Academy has been included in the new university educational system and since 1993 (origin of the Czech Republic) has served as a training center for Czech Army medical professionals. It has trained nearly 2600 military surgeons, dentists, and pharmacists till now.

After the transformation of the Purkyně Military Medical Faculty into the Faculty of Military Health Sciences (seated still in Hradec Králové) in 2004, the basic functions and tasks of the school focused on a specialized training of the Czech Army medical officers and research work in the area of military health service.

The Faculty of Military Health Sciences is focused to provide university-level studies from medicine, stomatology, pharmacy and medical rescue. The faculty has also eight PhD programs and provides the upper form of education as well. Since its establishing, the Faculty of Military Health Sciences is a significant school providing not only graduates but also significant research like publications in journal or participating in scientific projects. The results from creative work can be learned just from this report printed annually.

## **THE MAIN AIMS OF THE FACULTY IN 2018**

The Faculty of Military Health Sciences (FMHS) of the University of Defence in Hradec Králové represents a centre of medical education, training and research of the Army of the Czech Republic. It covers entirely the needs of the troops concerning medical professional training in all specializations, medical informatics, science and research.

### **1. Education**

The main aims of the FMHS in the field of education were as follows:

- to provide university-level studies in the subjects of military general medicine (6 years), stomatology, pharmacy (5 years), and medical rescue (3 years)
- to provide postgraduate study for PhD degree (4 years) in the following accredited disciplines:

Epidemiology	Military Hygiene
Field Internal Medicine	Military Radiobiology
Field Surgery	Molecular Pathology
Infection Biology	Toxicology
Medical Microbiology	Preventive Medicine and Public Health Protection

According to the needs of the Surgeon General of the Czech Armed Forces and the Military Medical Service Administration, the Faculty provides specialized and lifelong education of doctors, pharmacists and other military medical service personnel in specified branches of the Act No. 95/2004 of the Code about conditions of receiving professional qualification and specialized qualification to perform a medical profession as a physicians, dentists, and pharmacist. It unifies the system of their training with requirements of EU.

The Faculty organizes and provides training for medical personnel in the active duty, physicians and nurses. The Faculty provides professional refresher courses for medical staff, non-medical staff and non-medical

personnel serving field medical units and individual units of the military hospital base on select up-to-date topics. The school actively participates in continued training of physicians and health care personnel, who then serve in missions abroad. However, the unique military know-how is also attractive for people, who work out of the military health care sphere. The FMHS provides courses on the advanced first aid in the field not only for Military Medical Service personnel but also for non-medical professionals of Military Police units, reconnaissance and special units within the frame of the Czech Armed Forces, Rapid Reaction Units of the Czech Republic Police and others.

All soldiers selected for foreign missions attend special courses of an advanced first aid. Training in emergency life support in field conditions is required for medical personnel. The Battlefield First Aid courses for physicians and nurses or health care personnel include the problems of CBRN protection as well and became a standard not only for the entire military medical staff, but also for many other specialists, who are enrolled in foreign missions.

Other courses concentrate on teaching and training of a comprehensive knowledge necessary for providing medical care within the frame of Disaster Medicine. The FMHS also provides other teaching and training activities determined by "The Plan of Courses and Professional Residencies Training of the Czech Armed Forces Medical Service" and "Notification of Director of Personal Section of the Ministry of Defence – Teaching Activities at Military schools and Training Facilities in the Czech Republic and Abroad". It participates in medical personnel training of medical and non-medical specializations under the methodical and professional leadership, in providing instructors for training of advanced categories of medical personnel and in teaching instructors of lower medical specialists training.

## **2. Scientific and research work**

The FMHS of the University of Defence provides and solves research tasks for the Czech Armed Forces Medical Service. Well assembled scientific teams focus on individual research tasks using state-of-the-art technologies. Within the Faculty, complex laboratory technologies for scientific work are utilized for scientific advancements, which lead to the improvement of life force protection against CBRN agents. The high scientific level and the achieved results in scientific and research activities of present teams have enabled to for scientific cooperation with foreign partners. The FMHS is a leading institution in the Czech Republic performing military research within the sphere of CBRNE issues in NATO and EU.

The high-quality research capabilities and international recognition of the scientific teams form a solid base for scientific cooperation with partners in NATO countries, which is financed by the NATO and EU funds. Within the sphere of the science and research, the FMHS fulfilled strategic purposes of the Czech Armed Forces transformation by targeting the priorities of the

Army (biological agents, chemical agents, military health care). Furthermore, it joined the appropriate institutions and organizational structures of NATO and EU countries and obtained original results in these critical areas. From the point of view of specialization and direction of the Czech Armed Forces, the departments of the FMHS solve medical issues of biological, chemical and radiation protection. Previous and current scientific work focuses on medical aspects of the effects of CBRN agents and several scientifically oriented departments within the FMHS work in collaboration in solving the specific tasks. This fully corresponds with set priorities in the field of scientific and research work of the Army of the Czech Republic. The military medical service organization and management, information systems, research activities of clinical and therapeutic preventive branches represent other important fields of scientific work.

Many invitations to international symposia and conferences as well as a number of publications prove that scientific knowledge is used in education. The FMHS personnel can publish achieved results of their research work, therapeutic preventive activities and educational activities in the journal *Military Medical Science Letters* – the oldest military specialized journal, which has been published since 1925. As of the last year, the journal is published fully in English. Together with professional scientific results the pedagogical activities are subject of an annual evaluation. Based on the results, the academic staff is successful in keeping a good level of publication activities in journals with impact factor and in other national and foreign journals. This, in turn, enables for relatively broad and successful training activities in the accredited doctoral study programs.

Scientific, research and development activities in the field of medical support include the prevention, diagnosis and treatment of sick and wounded. An integral part of this work is to improve the system of the medical equipment administration and supply support.

Research and development is carried out at 8 departments – Epidemiology, Military Medical Service Organization and Management, Radiobiology, Toxicology and Military Pharmacology, Military Surgery, Military Internal Medicine and Hygiene, Emergency Medicine and Military General Medicine, Molecular Pathology and Biology.

In 2018, scientific work at the Faculty departments focused on CBRNE protection research, projects on pathogenesis of infectious diseases and potential intervention means, prevention in the field of hygiene and epidemiology, topical problems of the field surgery and field internal medicine, topical problems of the organization, management, education and information technology in the Military Medical Service.

The continuous accreditation for proceedings to achieve professorships in the areas of Epidemiology, Medical Microbiology, Toxicology, Field Internal Medicine, Infection Biology and Molecular Pathology and the accreditation for habilitation (associate professorship) in the branches of

Hygiene, Preventive Medicine and Epidemiology, Medical Microbiology, Toxicology, Field Surgery, Military Radiobiology, Field Internal Medicine, Infection Biology and Molecular Pathology gives the evidence about the excellent level of achieved results in scientific and research activities of FMHS.

### **3. Therapeutic activities**

Special therapeutic activities were provided especially at the departments of Field Internal Medicine, Field Surgery and General and Emergency Medicine. Close cooperation between these subjects and the health service establishments in the region have been continuously developed. Therapeutic medical care was provided especially in the fields of hematologic intensive care, traumatology, hepatobiliary surgery, plastic surgery at the departments of internal medicine and surgery at the Teaching Hospital.

### **4. International cooperation**

The main aims of international cooperation of the FMHS were to exchange scientific, educational and therapeutic information and to develop working contacts between military medical, medical educational and research institutions of the NATO and EU countries as well as civilian medical institutions with educational, defence research and development programs worldwide. Residency and exchange programs for numerous students, doctors and research workers took place at those institutions. As for study programs, the Faculty keeps close relations with partner educational institutions above all in NATO and EU countries.

### **5. Expert activities**

The membership in work groups for coordination and cooperation of military medical research and professional training at NATO (COMEDS, BIOMEDAC, RTA/RTO) and at EDA (European Defence Agency), in work groups of government experts for the Convention on the prohibition of biological, bacteriological, and chemical weapons and their destruction in Geneva and UNO, organizing scientific conferences with international participation, and solving foreign research projects under the cooperation of the FMHS personnel are very important for the presentation of international cooperation results. The priority still remains in cooperation in the frame of the Human Factors Medicine of the NATO Research and Technology Organization and its work groups (TG, WG), CBRN and Human Factors cooperation within the frame of EDA and additional collaborative research projects with other foreign scientific institutions. Our aim is to intensify international cooperation in NATO focused on scientific support of the armed forces structure.

### **6. Scientific and educational information services**

Scientific and educational information services that support the Medical Service of the Czech Republic Army were provided by the Department of

## ***THE MAIN AIMS OF THE FMHS IN 2018***

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Information and Communication Technologies. Numerous literature retrievals, courses, library and printing workshops and other information services support for students, teachers, scientists, postgraduates, doctors, nurses and other medical experts were carried out.

### **7. Foreign missions**

The FMHS performed the preparation of health personnel for humanitarian and peacekeeping missions and members of the FMHS staff participated in several foreign missions.



**THE STRUCTURE OF THE FMHS**



## **THE DEAN OF THE FACULTY AND HIS DEPUTIES**

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**The Department of Epidemiology** as the basic educational and research component of the Faculty of Military Health Sciences (FMHS) is divided into three groups: the epidemiology group; the microbiology,

disinfection, disinsection and rodent control group; group of experimental biology.

The Department of Epidemiology has fulfilled the following main tasks:

It has provided undergraduate education at the FMHS and at the civilian Medical Faculty of Charles University in Hradec Králové, as well as postgraduate training and postgraduate doctoral studies. The teaching activities have been particularly aimed at general and special epidemiology with respect to the topical situation in the Czech Army and in the Czech Republic. The topics of "Emerging and Reemerging, Infectious Diseases", "Travel Medicine" and "Dangerous Pathogens" have also been emphasized. Two doctoral study programs (PhD – epidemiology and medical microbiology) are certified by the Czech Governmental Commission. Since 1990, more than 31 students have finished their PhD studies in the Department. The Department has state accreditation for habilitation and for professorial appointment in two medical branches: Hygiene, Preventive Medicine and Epidemiology; and Medical Microbiology.

The Department of Epidemiology plays an important role in education, training and consultancy related to biological threats/weapons and preventive medicine.

Members of the Department participate in training and education of medical and other personnel dispatched in military peacekeeping and humanitarian missions abroad. The aim is to inform them about any health risks during staying abroad, especially about prevention of infectious diseases, possibilities of vaccination or chemoprophylaxis. They also provide both consultancy service prior to the departure abroad and a practical realization of the respective measures. The Department of Epidemiology provides an epidemiological service for the Field Hospitals of the Czech Army.

Research activities have concerned seroprevalence studies (e.g. Pertussis, Viral hepatitis C, Measles, Mumps, Hantavirus, Q-fever), testing the antimicrobial activity of the new compounds, molecular genetic analysis of herpes viruses.

The members of the Department are members of journal's editorial boards (e. g. Epidemiologie, mikrobiologie a imunologie – prof. Splino; Military Medical Science Letters, Vaccines and Immunology, and Vakcinologie – prof. Chlibek; Annals of Infectious Disease and Epidemiology – doc. Bostikova), and they work as reviewers of international journals as well (Vaccine, Lancet Infectious Disease). Some of them work in a number of committees and boards: European Centre for Disease Control and Prevention (prof. Chlibek) or Central European Vaccination Awareness Group-CEVAG (prof. Chlibek).



The members of the Department are also members of NATO working groups and advisory committees for biological threats and weapons (BIOMEDAC – Biological Medical Advisory Committee – prof. Chlibek) and NATO-Research&Technology Organisation (prof. Chlibek). Prof. Bostik is a CZ representative to the EDA advisory Capability&Technology group CBRN and Human Factors and also an active member of the NATO LTSS HFM-273 group.

Disinfection, disinsection and rodent control are very important parts of the medical practice in the Czech Army. This Department is the only one of its kind in the Czech Army for the assessment of the antimicrobial efficacy of disinfectants or new antimicrobial agents.

## **RESEARCH PROJECTS**

### **BIOFILM – Synthesis and evaluation of novel compounds based on quaternary ammonium salts for eradication of microbial bio films**

Marková, A., Marek, J.

Supported by the Ministry of Education, Youth and Sports, 2018–2020 (Project No.: SV/FVZ201808)

Biofilm is community of microorganisms fixed to the various surfaces (in healthcare, for example, tissues, catheters, cannula plastic implants, teeth and dental implants). Biofilm formation is much better for a number of microorganisms than staying in a planktonic form. Microorganisms are able to differentiate during the biofilm formation and produce specific biofilm phenotype. Formations of flagella and fimbria are genetic modifications enabling initiation of adhesion, however production of extracellular polysaccharide matrix is significant for biofilm protection. Due to polysaccharide matrix are biofilms more resistant against external conditions (mechanical and chemical). In general, planktonic forms of microorganisms are more easily eliminated than their biofilms. Our main research activity will include synthesis of novel compounds based on quaternary ammonium salts and evaluating their eradication ability against pathogenic microorganisms. Minimum inhibitory concentration (MIC) will be measured for all substances, then we will focus on introducing a new MBEC-based methodology for measuring minimum biofilm eradication concentration (MBEC). Our laboratory has appropriate strains of biofilm forming microorganisms (*Pseudomonas aeruginosa*, *Staphylococcus aureus* etc.). Two or three suitable strains will be chosen and we will compare antimicrobial action of new compounds against biofilm and planktonic form. Furthermore, the effect of new compounds will be compared with standards (benzalkonium etc.) The most important outcome of this study is to show the differences in the effectiveness of disinfectants on the microorganisms in two different life forms.

**BREASTFEEDING – Factors influencing initiation and continuation of breastfeeding in the South-East United States**

Holmquist, I., Bošťíková, V.

Supported by the Ministry of Education, Youth and Sports, 2018–2020 (Project No.: SV/FVZ201812)

The purpose of this study is to determine and analyze changes in breastfeeding rates and to explore factors influencing initiation of breastfeeding in a hospital setting with specific focus on the South-East United States and the Czech Republic. Exploring factors that influence initiation of breastfeeding in hospital settings is especially important because most of currently available studies only review the effects of direct breastfeeding interventions, rather than the role of policies and pro-breastfeeding programs. Data about the effect of policies and pro-breastfeeding programs are rarely collected and reported. This study will compare and contrast practices, policies and pro-breastfeeding interventions in the South-East United States with practices, policies and pro-breastfeeding interventions in the Czech Republic.

**CLOSTRIDIUM – Colonization of the intestine of medical personnel with *Clostridium difficile* as a potential source of hospital acquired infections**

Hašková, K., Bošťíková, V.

Supported by the Ministry of Education, Youth and Sports, 2018–2018 (Project No.: SV/FVZ201809)

Study of potential colonization of the intestine of medical personnel with *Clostridium difficile*. The subject of the study is to figure out the percentage of medical personnel colonized with toxin-producing *Clostridium difficile* with the use of real-time PCR detection of toxin B. This is important due to the fact that *Clostridium difficile* is mainly a hospital-acquired infection and the increase of incidence of *Clostridium difficile* infections in the Czech Republic from both a medical and economic perspective.

**Development of novel disinfectants against pathogens occurring in the hospital environment**

Soukup, O., Marek, J., Bošťík, P., Bošťíková, V., Sleha, R.

Supported by the Internal Grant Agency of the Czech Republic Health Service, 2015–2018 (Project No.: NV15-31847A)

In this project, we would like to develop new compounds based on quaternary ammonium salts with a strong disinfectant potential against nosocomial infections in hospital environment, thus bacterial, fungal and viral pathogens. The project is designed for development of various (3-6) mixtures with strong disinfecting properties and wide spectrum of efficacy by combining individual agents with more specific efficacy. Developed mixtures also should not exert skin irritation at operating personnel, which will be ensured by in vitro and in vivo skin tests. Furthermore, variability of the mixtures and their alternating application should represent a tool for the controlling of microbial resistance. In this project, basic research (9%) represent the synthesis of novel compounds and the structure-biological activity relationship (SAR) evaluation. Applied research (91%) represents majority of the project, thus, the funnel-like selection of a drug candidates, their in vivo safety validation and subsequent patent protection application with subsequent application for patent protection.

### **The potential of xanthohumol and beta-bitter acids in the therapy of nosocomial infections**

Boštík, P., Boštíková, V., Páral, J., Mikyška, A., Čermák, P., Bogdanová, K., Houška, M.

Supported by the Internal Grant Agency of the Czech Republic Health Service, 2017–2020 (Project No.: NV17-31765A)

The increasingly more prevalent bacterial resistance to antibiotics presents an important worldwide problem. Compounds of natural origin with a proven anti-bacterial effect may represent new resources in this area or serve as complementary therapies utilized together with antibiotics. Certain compounds from hops, especially beta-bitter acids and xanthohumol possess strong inhibitory effects on Gram-positive (*Staphylococcus aureus*, including resistant variants such as MRSA) and anaerobic bacteria, namely *Clostridium perfringens* and *C. difficile*. Some of the other characteristics of these compounds, including their low solubility in water, low toxicity and low level of adsorption in the gastrointestinal tract (GIT), predispose them as useful tools for local infections of skin and GIT. Formulations containing these compounds, which will be developed and evaluated in this project, can thus represent much needed tools for a local therapy of infections caused by antibiotic-resistant strains of bacteria.

**DEPARTMENT OF MILITARY MEDICAL SERVICE ORGANIZATION  
AND MANAGEMENT K-302**

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**The Department of Military Medical Service Organization and Management** is the primary department which offers military and professional training for the students of the Faculty of Military Health Sciences, particularly in the field of military medical service support in operations, disaster medicine, crisis management, emergency planning and psychology. Other covered subject areas are military history, military tactics & logistics, military communication, topography and CBRN defence. The Department organizes follow-up education for military doctors, stomatologists, pharmacists and bachelors in advanced courses. Likewise, it offers specialized training and refresher courses for paramedical personnel to the extent necessary to carry out required medical duties in military

operations e.g. military medical service organization, medical evacuation and crisis intervention. It participates in preparation of non-medical personnel located within the HQ and staff of the military medical units and facilities. It carries out training in medical support planning, working with maps, deployment of field medical facilities, calculation of medical casualties and military medical units command, control and cooperation.

The subject „Organization and Tactics of the Medical Service“ makes students acquainted with terms and conditions of the medical service during wartime and in foreign operations, identifies tasks and principles of medical support and medical C2 issues that are fundamental to comprehension and correct application of knowledge in terms of other military medical branches. It familiarizes students with the principles followed from NATO documents and standardization agreements.

The Department's primary aim is to pass the knowledge on to students, develop their habits and skills to fulfill basic tasks and duties arising from their planned command functions. It is involved in preparation of medical personnel prior to deployment. The Department provides knowledge and passes previous experience on to control authorities and executive facilities of the medical services in crisis, a war or other emergency situations as well as in humanitarian missions. It applies the knowledge of military subjects to specific environment of medical service, respecting both military principles and requirements as well as the principles of International Humanitarian Law.

The research work of the Department focuses on improving the quality and efficiency of organization and management of the medical service in accordance with military doctrine of the Czech Republic. It contributes in optimization process of the organizational structure of the medical units, departments and facilities, elaborating principles of their operations and methods of their control during a war. It develops materials and proposals from these areas for conceptual authorities of the ACR Medical Service, including NATO STANAG assessment reports in terms of their ratification and options of implementation.

The Department is an expert guarantor in the field of military medical service organization and management. It provides expert statements for the Ministry of Defence and Military Medical Agency and gives consultations to managers of all military medical service levels.

**DEPARTMENT OF RADIOBIOLOGY K-303**

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**The Department of Radiobiology** was established at Purkyně Military Medical Research and Postgraduate Institute on September the 1st 1963. The first chief of the department became Colonel Prof. MUDr. Josef Mráz, CSc., who was in 1968 appointed the first professor of military radiobiology of Charles University. The main tasks of the department are teaching and research activities, which are closely connected.

In the field of research, the experimental work includes histology and cytology, in vitro methods, methods of proteomic analysis and methods of flow cytometry. Individual technological units allow in vitro and in vivo observation of post-radiation mechanisms on molecular, cellular, and organ levels.

Military research is focused on early diagnosis and therapy of post-radiation damage as the main objective of the department. The aim of investigation in the medium-term horizon is discovery and practical introduction of biodosimetric markers, study of molecular mechanisms of radiation-induced DNA damage repair and autophagy, development of radioprotection agents as well as continuous renewal of decontamination agents for the Army of the Czech Republic. Mutual cooperation with other CBRN research workplaces world-wide also remains an integral part of our research activities. Cooperation with civilian workplaces at the Faculty of Medicine and the University Hospital in Hradec Králové is focused on radiation oncology.

The Department of Radiobiology takes part in military medical-specialist education in the form of pre-gradual and post-gradual education mainly in doctoral studies. The main educational activity is lecturing military radiobiology. The main topics are: the nuclear weapons effects on the living organism, the possibilities of the protection and medical treatment of irradiated persons. Other specific military issues are disaster medicine, CBRN protection etc., which are taught at the Faculty of Military Health Sciences, including the topics, which are presented by the instructors of our department.

## **RESEARCH PROJECTS**

### **ACID – Application of nanoparticles from hyaluronic acid in protection against ionizing radiation**

Lierová, A., Šinkorová, Z.

Supported by the Ministry of Education, Youth and Sports, 2018–2018 (Project No.: SV/FVZ201805)

Hyaluronic acid (HA) is one of the main investigated molecules of this time for its physicochemical and biological properties such as biocompatibility, biodegradability and non-immunogenicity. The properties of this particular molecule depend on its size. Physiologically, HA occurs as a high molecular weight HA (> 1MDa), but a short HA fragment (150-350 kDa) formed during inflammation. High molecular HA has significant anti-inflammatory and antiangiogenic properties, supports cell survival and tissue regeneration. Unlike HA short fragments have pro-inflammatory and pro-angiogenic properties, promotes cell migration and acts as a strong signaling molecule that initiates production of chemokines, cytokines and growth factors in many cell types [1-3]. Hyaluronic acid and HA-binding proteins are involved in many processes, including modification of inflammation and maintenance of barrier function. Expression of HA binding proteins and activation of metabolism is in many models of acute organ damage and along with increased production of hyaluronidase. Other activators of this pathway include reactive oxygen species (ROS). ROS production is one of the major damaging properties of the ionizing radiation (IR) on the organism. In this regard, the HA pathway may be a very attractive and appropriate new therapeutic target for protection against IR [4,5]. The ability of HA as the major regulator of the amount of water in the interstitial space due to the binding of water to its molecular structure to form a high viscosity gel could also be utilized in radioprotection. This would reduce the number of radicals and thereby mitigate radiation damage [6]. In the 1950s, however, IR unwittingly disintegrated endogenous HA into short fragments, with worsening of inflammation [7], recent work by Riehla et al. [8], however, pointed to new perspectives in the use of HA in radioprotection. A radioprotective effect on the intestinal epithelium was recorded after intraperitoneal administration of hyaluronic acid prior to the 12-Gy total-body irradiation of the C57BL6 mouse model. The results of the work revealed a new mechanism of action via the Toll-like receptor signal pathway (TLR) 4. However, an application procedure was used as the HA was administered 8 hours before irradiation. Also, the possibility of influencing the high molecular weight HA ratio and the short fragment of HA at damage is also beneficial. In the case of prevalence of high molecular weight hyaluronan, even exogenously administered, it provides a protective signal for cells and thus supports survival and repair [9]. The chemical structure of this molecule allows very efficient production of nanoparticles (NP) and free substitution groups allow for surface modification by suitable substances for more targeted and efficient use. However, excessive amounts of bound molecules on HA surface modified into nanoparticles do not affect its metabolic activity. It has also been shown that HA NPs are more stable than exogenous chains with prolonged periods of blood circulation and degradation. These properties were used in more targeted chemotherapy, where the modified surface with anticancer substances (doxorubicin, mitomycin C) was added. For both of these NP-binding agents, multiple (100x) higher antitumor activity than with conventional chemotherapy. Although the modification of a certain



substance on nanoparticles always accompanies certain pros and cons, this molecule has several parameters, such as molecular weight, chemical modification, nanoparticle size and surface characteristics that significantly affect the resulting cell behavior after absorption of the resulting HA NPs [10-13].

### **CILIA – Primary cilia as an indicator of cell stress**

Filipová, A., Šinkorová, Z.

Supported by the Ministry of Education, Youth and Sports, 2017–2019 (Project No.: SV/FVZ201703)

Cellular stress is regarded as a pathophysiological damage mechanism in terms of homeostasis; it is triggered by diverse stimuli such as radiation, starvation, or chemical effects (e.g. cytostatics). Proliferating cells more sensitive to stress stimuli, particularly during cell division. From a homeostatic point of view, subliminal stimuli often induce repair mechanisms, and supra-threshold stimuli may induce apoptosis. The qualitative assessment of these processes is challenging and requires a comprehensive approach including both molecular biology and functional cell assays. Cellular stress could be defined as a complex system involving different levels of cell organization, i.e. genetic information, cytoskeleton structure, metabolism, and cell-to-cell contact. Cytoskeleton stability is an important indicator of cellular stress; therefore, an appropriate analysis of these changes could provide further insight on the development, and consequences, of cellular stress, its environment and homeostasis. In this sense, ionizing irradiation is a known source of cellular stress as it often induces centrosome multiplication in addition to DNA double strand breaks; centrosomes are essential for correct chromosome segregation during the cell cycle as they anchor the mitotic spindle, these centrosomes are formed from the mother centriole which is also the basal body of primary cilia. Primary cilia are membrane bound structures which are dynamically regulated during the G0/G1 phase and absorbed before entry into mitosis; therefore, ciliogenesis is closely associated with centrosome duplication during the cell cycle. Under normal conditions, centrosome duplication occurs only once within the cell cycle; however, the effect of radiation on primary cilia has not been studied to sufficient extent. The objective of this project is to describe and evaluate the suitability of primary cilia as an indicator of cytoskeletal instability due to cellular stress, induced by ionizing irradiation, in proliferating fibroblasts.

### **Development of novel radioprotective agents based on small molecular inhibitors**

Šinkorová, Z., Marek, J., Řezáčová, M.

Supported by the Czech Republic Grant Agency, 2017–2019 (Project No.: GA17-13541S)

Radiotherapy is a very important modality for treating cancer. Its therapeutic potential is however limited by normal tissue damage, which leads to a wide range of symptoms (impeding quality of life of oncologic patients), prevents delivery of intended dose and reduces the tumor-eradicating effect of the therapy. Both acute and chronic radiotoxicity have been associated with cell death. Whereas multiple cell death pathways are executed in cancer cells after irradiation, in radiosensitive tissues such as bone marrow or gastrointestinal tract, the cell death is dominantly mediated via apoptosis. Since a pro-apoptotic protein PUMA plays a key role in this process, its inhibition increases resistance against radiation. Inhibitors of PUMA seem therefore very promising in selective modulation of normal tissue damage during radiotherapy. Their clinical utilization could be very wide due to PUMA involvement in pathogenesis of myocardial reperfusion injury and neurodegenerative diseases.

#### **ELECTROCHEMISTRY – Electrochemical detection of DNA damage after gamma irradiation**

Jeličová, M., Němcová, M., Šinkorová, Z., Metelka, R.

Supported by the Ministry of Education, Youth and Sports, 2016–2018 (Project No.: SV/FVZ201602)

A main aim of this work is a detection of nucleic acid structural damage particularly double-strand breaks in a lymphocytes, which are induced by ionizing radiation (IR). Newly developed electrochemical method enables retroactive determination of received dose in a peripheral blood of irradiated people. Electrochemical detection is a method, which monitors electron transfer of redox compounds, that are bind to the DNA molecules on an electrode surface. Subsequently, a current distinctive signals, which are related to the structure of the complex are recorded. Based on these data the structure of nucleic acids can be studied in detail. A blood of an animal models and blood of an oncology patients later on, will be used for the experiments. The dose range is 0.5 - 5 Gy at the time intervals of 1, 4 and 24 hours after irradiation. Quantification of DNA damage by basic biodosimetric method (micronucleus assay) and detection of  $\gamma$ H2AX by flow cytometry will be used for comparison. Electrochemical detection provides unparalleled, simple, low-cost and quick way for solving the problematics without the need of sample evaluation by a qualified, pre-trained staff. Up to date, there is no fast and significant biodosimetric method usable within 24 hours after irradiation, making the proposed approach unique. Currently, a classic cytogenetic analysis allows retrospective assessment of received dose for only a few irradiated individuals. Besides, it is not only financially, but also

time-demanding. Hence, an improvement of this process comes to the forefront.

### **New approaches in diagnostics and therapy of irradiated persons**

Tichý, A.

Supported by the Czech Republic Ministry of Internal Affairs, 2017–2020  
(Project No.: VH20172020010)

The aim of the project is identification and quantification of proteins by mass spectrometry. Subsequent bioinformatic data analysis will select significant plasma proteins that are quantitatively different in serum samples of leukemic patients before and after whole body irradiation. The result will be a list of proteins with a demonstrable relationship to exposure to ionizing radiation. Furthermore, we aim to identify new irradiation indicators by flow cytometry. First, we aim to quantify changes in hematological parameters (leukocytes, thrombocytes, hematocrit) of an experimental mammalian model including LD50/30 as a basic indicator of the severity of an acute radiation syndrome (ARS), to classify irradiated subjects into one of the five Radiation Categories. Furthermore, the radiosensitivity of the major lymphocyte populations and their decrease in peripheral blood will be determined as a significant indicator for determining the dose range needed to distinguish the severity of ARS development. Quantitative changes in the leukocyte cytoplasm will be analyzed for accurate sorting. The result will be a panel of biological indicators that allow, on the basis of predefined parameters, to determine whether or not an individual was exposed to ionizing radiation and to estimate ARS development depending on RC categorization. In the last part of the project we will focus on testing of new ways of ARS therapy by growth factors. The goal is to test several combinations of clinically available growth factors for more complex bone marrow stimulation in ARS. The tested factors will include: peg-G-CSF, KGF and IGF-1. In addition to the determination of experimental survival curves, the efficacy of treatment by histopathological examination of selected tissues will be assessed and we expect the treatment to be verified with the most appropriate combination of growth factors in the higher mammalian model. The results will be recommendations for the application of growth factors and the evaluation of the benefits for ARS therapy.

### **THYMOCYTES – Effect of radioprotection in the development of thymocytes after whole body irradiation**

Němcová, M., Šinkorová, Z.

Supported by the Ministry of Education, Youth and Sports, 2016–2018  
(Project No.: SV/FVZ201606)

Thymocytes are a heterogeneous group of T cells with a key role in the immune system. While the development of the majority of hematopoietic cell lineages progresses in bone marrow, differentiation and maturation of T cells is completed in the thymus from bone marrow precursors. Changes in the migration process of hematopoietic cells and their differentiation in thymus can induce immunological disorder, autoimmune reactions or outbreak of cancer.

**DEPARTMENT OF TOXICOLOGY AND MILITARY PHARMACY  
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The Department of Toxicology was established in 1951. Since then, as an integral part of the Faculty of Military Health Sciences, it has been involved in education and scientific research work on chemical warfare agents for defensive and protective purposes only.

**The Department of Toxicology and Military Pharmacy** was established on the 1st September 2014 by integration of the Department of Toxicology, the Centre of Advanced Studies and the Department of Public Health. It comprises two groups – the military pharmacy group (biochemical laboratory, laboratory of organic synthesis, analytical laboratory, decontamination laboratory) and the toxicology group (toxicological laboratory, pharmacological laboratory, neurophysiological laboratory, neurobehavioral laboratory, laboratory of cell toxicology). This structure permits a complex study of highly toxic substances including chemical warfare agents with aims to determine their action on biochemical, neurobehavioral, histochemical, pharmacological and neurophysiological level, to study and develop antidotes, to analyze all types of samples with respect to the presence of known chemical warfare agents, to test decontamination effectiveness of developed and field decontamination kits. Present scientific research projects are focused on therapeutic, prophylactic and protective measures against the most toxic chemical warfare agents. Special attention has been paid to the most recent and most dangerous nerve agents and mustards. Department have participated in OPCW Biomedical Proficiency Test.

The main educational activity task was to give lectures for in undergraduate and post-graduate studies dealing with problems of biological effects of real and potential chemical warfare agents, the possibilities of the medical and chemical protection against them and the approaches to medical care of for persons intoxicated with chemical warfare agents, especially nerve agents. The Department provides and guarantees the teaching master's degree program, Military Pharmacy and also participates in the teaching of toxicology in Disaster Medicine.

In 2018, the Department of Toxicology and Military Pharmacy has continued in the cooperation, started by with the Armed Forces Biomedical Research Institute in Brétigny-sur-Orge (France), the Institute for Medical Research and Occupational Health in Zagreb (Croatia), the Korea Research Institute of Chemical Technology in Daejeon (South Korea), WIHE in Warsaw (Poland), the Sahlgrenska Academy, the University of Goteborg (Sweden) and University of California, San Diego, Skaggs School of Pharmacy and Pharmaceutical Sciences (USA) – in the field of development of prophylactic and therapeutic means against nerve agents and organophosphorus insecticides. The cooperation has been mostly characterized by the exchange of scientific information. The cooperation with the Department of Organic Chemistry, Institute of Chemistry, P. J. Šafárik University in Košice (the Slovak Republic), the University of Bologna (Italy), the School of Biology, the Enviromental Sciences and Chemistry (Spain) and the University Bourgogne Franche-Comté (France) is continuing in the field of the development of new potential therapeutic means against Alzheimer's disease.

## **RESEARCH PROJECTS**

### **AGENTS – Development of new agents with anti-inflammatory effect**

Konečný, J., Korábečný, J.

Supported by the Ministry of Education, Youth and Sports, 2018–2020  
(Project No.: SV/FVZ201803)

Nerve agents (NAs) are highly toxic organophosphorus compounds with rapid onset of action. Their mechanism of action involves irreversible inhibition of acetylcholinesterase (AChE), this process leads to accumulation of neurotransmitter acetylcholine (ACh) with cholinergic crisis as a consequence. According to previously published studies, NAs affect not only cholinergic receptors, but also other receptors like NMDA receptors that plays a pivotal role in inflammatory responses. The multi-target-directed ligands (MTDLs) approach includes compounds that are capable to simultaneously target multiple biological systems. The aim of the project is to verify the concept of new dual-targeted compounds, designed in accordance with the MTDLs strategy, amalgamating AChE inhibitors and NMDA receptor antagonists into single molecules. Tacrine, 7-MEOTA, 6-chlorotacrine and others will be used as AChE reversible inhibitors whereas memantine or neramexane will be applied as NMDA receptor antagonists. The project aims to investigate the effect of newly developed hybrid compounds on AChE inhibition as well as their effect on NMDA receptors under in vitro conditions.

### **BACE 1 – Isolation and purification of beta-secretase (BACE 1) from cell matrix and validation of colorimetric method for the determination of thei activity**

Hrabínová, M., Jun, D.

Supported by the Ministry of Education, Youth and Sports, 2018–2018  
(Project No.: SV/FVZ201810)

The aim of research will be isolation and purification enzyme beta-secretase. BACE1 is the important markers involved in the pathogenesis of neurodegenerative diseases (e.g. Alzheimer's disease). This expression of enzyme ongoing in Expi293 cells. These cells produce more protein in less volume and less time. The colorimetric and fluorimetric assay will be compared. Validated methods will be used for screening assessment of substances proposed as potential drugs for these diseases.

### **BIOFILM – Synthesis and evaluation of novel compounds based on quaternary ammonium salts for eradication of microbial bio films**

Marková, A., Marek, J.



Supported by the Ministry of Education, Youth and Sports, 2018–2020  
(Project No.: SV/FVZ201808)

Biofilm is community of microorganisms fixed to the various surfaces (in healthcare, for example, tissues, catheters, cannula plastic implants, teeth and dental implants). Biofilm formation is much better for a number of microorganisms than staying in a planktonic form. Microorganisms are able to differentiate during the biofilm formation and produce specific biofilm phenotype. Formations of flagella and fimbria are genetic modifications enabling initiation of adhesion, however production of extracellular polysaccharide matrix is significant for biofilm protection. Due to polysaccharide matrix are biofilms more resistant against external conditions (mechanical and chemical). In general, planktonic forms of microorganisms are more easily eliminated than their biofilms. Our main research activity will include synthesis of novel compounds based on quaternary ammonium salts and evaluating their eradication ability against pathogenic microorganisms. Minimum inhibitory concentration (MIC) will be measured for all substances, then we will focus on introducing a new MBEC-based methodology for measuring minimum biofilm eradication concentration (MBEC). Our laboratory has appropriate strains of biofilm forming microorganisms (*Pseudomonas aeruginosa*, *Staphylococcus aureus* etc.). Two or three suitable strains will be chosen and we will compare antimicrobial action of new compounds against biofilm and planktonic form. Furthermore, the effect of new compounds will be compared with standards (benzalkonium etc.) The most important outcome of this study is to show the differences in the effectiveness of disinfectants on the microorganisms in two different life forms.

### **Centrally acting antidotes for the treatment of organophosphorus poisoning**

Soukup, O., Jun, D.

Supported by the Internal Grant Agency of the Czech Republic Health Service, 2017–2020 (Project No.: NV17-32801A)

Inactivation of acetylcholinesterase (AChE) in nerve and muscle by organophosphates is the toxic mechanism common to both nerve agents and pesticides. Standard countermeasures against OP poisoning involves muscarinic inhibition and the use of oxime – a reactivator. The latter, however, is limited by a versatility of oximes and by a low penetration of reactivators into the brain. The aim of this project is to develop oxime reactivators with better penetration of the blood brain barrier (BBB). Namely, monoquaternary oximes with balanced physico-chemical properties containing selected nucleophile capable of AChE reactivation and a ligand of peripheral anionic site ensuring the binding to the enzyme. Unique reactivators will be prepared and by application of series of in vitro and in

vivo tests the compounds will be evaluated and described. The best candidate of preclinical development with practical potential will be identified.

### **Development of polyvalent decontamination mean**

Jun, D., Marek, J.

Supported by the Internal Grant Agency of the Czech Republic Health Service, 2018–2021 (Project No.: NV18-09-00181)

Project is aimed at the development of new combined micellar decontamination systems based on quaternary nitrogen compounds having detergent and active decontamination properties, which will cause faster hydrolysis of chemical warfare agents. In the case of biological agents, these molecules are strong disinfectants, able to destabilize pathogen membrane structures. Several decontamination mixtures will be prepared and tested both in vitro and in vivo for their decontamination and disinfection properties against selected chemical and biological agents. The expected result of the project is efficient decontamination solution for personal skin decontamination with good tolerability.

### **EXPOSURE – Determination of toxicological parameters and markers of exposure to potential chemical warfare agents**

Herman, D., Váňová, N., Jun, D., Múčková, L., Čechová, L., Mišík, J.

Supported by the Ministry of Education, Youth and Sports, 2018–2019 (Project No.: SV/FVZ201807)

Present scientific project follows up the previous project of Ministry of Education, Youth and Sports (SV/FVZ201505) and is focused on the development of analytical methods able to prove the exposure to potential warfare agents and to evaluate oxidative stress they might induce. Since the threat of misuse of such compounds is due to their high toxicity still actual, development of selective and sensitive techniques for their determination is highly demanded. After entering the blood, these compounds bind to the proteins by covalent bonding. Therefore, enzymatic cleavage of proteins and solid phase extraction are used in the process of sample preparation and specific cleavage products are subsequently determined by high pressure liquid chromatography – mass spectrometry (LC-MS). In vitro evaluation of oxidative stress will be based on determination of intracellular levels of reactive oxygen species (ROS) using 2',7'-dichlorodihydrofluorescein as a fluorescent probe. Biomarkers of oxidative stress (BOS) represented by malondialdehyde and 3-nitrotyrosine and thiol antioxidant status will be evaluated by LC-MS.

**MDCK – The development and validation of new in vitro methodology based on MDCK cell lines for the study of the penetration of potential drugs across the blood brain barrier**

Kobřlová, T., Herman, D., Soukup, O.

Supported by the Ministry of Education, Youth and Sports, 2017–2019  
(Project No.: SV/FVZ201708)

The organophosphates are considered as one of the most dangerous abusable toxic substances. The mechanism of action of organophosphates is inhibition of acetylcholinesterase enzyme. The treatment of intoxication included anticholinergics, anticonvulsants and reactivators of acetylcholinesterase. One problem of reactivators effect is poor penetration into the central nervous system in sufficient amount. It is necessary to develop compounds which will be able to cross the blood-brain barrier without a serious side effect. The penetration across the BBB is necessary to determine. The in vivo methods are expensive, time and animals consuming. One of the screening methods PAMPA, which was introduced in our laboratory, uses the lipidic membrane for simulation of BBB. The mechanisms present in live organisms are not included in the PAMPA method. The aim of this project is to develop a new methodology for assessing the BBB penetration which uses the MDCK cell line. A special kind of these cells can express transporters, e.g. P-glycoprotein. The method will be validated by standardly used drugs. The parameters of antidotes will be established for both organophosphates poisoning and new synthesized potential drugs. The national and international cooperation is expected due to the high demand for such methods.

**ORGANOPHOSPHATE – Development and preparation of novel acetylcholinesterase reactivators as potent antidotes against organophosphorous intoxication**

Górecki, L., Kučera, T., Korábečný, J., Musílek, K.

Supported by the Ministry of Education, Youth and Sports, 2016–2018  
(Project No.: SV/FVZ201601)

Chemical warfare agents (CWAs) are one of the big threats in the modern civilization. This fact is supported by the expanded power of terrorism which endangers any country worldwide. The most toxic CWAs are nerve agents, chemically classified as organophosphorus compounds. Organophosphates act as irreversible inhibitors of the enzyme acetylcholinesterase that may lead to death. Mono- and bis-pyridinium aldoximes are the only causal antidotes that are designated for the treatment of such life endangering intoxication. Efficiency of these causal antidotes is insufficient and hampered with several major drawbacks. The goal of this project is introduction of novel reactivators that would exceed activity of the standards and also surpass their drawbacks. Initially, we will perform *silico*

screening of potent candidates and on these bases we will start synthesis of leading candidates. The structures of such compounds will be mostly based on a dual site binding strategy. On these bases we will propose series of mono-quaternary or non-quaternary reactivators that will be further tested for their biological activity.

**SCAVENGERS - Butyrylcholinesterase reactivators for preparation of pseudo-catalytic scavengers applicable for organophosphorus intoxications**

Musílek, K., Jun, D., Kuča, K.

Supported by the Czech Republic Grant Agency, 2018–2020 (Project No.: GA18-01734S)

Organophosphorus compounds are produced as chemical warfare agents or used as insecticides and cause life endangering intoxications. The concept of pseudo-catalytic bioscavenger which could bind organophosphorus compound, detoxify it and reactivate own bioscavenging activity was defined to prevent such intoxication. The truly human butyrylcholinesterase is now available as bioscavenger via purification by affinity chromatography with specific sorbent. However, for pseudo-catalytic concept, there is lack of small molecules (butyrylcholinesterase reactivators) which could reactivate butyrylcholinesterase bioscavenging function after detoxifying of organophosphorus compound. Thus, this project is focused on proof of concept of pseudo-catalytic bioscavenger by using human butyrylcholinesterase and its reactivators, which will be developed for this purpose.

**TENSIDES – Development of decontamination substances against chemical warfare agent based on surfactants**

Matula, M., Jun, D.

Supported by the Ministry of Education, Youth and Sports, 2017–2019 (Project No.: SV/FVZ201702)

Decontamination of chemical warfare agents (CWA) is one of the possibilities of an efficient prophylaxis of poisonings. The Czech army has several decontamination mixtures mainly for the decontamination of equipment except of IPB-80 which can be used for skin decontamination. The aim of this study is to develop in vitro methods for evaluation of decontamination efficacy of decontamination mixtures. Subsequently, we will propose new mixtures and carry out evaluation of their effectiveness on CWA simulants and selected CWAs. The result would be the mixture which is capable to decontaminate nerve agents and also mustard gas.

**DEPARTMENT OF MILITARY SURGERY  
K-305**

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**Structure and main tasks of the department (till 31 August 2018)**

*1. Division of General Surgery*

Šubrt Zdeněk – Head of the Group

*2. Division of Traumatology and Burns Treatment*

Lochman Petr – Head of the Group

**Structure and main tasks of the department (since 1 September 2018)**

*1. Division of Traumatology and Burns Treatment*

Lochman Petr – Head of the Group

**Main tasks**

- Undergraduate education of medical students
- Postgraduate training of military surgeons and other medical specialists
- Expertise and referential work for needs of the Czech Armed Forces
- Research in Military Surgery
- Preparation of medical health-care personnel before foreign missions of the Army of the Czech Republic

Till 30 August 2018 **the Department of Military Surgery** consisted of two divisions – the Division of General Surgery and the Division of Traumatology and Burns Treatment. At present the Department of Military Surgery consists only of one division – The Division of Traumatology and Burns Treatment. Besides working at each Division of the Department of Surgery of the Teaching Hospital in Hradec Králové, members of the Department perform both, undergraduate courses in field surgery for students of the Faculty of Military Health Sciences, and postgraduate training of military physicians for their specialization exams in surgery and general medicine. The Department also participates in teaching of the Battlefield Field Emergency Care courses, disaster medicine and the first aid courses, organized by the Faculty of Military Health Sciences for the Czech Army members. Members of the Department participate in several specialised

NATO working groups according to their expertise. Moreover, they are consultants of Surgeon General of the Czech Armed Forces. In the last several years, the Department has played important role in education and training of personnel of field hospitals operating in foreign missions (Yugoslavia, Bosnia-Herzegovina, Albania, Iraq, Afghanistan). Members of the Department also took part in those missions. Research and publication activities are also essential part of the Department members' work.

#### **Participation in a foreign mission**

- J. Páral – 11th Field Hospital, ISAF, Kabul, Afghanistan, 2002, 2011 (TSF)
- J. Páral – British Field Hospital, Op TELIC, Shaibah, Iraq, 2004
- P. Lochman – British Field Hospital, Op TELIC, Shaibah, Iraq, 2004
- J. Páral – Czech Field Surgical Team, International Medical Treatment Facility (Role 3) KAIA, Kabul, Afghanistan 2012
- J. Šimek – Czech Field Surgical Team, International Medical Treatment Facility (Role 3) KAIA, Kabul, Afghanistan 2012

#### **National textbooks**

- Small atlas of dressing techniques (Páral), 1st ed. Prague: Grada Publishing, 2008. 240 p. ISBN 978-80-247-2255-9
- Acute mesenteric ischemia - Modern diagnostics and treatment of acute bowel ischemia (Páral), 1st ed. Prague: Grada Publishing 2012. 112 p. ISBN 978-80-247-3996-0
- Handbook of surgery (Šubrt), 2nd ed. Prague: Grada Publishing 2015. 512 p. ISBN 978-80-247-1005-1

#### **International textbooks**

- Gastrointestinal Stromal Tumors (Páral) in *Aperelho Digestivo* (Coelho), Editora Atheneau, Sao Paulo, Brasilia, 2012, p. 325–336. ISBN 978-85-388-0296-9

### **RESEARCH PROJECTS**

#### **Nanofibrous biodegradable small-diameter vascular bypass graft**

Lukáš, D., Páral, J., Kaláb, M.

Supported by the Internal Grant Agency of the Czech Republic Health Service, 2015–2018 (Project No.: NV15-29241A)

Materials that are currently used to fabricate vascular prostheses are non-degradable and thrombogenic. The aim of this project is to develop new tubular degradable scaffold made of nanofibers with three-dimensional double-layered structure. Biodegradable polymers will be electrospun to obtain nanofibrous vascular graft with desired properties. Inner layer will be made from thin fibers that will facilitate endothelial cell spreading from adjacent vessel. Outer layer will be composed of thicker fibers to enable smooth muscle cell infiltration into the 3D structure as in native vessel. These double-layered scaffolds will be tested mechanically to meet all requirements for vascular replacement in terms of tensile strength, elongation and suture retention. The graft will be tested in vitro in static and dynamic conditions in bioreactor using endothelial and smooth muscle cells. The tissue remodeling process following the implantation will be predicted by macrophage polarization testing. Further in vivo tests will be carried out to investigate the patency of produced grafts.

### **The potential of xanthohumol and beta-bitter acids in the therapy of nosocomial infections**

Boštík, P., Boštíková, V., Páral, J., Mikyška, A., Čermák, P., Bogdanová, K., Houška, M.

Supported by the Internal Grant Agency of the Czech Republic Health Service, 2017–2020 (Project No.: NV17-31765A)

The increasingly more prevalent bacterial resistance to antibiotics presents an important worldwide problem. Compounds of natural origin with a proven anti-bacterial effect may represent new resources in this area or serve as complementary therapies utilized together with antibiotics. Certain compounds from hops, especially beta-bitter acids and xanthohumol possess strong inhibitory effects on Gram-positive (*Staphylococcus aureus*, including resistant variants such as MRSA) and anaerobic bacteria, namely *Clostridium perfringens* and *C. difficile*. Some of the other characteristics of these compounds, including their low solubility in water, low toxicity and low level of adsorption in the gastrointestinal tract (GIT), predispose them as useful tools for local infections of skin and GIT. Formulations containing these compounds, which will be developed and evaluated in this project, can thus represent much needed tools for a local therapy of infections caused by antibiotic-resistant strains of bacteria.



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HYGIENE K-306**

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**DEPARTMENT OF MILITARY INTERNAL MEDICINE AND MILITARY  
HYGIENE K-306**

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The Department is divided into the group of Military Internal Medicine and the group of Military Hygiene.

### **Military Internal Medicine**

The Department is divided into the group of Military Internal Medicine and the group of Military Hygiene. Military Internal Medicine The group of Military Internal Medicine is the clinical part of the department systematically focused on specialized part of Internal Medicine – Military Internal Medicine. Military Internal Medicine as a sub-speciality of Internal Medicine has been progressively developed into a recent shape and purpose in accordance with latest trends of military health support and modern therapeutic approaches. Military Internal Medicine provides knowledge of and practical experience with treatment of life-threatening non-surgical impairment in specific conditions of the military, especially during the armed conflicts. Nowadays, Internal Medicine is also of increasing importance in postoperative care, where multidisciplinary approach leads to improved prognosis of the most severe surgical affections. Furthermore, the knowledge of and practical experience with Military Internal Medicine are useful also in peacetime, especially in large-scale disasters – catastrophes. In fact, most of the skills obtained by Military Internal Medicine training are useful in a novel and progressive branch of medical specialization – **Disaster Medicine**.

Military Internal Medicine has been further developed into 3 basic branches: therapeutic-preventive, pedagogical-educational and research-scientific.

**The therapeutic-preventive branch** is the essential part of Military Internal Medicine. It provides specialized knowledge of and experience with treatment of the most severe medical affections. The group of Military Internal Medicine cooperates with internal departments of the University Hospital in Hradec Kralove, which provides its therapeutic and educational background.

### **Military Hygiene**

The group of Military Hygiene monitors the living and working conditions of troops with the aim to develop, propose and assert measures for health protection and promotion of military professionals in order to maintain a good health state of troops and combat capability of the Army of the Czech Republic personnel in difficult conditions of military environment. In accordance with this function, the activity of the group of Military Hygiene is aimed at monitoring the impact of environmental factors on the organism, at evaluating their risk in working and living environment and at setting effective preventive measures to protect and promote health of soldiers.

Currently, the group of Military Hygiene complexly covers the basic issues of the relation between life and job environment and health of an individual.

The group can provide the analysis of selected physical and chemical factors of external environment in the conditions of the Army of the Czech Republic. It studies the possibilities of use of chemical substances for disinfection effects. The group is focused above all on response of the organism to work in protective clothing and severe climatic conditions and on evaluation of the degree of risk connected with environment contamination.

In the area of group of Military Hygiene, attention is paid namely to the incidence and prevalence of risk factors of non-infectious diseases of mass incidence, rational food, catering of troops in peacetime and wartime conditions – emergency food rations, assessment of the properly received and consumed energy.

### **Cooperation**

- Charles University, Faculty of Medicine in Hradec Kralove
- University Hospital in Hradec Kralove
- Military Medical Agency of the Army of the Czech Republic
- Central Military Hospital – Military University Hospital in Prague
- Brno Military Hospital
- Military Hospital in Olomouc
- Health Institute in Hradec Kralove
- Hygienic Station in Liberec
- Military Health Institute in Prague
- Training Command – Military Academy in Vyškov
- Agricultural University in Nitra, Slovakia

## **TEACHING**

### Military Internal Medicine

**The pedagogical-educational branch** activities in Military Internal Medicine are closely related to therapeutic-preventive care. The department provides comprehensive education of Internal Medicine and Military Internal Medicine in both undergraduate and postgraduate degree programs. Almost all military medical specialists in Internal Medicine, including both Czechoslovakian and the Czech Army members, completed their postgraduate education of Internal Medicine at our department and gained specialization degree in Internal Medicine. We are proud to announce that during the history of our department, we assisted more than 1500 physicians in gaining the specialization degree in Internal Medicine.

Nowadays, the educational process involves undergraduate education in the program of Military Internal Medicine, Military Dentistry, Military Pharmacy and Military Health Assistant. The group of Military Internal Medicine participates actively in teaching in specialized courses, such as BATLS (Battlefield Advanced Trauma Life Support) and also provides medical support during specialized training operations of various units of the Army of the Czech Republic. In cooperation with the Internal Department of the Military University Hospital in Prague and internal departments of other military hospitals, the department provides necessary background for physicians in the military in order to gain the medical postgraduate certification in Internal Medicine.

Important and highly demanding assignment of the department is management and support of doctoral study program of Military Internal Medicine. This study program has been accredited since 1993. The department is also accredited for associate professor and professor degrees proceedings in the field of Military Internal Medicine..

### Military Hygiene

The group of Military Hygiene takes part in undergraduate education of military hygiene and preventive medicine for all military students of the Faculty of Military Health Sciences including civilian students of the Faculty of Health Sciences in Pardubice.

The group members participate in teaching at Charles University, the Faculty of Medicine in Hradec Kralove and cover the final exam in hygiene, military hygiene and epidemiology.

The group can provide education of hygiene and preventive medicine in the doctoral study program Preventive medicine and health care.

The group is engaged in education of hygiene and preventive medicine of civilian and military doctors and nurses including training of NATO missions participants.

The group cooperates with the Military Academy in Vyskov and ensures education and special training of the employees of the Ministry of Defence in the field of occupational hygiene, occupational medicine and risk prevention.

## **RESEARCH**

### Military Internal Medicine

**The scientific-research branch** is the third main part of the group of Military Internal Medicine. In general, the department is focused on clinical research in internal medicine and its implementation in specific military practice. The research is aimed at covering requirements of the Army of the Czech Republic including field and foreign military operations.

The shape of our recent research activities was formed together with the development of organization structure of the department. The long history and development of our department was connected with the development of public society, the Army and both schools in Hradec Kralove, the University of Defence Brno, the Faculty of Military Health Sciences and Charles University, the Faculty of Medicine..

#### **Main topics are:**

- New trends in transplantation of hematopoietic stem cells and supportive care
- Optimization and individualization of treatment of disorders involving bone marrow and hematopoiesis, especially research in acute leukemias as a “model disease“
- Monitoring of side effects during treatment of hematologic disorders using various novel biochemical markers, especially for evaluation of cardiac toxicity
- Cardiovascular research with focus on acute coronary syndrome and heart failure
- The role of enteral and parenteral nutrition in intensive care
- Participation in international clinical trials, especially in fields of hematology and cardiology

**Cooperation in clinical research**

1. Hematopoietic stem cell transplantation (HSCT), transplant-related complications and supportive care, the role of cytokines, cytokine receptors and adhesion molecules in HSCT, acute leukemias and other hematologic disorders – the project has continued.
2. Complex monitoring of cardiotoxicity of antitumorous treatment, mainly cardiac biomarkers – the research project has continued.
3. New biochemical markers of cardiac injury (natriuretic peptides, cardiac troponins, heart-type fatty acid binding protein, glycogen phosphorylase BB) – clinical and laboratory evaluation has continued.
4. Analysis of transplantation activities, indications and results in the Czech Republic – the National Stem Cell Transplantation Registry – the project has continued.
5. A study on application of enteral and parenteral nutrition in intensive metabolic care – the research project has continued.
6. International randomized clinical trials (PRAN-16-52, REACH 3, ASTRAL SGI-110-07, OPTIC 2L, CABL 001, ROBUST).
7. Academic studies of the Czech Hematology Society and the Czech Leukemia Study Group – for Life.

**Military Hygiene**

Scientific research is focused on primary prevention of chronic diseases and relation of life and job environment and life style. Realization of intervention study and project is focused on healthy status of professional soldiers.

**Main topics are:**

- Epidemiological studies of non-infectious diseases
- Evaluation of nutritional and health statuses
- Evaluation of energetic and metabolic requirements
- Combat rations in different climatic conditions
- Evaluation of response of the organism to work in unfavourable environmental and working conditions

- Evaluation of working energy expenditure
- Evaluation of physiological function in protective suits
- Elaboration of proposals for working and rest regimes, energy, fluids and minerals as a prevention of diseases

## **RESEARCH PROJECTS**

### **PARENTERAL NUTRITION – Influence of parenteral nutrition on selected metabolic markers in critically ill patients**

Skořepa, P., Horáček, J.

Supported by the Ministry of Education, Youth and Sports, 2018–2018  
(Project No.: SV/FVZ201811)

Metabolic support in the form of parenteral nutrition is intended to provide the body with the necessary amount of substrates to minimize the effects of hypercatabolism, thereby increasing the chances of success in treatment. The need and dose of glucose in parenteral nutrition is still unclear in intensive care. This is not altered by some recommendations based on some published studies. Conversely, the delivery of glucose in a critical condition may have a positive effect, but clinical trials are missing. The study will be conducted at the FNHK intensive care unit, where hospital patients will meet the indication of parenteral nutrition. Patients will be assigned to two groups receiving another parenteral nutrition solution. Sampling takes place in the patient's standard bed and after the first feeding, followed by 1, 3, 6, 9, 14 and 28 days. The benefits of measured metabolic parameters will be to optimize nutritional support. This study is the first in which research is used to compare two different solutions for parenteral nutrition in this way, in this case it is the uniqueness of the project.



**DEPARTMENT OF EMERGENCY MEDICINE AND MILITARY  
GENERAL MEDICINE K-307**

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History of the Department started in 1983 at the J. E. Purkyně Military Medical Research and Postgraduate Institute. First as a Group of Military Medical Service Organization in Peacetime which was a part of the Department of Military Medical Service Organization. With increasing demands on training of the military health personnel, the Department of General Medicine was established. First Specialization Exams in this new basic specialization branch were held in February 1985. 525 military doctors passed the Specialization Exam in General Medicine at the Department of General Medicine till 31st December 2004. Now the Department collaborates in Specialization Exam with the Institute of Postgraduate Medical Education in Prague, the Chamber of Medicine, professional medical societies and associations in postgraduate training and specialized activities. It participates in establishing standards for special therapeutic care.

Since 1997, the work at this Department has focused more on pre-hospital emergency care and teaching the First Aid and Emergency Medicine. At the same time a significant modernization and a proper

subdivision of teaching premises according to the type of courses were carried out there. Now the Department is equipped with modern teaching models and simulators for teaching pre-hospital care, including the possibility of interactive teaching aids. Current innovations of medical material and equipment are applied in teaching process.

The Military Medical Service after the entry into NATO was one of the main contributors of the Czech Armed Forces to this international military organization. The Department of General Medicine and Emergency Medicine has been charged with specialization training of the military health personnel deployed on foreign mission. The extension of teaching activities in this new field called for changes in table posts at the Department. In 2001, the Healthcare Education and Training Group was established and other workers were engaged to teach the first aid. Since 2003, regarding the extension of teaching, the Department has had a new name – the Department of General and Emergency Medicine.

A new period of the Department started in 2014. After restructuring of the University of Defence and the Faculty of Military Health Science together with prevailing teaching topics in urgent medicine, the Department was renamed on **the Department of Emergency Medicine and Military General Medicine**. It consists of two groups – the Group of Emergency Medicine and the Group of General Medicine.

The main mission of the Department is education and training of medical officers in casualty medical care in both combat and disaster situations. For this purpose, the principles and procedures of emergency care in field conditions are taught at the Department through BATLS/BARTS (Battlefield Advanced Trauma Life Support/Battlefield Advanced Resuscitation Techniques and Skills) courses. In the same area, the Department participates in training of medical personnel before their departure to foreign missions. The next important mission of the department is education and training of non-medical personnel in first-aid care. The most of the soldiers are trained in the Battlefield First-Aid Courses, some of them are trained in consequential Combat Life Saver Courses. This course offers a lot of useful knowledge and skills, e.g. control life-threatening external hemorrhage, airway management and decompress the chest.

The Department of Emergency Medicine and Military General Medicine is the main department providing military-professional training in the subject called Military Medical Service Organization in Peacetime for students of the Master's Study Program in branches of General Medicine and Military Pharmacy, and for students of the Bachelor's Study Program in the branch of Military Medical Management and in various types of training and courses. It also provides further education for military doctors, pharmacists and other personnel of the Military Medical Service through refresher courses and specialization courses.

The subject called Disaster Medicine makes students acquainted with principles of emergency medicine and operation of individual parts of integrated rescue system in conditions of serious accidents, natural disasters and catastrophes. In connection with this training, the Department provides its participants with knowledge and experience of the operation of the Military Medical Service institutions and facilities in crisis, in combat or other extraordinary situations. It applies the knowledge of military and military-professional subjects into specific conditions of operation of the Military Medical Service respecting both military principles and requirements as well as the principles of humanity, law and especially Geneva Conventions.

The Department is a co-ordinating centre in the branch of Military Medical Service Organization in Peacetime, Social Medicine, Emergency Medicine and Disaster Medicine. It participates in increasing the quality of organisational structure of medical units, formations and facilities. It elaborates their operation procedures and principles of their management in peacetime as well as in emergency situations. The Department provides expert activities and elaborates data and proposals from these areas for concept-making bodies of the Medical Service of the Armed Forces of the Czech Republic. The Department analyzes NATO regulations and directives and recommends their introduction in practice as well as in teaching process. It provides consultations for field leading officers of the Military Medical Service. The Department cooperates with civilian institutions, namely, with the bodies of the Ministry of Health of the Czech Republic in the issues concerning the cooperation between civilian and military medical services in extraordinary situations. It ensures publication activities focused on educational work requirements and on presenting scientific information. The Department is in charge of the education of talented students within the framework of students' scientific and professional activities. It participates in the solution of assignments within the organizational structure of the military health care in peacetime. It is the consultation and expert workplace in the branch of General and Emergency Medicine for the Armed Forces of the Czech Republic.

**DEPARTMENT OF MOLECULAR PATHOLOGY AND BIOLOGY K-308**

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**The Department of Molecular Pathology and Biology** is a research and educational center focused on application of advanced technologies of functional genomics in bio-medical defence research. Scientific work is preferably aimed at the studies of the host-pathogen interactions at the molecular level. The objectives of this research are divided into three main areas: bio-molecular signatures of biological agents potentially abused for the military, terrorist attacks or bio-crime acts, intracellular fate of ingested microbes and finally the modulation of host cell signaling and gene expression by ongoing infection. The favorite microbial model is the live vaccine strain of *Francisella tularensis*, a gram-negative facultative intracellular bacterial pathogen from the gamma subdivision of Proteobacteria. The laboratories of the Department are currently equipped with:

- the animal, tissue culture and microbiological labs for preparing samples for subsequent analyses,
- 2-D electrophoresis, liquid chromatography and mass spectrometers for realization of complete classical and shotgun proteomic analyses,

- PCR, RT-PCR and quantitative real-time PCR technologies for the basic search of gene expression and the mutant construction,
- light and fluorescent microscopy, ELISA, Western blot and flow cytometry for the study of bacterial or bacterial component impact on the host.

The established technologies enable researchers, PhD., and undergraduate students to realize complex studies oriented on the analyses of living system response to external (and internal, modulatory) signals encompassing the chemicals, biologically active bio-molecules, physical influences (temperature, radiation, etc.), and microorganisms. Currently, the Department of Molecular Pathology and Biology has 15 full-time employees, 12 scientists, 2 technicians and 1 administrative worker. Four scientists are supported by the grant agencies. The Department had 14 PhD students in 2018 and, furthermore, several undergraduates have been working on their diploma thesis at the Department.

### **PARTICIPATION IN INTERNATIONAL PROJECTS AND NETWORKS**

The Department traditionally cooperates with the research facility in Sweden (the Department of Clinical Bacteriology and the Laboratory for Molecular Infection Medicine of the Umea University) on identification of new factors of virulence of *Francisella tularensis*, molecular mechanisms of suppression of interferon beta production in host cells infected by *Francisella tularensis* and on the analysis of possible interaction between host and bacterial proteins. Further important collaborations concern the U.S. Army Medical Research Institute of Infectious Diseases (Fort Detrick, USA) on preparation and testing of bacterial proteins with immunostimulatory potential, the Department of Microbiology and Parasitology of the University of Rijeka on microscopic analysis of microbial intracellular trafficking, proteome analysis of phagosomes isolated from infected host cells, and, finally, the Aquila Bioscience Ltd. of the National University of Ireland in Galway on identification of glycan or lectin structures recognizing bacterial carbohydrate structures with the aim of new decontamination tools development. Within the frame of the Czech Republic, the Department has developed beneficial contacts with the Institute of Microbiology and the Institute of Molecular Genetics of the Czech Academy of Science in Prague, the Faculty of Science of Charles University in Prague, the Faculty of Medicine and the Faculty of Pharmacy of Charles University in Hradec Králové, the University Hospital in Hradec Králové, the Department of Pharmacology of the Faculty of Medicine in Hradec Králové, the Department of Oncological and Experimental Pathology of Masaryk Memorial Cancer Institute in Brno and the Veterinary Research Institute in Brno and Military Health Institute, Prague. The financial support for research activities performed in collaboration with the above-mentioned institutes comes from the programs and projects of the Czech Grant Agencies, the Ministry of Education, and Youth and Sports and the Ministry of the Interior.

## **RESEARCH PROJECTS**

### **Colorimetric sensor for diagnosis of pesticides poisoning**

Horna, A., Pohanka, M., Voříšek, V.

Supported by Technology Agency of the Czech Republic, 2018–2021  
(Project No.: TH03030336)

The project is focused to construction of a colorimetric sensor for a fast diagnosis of pesticides poisoning and it will be suitable for the both human and veterinarian samples. Functional sample of the device will be verified on biological samples. Aims of the project will be reached in the of the project solving.

### **Construction of sensor for quantitative detection of antibodies against tissue transglutaminase for celiac disease diagnostics**

Kostelník, A., Martinková, P., Kostelníková, A., Pohanka, M., Voženílek, J.

Supported by Technology Agency of the Czech Republic, 2018–2019  
(Project No.: TJ01000478)

The main goal of this project is development of function model for a fast diagnosis of celiac disease via the determination of antibodies against tissue transglutaminase (anti-tTG). Tissue transglutaminase (tTG) is the most used marker in celiac disease which is hereditary disease manifested by intestinal mucosa inflammation and intolerance of gluten in diet, which has to be modify and replace by gluten free diet. This project is focused on construction of biosensor for anti-tTG determination from blood using QCM sensor as a platform for binding of tTG and selective binding of anti-tTG from the sample. The biosensor will be constructed as a simple tool suitable for homecare, small labs and surgeries. Goals of the project will be accomplished to the end of the project.

### **FRANCISELLA T – The role of glyceraldehyd-3-phosphate dehydrogenase and transcription factor HU in the virulence of the pathogenic bacterium *Francisella tularensis***

Kopečková, M., Stojková, P., Pávková, I., Špidlová, P.

Supported by the Ministry of Education, Youth and Sports, 2016–2018  
(Project No.: SV/FVZ201603)

This project is focused on characterization of two potential virulence factors in *Francisella tularensis*, namely glyceraldehyde-3-phosphate dehydrogenase (GAPDH) and transcription factor HU. The aim of the project is confirm virulence and immunoprotective effects of these potential virulence factors. GAPDH will try to find out whether it has other so-called "moonlighting" functions and clarify its role in pathogenesis. Another goal of the project is to elucidate the mechanism of HU protein interaction with the DNA molecule, including the identification of HU regulon. Involvement of both

GAPDH and HU in virulence of this pathogenic bacterium will be test in vivo and in vitro.

**INFECTION – Analysis of changes in host cell ubiquitinylation system during infection of pathogen *Francisella tularensis***

Vozandychová, V., Řehulka, P.

Supported by the Ministry of Education, Youth and Sports, 2018–2020 (Project No.: SV/FVZ201802)

Ubiquitinylation of proteins is one of the most important cell processes, which is involved in degradation of proteins, cell signaling, altering function of protein substrates, changing protein activity or their subcellular localization. Deubiquitinylation enzymes (DUBs) are an important part of the system controlling the reversible process of protein ubiquitinylation, including editing and controlling of mono- and polyubiquitine chains attached to the protein substrates. DUBs can remove ubiquitin from proteins and rescue them from degradation or functional change. These enzymes can also modulate the activity of important proteins during infection process, which was already shown in case of several known pathogens and their DUBs, e.g. bacterial strains *Salmonella* and *Yersinia*. This project is focused on the identification of potential DUBs in pathogenic bacteria *Francisella tularensis* that causes tularemia zoonosis and is listed in Category A Bioterrorism agents. Further analysis will be aimed at changes of DUBs host cells during infection with *Francisella tularensis*. This is important for a further understanding of the molecular basis of the disease process.

**MICROORGANISMS – Isolation of enzymes from unique microbial species and their practical application**

Válek, T., Martinková, P., Pohanka, M.

Supported by the Ministry of Education, Youth and Sports, 2017–2019 (Project No.: SV/FVZ201701)

Enzymes are necessary in all of types of organisms and they have a lot of functions in physiological and pathological conditions. Most of enzymes used in industry or medicine are produced by microorganisms like bacteria or fungi, because of easy production and specific abilities. Some of microorganisms are able to catalyze in extreme conditions such as warm, cold, low or high pH. Psychrophilic organisms live in cold environment and their biological activity is also high in temperatures around 0 °C. This ability is very useful in biosensor construction, so, biosensor containing enzymes from psychrophilic organism can be used in abnormal conditions. Biosensors based on microbial enzymes with unique properties present innovative tool in diagnostic methods appropriate for use in clinical practice or battlefield.

**PHOSPHINE – Phosphine anad mechanism of phosphine toxicity on the organism of laboratory animal**

Radochová, V., Pohanka, M.



Supported by the Ministry of Education, Youth and Sports, 2018–2020  
(Project No.: SV/FVZ201806)

Phosphine is a harmful chemical substance with not well-known mechanism of toxicity. It is probably caused by high phosphine reactivity and a toxic effect having impact on more sites like inhibition of enzymes on one site and damaging of soft tissues on the other site. This thesis is focused on study of phosphine toxicity and choice of markers indicating poisoning. There will be also proposed an animal laboratory model suitable for study of phosphine toxicity.

**Preparation of a standard collection of biologically important toxins - EBLN (European Biodefence Laboratory Network)**

Dresler, J., Kročová, Z., Myslivcová, A., Klimentová, J., Sheshko, V., Řehulková, H., Dřevínek, M.

Supported by the Czech Republic Ministry of Internal Affairs, 2017–2020  
(Project No.: VH20172020012)

The subject of the public contract is the creation of a collection of standards of difficult to obtain toxins using modern vector cultures / bacterial, insect or plant lines) that would allow the development and testing of targeted and highly specific techniques, where so far forensic analytical approaches are not available. Furthermore, the implementation and verification of procedures for working with difficult to cultivate agents / *Coxiella* spp./ whose detection and identification capabilities are not sufficient at present in most of the security units in the Czech Republic.

**PROTEIN - Testing of protein expression systém in the *Francisella tularensis* microbe**

Sheshko, V., Stulík, J.

Supported by the Ministry of Education, Youth and Sports, 2018–2019  
(Project No.: SV/FVZ201801)

*Francisella tularensis* is a gram-negative intracellular pathogen causing tularemia (1). The low infectious dose, high virulence and environmental resistance, and the ability to be disseminated as an aerosol make this organism a potential agent for bioterrorism; therefore, *F. tularensis* is currently classified as A Military and Terroristically Abusive Agents (2). The administration of antibiotics is the standard procedure for the treatment of tularemia. This treatment is only effective for early diagnosis of the disease. Symptoms of tularemia in humans are non-specific that may delay the diagnosis of the disease and subsequent therapy. For this reason, recombinant subunit vaccine is attractive target for the development of new *F. tularensis* vaccine for military and medical personnel as well as for civilian populations (3). As part of the ROZHN project as well as the international DTRA project (collaboration with USAMRIID), we focused on the identification of bacterial proteins with significant immunogenic potential that could be used to design the subunit vaccine against the *F. tularensis*

infection. Recombinant proteins were prepared in *E. coli* expression system. However, original protein modifications are not retained in this system that can affect their immune-stimulatory potential and protective capabilities. The development of the protein production system in *F. tularensis*, which will maintain all posttranslational modifications, is another necessary step in the preparation of an effective subunit vaccine against *F. tularensis*. Fully functional proteins can be used for immunization, host-pathogen interaction studies, modifications and structure determination, as well as definition their biological function. Historically, difficulties in the genetic manipulation of *F. tularensis* were due partially to poor recognition of exogenous promoter elements by *Francisella* transcriptional machinery. A recent study showed that the transcriptional machinery of this organism is quite unique (4). Unlike all other bacteria, *F. tularensis* possesses two distinct  $\alpha$  subunits of RNA polymerase, and these subunits are divergent even within the domains involved in promoter contact. These complications necessitated the design of genetic tools in which the expression of selectable and counterselectable markers was driven by *Francisella* promoters. Some promoter sequences have been characterized and adapted for use as a genetic tool for *F. tularensis*. One of the most frequently exploited and well-studied *F. tularensis* promoters is groEL that has been widely used for gene expression both in vivo and in vitro. Other promoters include the acpA promoter, which was used to drive the expression of green fluorescent protein (GFP) in *F. tularensis* strain LVS during a murine macrophage infection (5), and the FTN\_1451 promoter (6), which was used to express the kanamycin resistance gene in the process of adapting the Targeton system for use in *F. tularensis*. In other studies, the bfr promoter, which appears to be about 10 times more potent than the groEL promoter, is identified as one of the most potent promoters in the *F. tularensis* microbe (7). Regulated expression systems are important tools for the manipulation of gene transcription for the study of organismal biology. Currently, there are no many suitable genetic control systems for *Francisella tularensis*. Two of the most widely used systems for recombinant gene expression in microorganisms based on the classic lactose- and arabinose-inducible promoters do not work in *F. tularensis* (8-10). A conditional expression system was developed for *F. tularensis* that relies on the *F. tularensis* glucose-repressible promoter, FGRp (11). This system is active in macrophages, but it relies on a ubiquitous carbon source and is not flexible. Additionally, a regulatory system for the expression of *F. tularensis* genes was developed to utilize tetracycline transcription control (TetR). This system can be used for both induction and gene repression (12). Recently, selection of constitutive and controllable promoters from the library of synthetic DNA molecules having activities similar to those of the most potentially identified promoters of *F. tularensis* (13) has been completed. The aim of the project is a testing of the existing regulated *F. tularensis* (FTRp) expression system and preparing a new genetic tools based on endogenous and exogenous promoters (14,15). Based on previous results of proteomic and immunological studies, proteins

with different localization, structure and molecular properties will be selected. The genes of selected proteins will be amplified from the *F. tularensis* chromosomal DNA and subsequently cloned into vectors under different promoters. The subsequent production of the proteins will take place in *F. tularensis* cells. Detection of expression will be performed by SDS-PAGE electrophoresis, Western Blot and mass spectrometry. His-tagged proteins will be purified under native and denaturation conditions by affinity chromatography. The results will be evaluated and compared.

**Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the interaction with the host**

Stulík, J., Klimentová, J., Pávková, I., Kubelková, K.

Supported by the Czech Republic Grant Agency, 2017–2019 (Project No.: GA17-04010S)

*Francisella tularensis* is a gram-negative intracellular bacterium causing a severe disease known as tularemia. As one of the most infectious pathogens (as few as ten bacteria can initiate the disease) it has been classified as a potential biological warfare agent. Outer membrane vesicles secreted by gram-negative bacteria play an important role in bacterial physiology as well as in virulence and host-pathogen interaction. Isolated vesicles of number of bacteria have also been studied for their immunomodulatory potential. *F. tularensis* secretes vesicles of unusual tubular structure. The project aims to study the relationship of vesiculation and virulence in *F. tularensis*. The major goal presents the characterization of these vesicles and nanotubes composition, their production and description of their fate during interaction with the host cell. Consequently, their potential protective effect in vivo will be studied. The acquired information will help elucidating their role in the host-pathogen interaction and extend our knowledge about mechanism of virulence of *Francisella tularensis*.

**VESICLES – Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the host-pathogen interaction**

Bavlovič, J., Klimentová, J.

Supported by the Ministry of Education, Youth and Sports, 2018–2020 (Project No.: SV/FVZ201804)

The aim of the presented project is to describe at the cellular level the interaction of the outer membrane vesicles (OMVs) isolated from the *F. tularensis* bacterium with the host cell. Model host cells will be mouse bone marrow macrophages (BMDM). The host cell response will be evaluated via changes in cytokine secretion and mapping of the localization of OMVs within the cell.

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**The Vivarium** at the Faculty of Military Health Sciences of the University of Defence fulfils science, research and teaching tasks of the departments and specialized workplaces of the Faculty of Military Health Sciences. The vivarium is subordinated to the Vice-Dean for Research.

The separate vivarium for mice and sewer-rats is a part of the Department of Toxicology and Military Pharmacy.

From the point of view of the capacity the Faculty of Military Health Sciences is able to carry out experiments, place and take care of laboratory mice, sewer-rats, guinea-pigs, rabbits, pigs or mini pigs. In the area of the vivarium there are also laboratory workplaces and operating theatres, which are equipped for experiments on laboratory animals. All studies have to be allowed by the Ethical Board of the Faculty of Military Health Sciences fully in compliance with the legal standards of the protection against cruelty to animals.

The Vivarium with the operating block is intensively used above all for experiments on large experimental animals. The courses BATLS and BARTS are held there. During the courses different model situations and cases of emergency medicine are performed for military doctors and participants of foreign mission including war injuries on dead and live experimental animals.

On December 2015, the Vivarium was accredited for use again for 5 years (till January 2021) by the Central Board for Animal Protection.

The above-mentioned range of the activities shows that it is necessary to time work and also co-ordinate it personally including permanent presence of a veterinary surgeon, veterinary technicians and breeders of laboratory animals.

## **RESEARCH PROJECTS**

### **PHOSPHINE – Phosphine and mechanism of phosphine toxicity on the organism of laboratory animal**

Radochová, V., Pohanka, M.

Supported by the Ministry of Education, Youth and Sports, 2018–2020 (Project No.: SV/FVZ201806)

Phosphine is a harmful chemical substance with not well-known mechanism of toxicity. It is probably caused by high phosphine reactivity and a toxic effect having impact on more sites like inhibition of enzymes on one site and damaging of soft tissues on the other site. This thesis is focused on study of phosphine toxicity and choice of markers indicating poisoning. There will be also proposed an animal laboratory model suitable for study of phosphine toxicity.

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**The Communication and Information Systems Office** provides the top quality information service to ensure efficient scientific, research and teaching activities for teaching and research staff as well as under- and postgraduate students of our faculty.

The Communication and Information Systems Office provides the operation of the faculty network, enables access to army, specialized and public information systems and supplies the needs of the Faculty with modern information technologies. Main activity is ensuring the access to INTERNET and to specialized information systems. Management of data network, central management of software, servicing as well as specialized support of users is also provided.

Part of the Communication and Information Systems Office are also graphic services that create graphic documents and posters for presentations, make arrangements and changes of drafts for printing, make digital pictures and do other associated work. It also provides the operating and updating of the web site of the Faculty (<http://fvz.unob.cz>).

The printing-office of the Communication and Information Systems Office is able to cover reprographic and printing needs of the Faculty by its own sources in limited extent.

The library provides students, research and teaching staff of the Faculty of Military Health Sciences and members of the Czech Army Medical Service with scientific and information services. The main information services are provided by the library with 63 000 library units concerning medicine as well as associated branches.

Information sources in the field of military medicine, emergency medicine and disaster medicine are specificity of this library. The library enables access to various information databases (WoK, ScienceDirect, SCOPUS, SpringerLink, BiblioMedica, etc.) and provides systematic help when being used.

The library participates in teaching activities in the doctoral study programs and scientific education (Ph.D.) by giving lectures in Basics of Informatics focused on retrievals, processing and publication of scientific information.

**VISITORS TO THE FACULTY OF MILITARY HEALTH SCIENCES**

**Germany**

- LTC SCHARDT Markus, MD (Munich) – 3rd NATO MILMED COE Multinational Sharing Group Meeting, 16 October 2018–18 October 2018

**Hungary**

- COL FAZEKAS László, MD, COL TAYLOR Jack, MD, LTC BOGNAR Tamas, MD (Budapest) – 3rd NATO MILMED COE Multinational Sharing Group Meeting, 16 October 2018–18 October 2018

**Jordan**

- MAJ Dr. ATOOM Osama Erfafan Mustafa , MAJ Dr. AL DABOUBI Waseem Deifallah M., MAJ Dr. ABU-ZEITOUN Omar Yahia Hamed, MAJ Dr. ALDOBOSH Abdelhamid Mahmoud Fayad, MAJ Dr. RAF'AT A. Rahim A.K. (Rahayfeh Habasneh), CPT Dr. ALKHAWALDEH Laith Mahmoud Fayyad, 1LT ALZU'BI Ermrnan Khaled Mahmoud, 1LT Dr. ALZAWAHREH Majid Salim Mohammed, 1LT Dr. AL-DAMRAWI Hassan Rashed Hassan, 1LT Dr. AL-MASHAGBAH Mousa Mohammad Ali, 1LT Dr. TELFAH Ahmad Hussein Mohammad, 1SG IBRAHIM Osama Salag Yacoub (Amman) – Field Emergency Care (FEC) Course, 29 October 2018–31 October 2018

**Moldova**

- LTC LEȘAN Alexandru, MAJ CULIBABA Oleg, CPT ZOLOTCOV Victor, 1Lt RAILEAN Sergiu () – Field Emergency Care (FEC) Course, 05 March 2018–07 March 2018

**Norway**

- CDR STRANDENES Geir, MD (Bergen) – Invited speaker to the 18th Conference of Conference of the Professional Society of Military Doctors, Pharmacists and Veterinary Doctors of the Czech



## ***VISITORS TO THE FACULTY OF MILITARY HEALTH SCIENCES***

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Medical Association of J. E. Purkyně, 14 November 2018–14 November 2018

### **The Netherlands**

- MSC HARTMAN-MAATMAN, Martijn (Loosdrecht) – 3rd NATO MILMED COE Multinational Sharing Group Meeting, 16 October 2018–18 October 2018
- MSC CURVERS Huub (Heerlen) – 3rd NATO MILMED COE Multinational Sharing Group Meeting, 16 October 2018–18 October 2018

### **Ukraine**

- COL KUSHCH Vitalii, COL BYL Jaroslav, LTC FOMIN Olexandr, LTC LEHUTA Ihor, LTC POHORILYI Dmytro, MAJ KOZIN Rostyslav, MAJ STEFANYSHYN Bohdan, MAJ TROKHANCHUK Volodymyr (Kiev) – Field Emergency Care (FEC) Course, 05 March 2018–07 March 2018

### **United Kingdom**

- MAJ CRIPPS Alison (Birmingham) – 3rd NATO MILMED COE Multinational Sharing Group Meeting, 16 October 2018–18 October 2018

### **United States**

- Dr. ROOS Jason, DAGISTAN Courtney, KAZMIERCZAK Christian, SIKES Marty, MUSSONE Ronald Eugene, HOPPE Paul Daniel (Aberdeen, MD) – Implementation of the Agreement between the Czech Republic Ministry of Defence and the US on research and development information exchange from the area of CBRN defence, 10 October 2018–10 October 2018
- COL CAP Andrew, M.D., Ph.D., FACP (San Antonio) – Invited speaker to the 18th Conference of the Professional Society of Military Doctors, Pharmacists and Veterinary Doctors of the Czech Medical Association of J. E. Purkyně, 14 November 2018–14 November 2018
- Prof. JONSSON Coleen B., Prof. TIGYI Gabor J. (Memphis) – FMHS UoD was chosen as potential partner for future common

## ***VISITORS TO THE FACULTY OF MILITARY HEALTH SCIENCES***

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research and for preparation of common projects. The visitors have looked for new partners and during their visit we informed each other about scientific aims, methodology and we tried to find common fields of interest., 04 October 2018–04 October 2018

## **VISITS ABROAD**

### **Armenia**

- Páral, J. (22nd Annual Meeting of European Society of Surgery, Yerevan, 26 September 2018–28 September 2018)

### **Belgium**

- Kassa, J. (42nd NATO CBRN Medical Working Group Meeting, Brussels, 18 February 2018–22 February 2018)
- Pohanka, M. (54th Congress of the European Societies of Toxicology (EUROTOX 2018), Brussels, 02 September 2018–05 September 2018)

### **Bosnia and Herzegovina**

- Kolář, B. (Surgery Internship, Mostar, 29 June 2018–29 July 2018)

### **Canada**

- Bavlovič, J. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Hercík, K. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Klimentová, J. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Kopečková, M. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Kročová, Z. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Kubelková, K. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Pávková, I. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Plizáková, L. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Prokšová, M. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)

## VISITS ABROAD

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- Řehulka, P. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Řehulková, H. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Sheshko, V. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Stojková, P. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Stulík, J. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Špidlová, P. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)
- Vozandychová, V. (9th International Conference on Tularemia 2018, Montreal, 14 October 2018–21 October 2018)

### France

- Jun, D. (International Workshop on Nerve Agents, Paris, 26 November 2018–29 November 2018)
- Kučera, T. (Fellowship at the French Armed Biomedical Research Institute, Brétigny sur Orge, 27 May 2018–24 October 2018)
- Tichý, A. (International Military Radiation & Innovation Symposium – 4th IMRIS Symposium, Paris, 06 November 2018–07 November 2018)
- Tichý, A. (NATO HFM-291 Research Task Group „Ionizing Radiation Bioeffects and Countermeasures“ meeting, Paris, 08 November 2018–08 November 2018)
- Tichý, A. (4th International Military Radiation and Innovation Symposium IMRIS 2018 – New approaches in diagnostics and therapy of acute radiation syndrome, Paris, 07 November 2018–07 November 2018)

### Germany

- Humlíček, V. (6th International Congress on Emergency, Disaster and Military Medicine, Düsseldorf, 13 November 2018–14 November 2018)
- Jakl, M. (ESC Congress 2018, Munich, 25 August 2018–29 August 2018)
- Kostelník, A. (Applied Nanotechnology and Nanoscience International Conference – ANNIC 2018, Berlin, 22 October 2018–24 September 2018)

- Kubelková, K. (EMBO|EMBL Symposium: Innate Immunity in Host-Pathogen Interactions, Heidelberg, 24 June 2018–27 June 2018)
- Macela, A. (EMBO|EMBL Symposium: Innate Immunity in Host-Pathogen Interactions, Heidelberg, 24 June 2018–27 June 2018)
- Malý, O. (Pelvic Floor Endoscopy, Cologne, 26 October 2018–27 October 2018)
- Peták, M. (Surgery Internship, Deggendorf, 05 March 2018–20 April 2018)
- Prokšová, M. (EMBO|EMBL Symposium: Innate Immunity in Host-Pathogen Interactions, Heidelberg, 24 June 2018–27 June 2018)
- Stojková, P. (EMBO|EMBL Symposium: Innate Immunity in Host-Pathogen Interactions, Heidelberg, 24 June 2018–27 June 2018)

### **Greece**

- Boštík, P. (21st ESCV Annual Meeting, Athens, 23 September 2018–26 September 2018)
- Kubelková, K. (15th International Conference on Innate Immunity in memory of Alessandro Moretta, Chania, Crete, 18 June 2018–23 June 2018)
- Macela, A. (15th International Conference on Innate Immunity in memory of Alessandro Moretta, Chania, Crete, 18 June 2018–23 June 2018)

### **Hungary**

- Filipová, A. (44th European Radiation Research Congress, Pécs, 21 August 2018–25 August 2018)
- Púdelka, L. (NATO Medical Staff Introduction Course, Budapest, 03 December 2018–07 December 2018)
- Púdelka, L. (Medical Support Annual Discipline Conference and Military Medical Training Working Group Meeting, Budapest, 23 April 2018–27 April 2018)

### **China**

- Chlábek, R. (Czech Shanghai Vaccination Days & Trip of Prague Municipal Council, Shanghai, 11 June 2018–15 June 2018)
- Smetana, J. (Czech Shanghai Vaccination Days, Shanghai, 11 June 2018–15 June 2018)

## **VISITS ABROAD**

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### **Iraq**

- Kotek, J. (Surgery Internship, Arbil, 05 August 2018–31 August 2018)

### **Italy**

- Kubelková, K. (1st Level Master Course in "Protection against CBRNe Events", Roma, 24 April 2018–25 April 2018)
- Lochman, P. (2nd World Congress on Surgery and Anesthesia, Roma, 10 June 2018–13 June 2018)
- Řehulka, P. (22nd International Mass Spectrometry Conference (22 IMSC), Florence, 26 August 2018–31 August 2018)

### **Japan**

- Lochman, P. (90th Annual Meeting of the Japanese Gastric Cancer Association, Yokohama, 07 March 2018–09 March 2018)

### **Kenya**

- Vinklerová, K. (Specialized Internship, Itibo, 03 February 2018–03 March 2018)

### **Montenegro**

- Kolář, B. (European Students' Union Seminar Combating Challenges in Higher Education & 75th Board Meeting, Budva, 25 November 2018–01 December 2018)

### **Portugal**

- Boštík, P. (CapTech National Coordinators meeting – ESM4 EDA, Lisbon, 12 June 2018–16 June 2018)
- Kotek, J. (ERASMUS+ Internship Program, Coimbra, 01 March 2018–18 May 2018)
- Stulík, J. (International Conference TOLL 2018, Porto, 06 June 2018–09 June 2018)

**Russian Federation**

- Jeličová, M. (22nd International Scientific Conference of Young Scientists and Specialists (AYSS-2018), Dubna, 23 April 2018–27 April 2018)
- Lierová, A. (22nd International Scientific Conference of Young Scientists and Specialists (AYSS-2018), Dubna, 23 April 2018–27 April 2018)
- Páral, J. (World Congress of Association of Surgeons, Gastroenterologists and Oncologists (IASGO), Moscow, 09 September 2018–12 September 2018)

**Serbia**

- Palenčar, D. (Surgery Internship, Belgrade, 23 July 2018–17 August 2018)
- Roušová, A. (Surgery Internship, Belgrade, 23 July 2018–17 August 2018)
- Víchová, S. (Extra Pharmacy Internship, Novi Sad, 12 August 2018–01 September 2018)

**Singapore**

- Benková, M. (12th Annual Meet on Bacteriology and Applied Microbiology, Singapore, 12 November 2018–13 November 2018)

**Slovakia**

- Benková, M. (23rd Interdisciplinary Toxicology Conference – Toxcon, Stará Lesná, 19 June 2018–22 June 2018)
- Hepnarová, V. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)
- Hrabínová, M. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)
- Chlíbek, R. (2nd Days on Pediatric Infectious Diseases, Košice, 21 September 2018–22 September 2018)
- Chlíbek, R. (3rd Primary Pediatrics Days, Demänovská dolina, 11 May 2018–15 May 2018)
- Kassa, J. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)

## **VISITS ABROAD**

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- Kobrlová, T. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)
- Korábečný, J. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)
- Lašák, P. (26th International Conference Life Conditions and Health, Nový Smokovec, 01 October 2018–03 October 2018)
- Misík, J. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)
- Múčková, Ľ. (23rd Interdisciplinary Toxicology Conference (TOXCON 2018), Stará Lesná, 19 June 2018–22 June 2018)
- Pavlík, V. (ERASMUS+ Internship Program, Nitra, 19 November 2018–23 November 2018)
- Smetana, J. (9th Slovak Vaccinological Congress, Štrbské Pleso, 26 April 2018–28 April 2018)

### **Slovenia**

- Kolář, B. (74th Board Meeting of European Students' Union, Bled, 22 April 2018–28 April 2018)

### **Spain**

- Blažek, P. (6th International Work-Conference on Bioinformatics and Biomedical Engineering, Granada, 25 April 2018–27 April 2018)
- Boštík, P. (CapTech CBRN EDA, Madrid, 23 October 2018–25 October 2018)
- Marek, J. (5th International Conference on Antimicrobial Research (ICAR), Málaga, 24 May 2018–25 May 2018)
- Martinková, P. (World Conference on Analytical & Bioanalytical Chemistry, Barcelona, 23 July 2018–24 July 2018)
- Pohanka, M. (18th Annual Pharmaceutical Chemical Analysis Congress, Madrid, 05 November 2018–07 November 2018)
- Pohanka, M. (31st ECNP Congress, Barcelona, 06 October 2018–09 October 2018)
- Skořepa, P. (40th ESPEN Congress on Clinical Nutrition & Metabolism, Madrid, 01 September 2018–04 September 2018)
- Válek, T. (World Conference on Analytical & Bioanalytical Chemistry, Barcelona, 23 July 2018–24 July 2018)



**Sweden**

- Horáček, J. (23rd Congress of the European Hematology Association (EHA), Stockholm, 13 June 2018–17 June 2018)
- Sheshko, V. (Internship at the Umea University for a purpose of testing the protein expression system in *Francisella tularensis*, Umea, 05 November 2018–09 December 2018)

**The Netherlands**

- Ďuráčová, M. (Meeting to Discuss the Preliminary Evaluation of the Results, Haag, 18 June 2018–22 June 2018)
- Herman, D. (Meeting to Discuss the Preliminary Evaluation of the Results, Haag, 18 June 2018–22 June 2018)
- Myslivcová, A. (Participation in the Workshop on the Evaluation of Interlaboratory Comparison of Analyses of High Risk Agents and Toxins, Haag, 18 June 2018–21 June 2018)
- Vajrychová, M. (Meeting to Discuss the Preliminary Evaluation of the Results, Haag, 18 June 2018–22 June 2018)
- Váňová, N. (Meeting to Discuss the Preliminary Evaluation of the Results, Haag, 18 June 2018–22 June 2018)

**United Kingdom**

- Boštík, P. (NATO HFM-273 LTSS Working Group meeting, Porton Down, 18 June 2018–22 June 2018)
- Jeličová, M. (20th International Conference on Radiobiology, London, 19 November 2018–20 November 2018)
- Lierová, A. (20th International Conference on Radiobiology, London, 19 November 2018–20 December 2018)

**United States**

- Boštíková, V. (21st Century Challenge Symposium and Workshop, Atlanta, 24 November 2018–08 December 2018)
- Boštíková, V. (Golden Lectures of Globe Health and Supercourse Meeting: 21st Century Health Challenge, Atlanta, 24 February 2018–08 March 2018)
- Górecki, L. (Development of New Antidotes against Nerve Agents, San Diego, 11 July 2018–01 December 2018)

## ***VISITS ABROAD***

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- Herman, D. (66th ASMS Conference on Mass Spectrometry and Allied Topics 2018, San Diego, 01 June 2018–09 June 2018)
- Kubelková, K. (International cooperation and ASM Microbe 2018, Atlanta, 06 June 2018–12 June 2018)
- Myslivcová, A. (66th ASMS Conference on Mass Spectrometry and Allied Topics 2018, San Diego, 01 June 2018–09 June 2018)
- Tichý, A. (66th ASMS Conference on Mass Spectrometry and Allied Topics 2018, San Diego, 01 June 2018–09 June 2018)
- Váňová, N. (66th ASMS Conference on Mass Spectrometry and Allied Topics 2018, San Diego, 01 June 2018–09 June 2018)

**WORKSHOPS, COURSES, RESIDENCIES AT THE FACULTY IN  
2018**

**Military Hygiene**

- Specialized basic course – Teaching on foodstuff I, 26 February 2018–27 February 2018
- Specialized course – Prevention of non-infectious diseases of mass incidence, 12 March 2018–13 March 2018
- Specialized follow-up course – Teaching on foodstuff II, 23 April 2018–24 April 2018, 19 November 2018–20 November 2018
- Specialized course – Overweight and obesity, diagnosis, prevention and therapy, 05 November 2018–06 November 2018
- Specialised course – Nutrition state assessment, 15 January 2018–16 January 2018
- Specialised course – Health support programme – possibilities of prevention and intervention, 22 January 2018–23 January 2018

**Radiobiology**

- Specialized course – Radiation accident – protection and basic measures, 21 May 2018–22 May 2018

**Language Courses**

- Terminology course for nurses 2, 05 February 2018–16 February 2018
- Combined language courses – English (STANAG 3), 04 September 2017–01 June 2018, 03 September 2018–31 May 2019
- Combined language courses – English (STANAG 2), 04 September 2017–01 June 2018, 03 September 2018–31 May 2019
- Terminology course for nurses 1, 19 November 2018–30 November 2018
- Terminology course for MEDOPS, 18 June 2018–29 June 2018

**Military Medical Service Organization**

- Specialized course – Aeromedical evacuation, 10 April 2018–12 April 2018

## **WORKSHOPS, COURSES, RESIDENCIES AT THE FACULTY IN 2018**

- Specialized course – Prevention of burn out syndrom, 05 February 2018–07 February 2018, 05 November 2018–07 November 2018
- MEDEVAC specialized course – Use of helicopter, 01 October 2018–05 October 2018
- Specialized course – Psychology and crisis psychological interventions, management of patients with behavioral difficulties, 04 June 2018–06 June 2018, 08 October 2018–10 October 2018
- Specialized course for Medical operations officers – MedOps – The tenets of the use of Medical Service forces and assets, 11 June 2018–13 June 2018, 19 November 2018–21 November 2018

### **Computing**

- Specialized course – MS PowerPoint, 12 February 2018–14 February 2018
- Specialized course – Microsoft Office 2013 Professional, 26 March 2018–28 March 2018
- Specialized course – MS Excel, 12 March 2018–14 March 2018

### **Military Epidemiology**

- Specialized course – Current infectious diseases – news in epidemiology and microbiology, 15 October 2018–17 October 2018
- Specialized course – Highly dangerous infections, new infectious diseases, 15 January 2018–17 January 2018

### **General Medicine**

- Special course – Extended first aid in the field (CLS Course), 29 January 2018–09 February 2018, 11 June 2018–22 June 2018, 24 September 2018–05 October 2018, 08 October 2018–19 October 2018
- Special course – Repetitory of extended first aid in field conditions (R-CLS Course), 14 May 2018–18 May 2018, 05 November 2018–09 November 2018, 03 December 2018–07 December 2018
- Specialized course – Transportation of casualties in the field, 25 June 2018–29 June 2018
- Specialized course – First aid in field conditions for military paramedics, 25 July 2018–27 July 2018
- Specialized course – First aid in field conditions (health training) for Military High School Moravska Trebova, 16 April 2018–19 April

## **WORKSHOPS, COURSES, RESIDENCIES AT THE FACULTY IN 2018**

2018, 23 April 2018–26 April 2018, 21 May 2018–24 May 2018, 28 May 2018–31 May 2018

- Specialized course – Repetitory of field emergency care, 22 January 2018–24 January 2018, 22 October 2018–24 October 2018
- Specialized course – Defibrilators and their operation, 08 March 2018–08 March 2018
- Specialized course – Field emergency care for foreign armies (Ukraine, Moldova, Jordan), 05 March 2018–07 March 2018, 29 October 2018–31 October 2018
- Special course – Extended first aid in the field (CLS Course) for military paramedicals, 27 August 2018–07 September 2018
- Specialized course – Repetitory of first aid for non-medical personnel, 10 December 2018–12 December 2018
- Special course – Extended first aid in the field for the Police of the Czech Republic (CLS Course), 03 April 2018–13 April 2018
- Specialized course – First aid in field conditions, 15 January 2018–19 January 2018, 12 February 2018–16 February 2018, 26 February 2018–02 March 2018, 26 November 2018–30 November 2018
- Specialized course – Field emergency care, 19 March 2018–21 March 2018, 25 June 2018–27 June 2018, 12 November 2018–14 November 2018
- Specialized course – First aid in the field for Police of the Czech Republic, 12 March 2018–16 March 2018

### **Molecular Pathology**

- Specialized course II – advanced – Collection and transport of biological samples, 29 January 2018–02 February 2018
- Specialized course – Detection and identification of biological agents, 09 July 2018–13 July 2018
- Specialized course I – basic – Collection and transport of biological samples, 18 June 2018–29 June 2018

### **Military Toxicology**

- Specialized course – Dealing with extremely dangerous poisons, drugs and psychotropic substances, 08 January 2018–11 January 2018, 09 April 2018–12 April 2018, 23 April 2018–26 April 2018, 08 October 2018–11 October 2018

### **Multidisciplinary Studies**

### **WORKSHOPS, COURSES, RESIDENCIES AT THE FACULTY IN 2018**

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- Preparatory course for entrance examination, 04 June 2018–09 June 2018

#### **Military Pharmacy**

- Specialized course – Basis of pharmacology and self-treatment, 19 February 2018–22 February 2018

**INTERNATIONAL COOPERATION**

**Cooperation at the military medical facility level**

**France**

- Armed Forces Biomedical Research Institute, Brétigny-sur-Orge

**Germany**

- Institute of Microbiology of Federal Armed Forces Medical Academy, Munich
- Bundeswehr Institute for Radiobiology, Munich

**Norway**

- Norwegian Defence Research Establishment – FFI, Kjeller

**Poland**

- Military Institute of Hygiene and Epidemiology, Department of Pharmacology and Toxicology, Warsaw

**Slovakia**

- Central Military Hospital, Ruzomberok

**Sweden**

- Swedish Defence Research Agency, Department of Threat Assessment, Division of NBC Defence, Umea

**United Kingdom**

- Defence Medical Services Training Centre Keogh Barracks in Aldershot, Ash Vale

**Scientific cooperation with civilian institutions abroad (on the basis of individual agreements and joint projects)**

**Austria**

- Institute of Chemical Technologies and Analytics, Vienna University of Technology, Vienna

**Croatia**

- Department of Microbiology and Parasitology, University of Rijeka, Rijeka

## **INTERNATIONAL COOPERATION**

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- Institute for Medical Research and Occupational Health, Zagreb

### **France**

- University of Burgundy – Franche-Comté

### **Germany**

- Department of Solid States Nuclear Physics, University of Leipzig, Leipzig
- Bundeswehr Institute for Radiobiology, Munich
- German Cancer Research Center, Heidelberg

### **Italy**

- University of Bologna, Bologna

### **Portugal**

- University of Porto, Faculty of Pharmacy, Department of Biological Sciences, Laboratory of Biochemistry, Porto

### **Republic of Korea**

- Korea Research Institute of Chemical Technology, Daejeon

### **Slovakia**

- P. J. Safarik University, Kosice
- Agricultural University in Nitra, Nitra

### **Spain**

- University of Alcalá, Environmental Sciences and Chemistry, School of Biology, Department of Organic Chemistry and Inorganic Chemistry, Alcalá de Henares
- Centre for Research of Environmental Epidemiology (CREAL), Barcelona

### **Sweden**

- Sahlgrenska Academy, University of Goteborg, Goteborg
- University of Umea, Umea

### **United States**

- Emory University, Atlanta
- MMRHVLB/CCID/CDC, Atlanta
- University of California San Diego, Skaggs School of Pharmacy and Pharmaceutical Sciences, San Diego



- University of Pennsylvania, Perelman School of Medicine, Departments of Medicine and Pathology, Philadelphia

### **Participation in international projects and networks**

<b>Ireland</b>	National University of Ireland in Galway
<b>Spain</b>	Centre for Research of Environmental Epidemiology (CREAL), Barcelona
<b>Switzerland</b>	European Study Group on Nosocomial Infection
<b>United Kingdom</b>	Public Health England - Centre for Radiation, Chemical and Environmental Hazards, Didcot

### **Other international activities**

- L. Andrejsová – member of the European Radiation Research Society
- P. Boštík – national coordinator for CBRN in Cap Tech ESM04 EDA
- P. Boštík – member of NATO LTSS HFM 273
- P. Boštík – council member of the European Society of Clinical Virology
- P. Boštík – member of Regional Cooperation for Health Science and Technology
- P. Boštík – member of the Association of UICC Fellows
- P. Boštík – member of the American Association of Immunologists (AAI)
- P. Boštík – member of the Federation of American Societies for Experimental Biology
- P. Boštík – member of the American Society of Microbiology
- P. Boštík – member of Editorial board of „*the Open Infectious Diseases Journal*“
- V. Boštíková – member of the International Board for the Investigation and Control of Influenza and Other Epidemic Diseases
- V. Boštíková – member of the European Society of Clinical Virology
- V. Boštíková – member of Editorial board of „*Journal of Clinical Virology*“
- T. Dušek – member of the European Society of Coloproctology
- J. Horáček – member of the European Society for Blood and Marrow Transplantation (EBMT)
- J. Horáček – member of the European Society of Hematology
- Z. Hrstka – Military Psychologists Association of European Federation of Psychologists' Associations (EFPA)

## INTERNATIONAL COOPERATION

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- R. Chlíbek – European Centre for Disease Control (ECDC) – member of Potential shortages of Vaccines and treatment for rare communicable diseases in Europe Group
- R. Chlíbek – European Centre for Disease Control (ECDC) – member of Expert Panel Hepatitis A
- R. Chlíbek – member of the Global Pertussis Initiative(GPI)
- R. Chlíbek – member of NATO – Biological Medical Advisory Committee
- R. Chlíbek – supervisor of the Central European Vaccination Awareness Group (CEVAG)
- R. Chlíbek – member of the Central and Eastern Europe Pertussis Awareness Group
- R. Chlíbek – member of C.O.P.E. – Consensus on Pertussis Booster Vaccination in Europe
- R. Chlíbek – member of the European Society of Clinical Microbiology and Infectious Diseases
- M. Jakl – member of the European Society of Cardiology
- L. Jebavý – member of the European Group for Blood and Marrow Transplantation (EBMT)
- L. Jebavý – member of the Multinational Association of Supportive Care in Cancer (MASCC)
- L. Jebavý – member of the European Study Group on Nosocomial Infections (ESGNI)
- J. Kassa – member of NATO CBRN Medical Working Group
- J. Kassa – member of the European Society for Neurochemistry
- J. Kassa – member of Editorial board of „*Journal of Medical Chemical, Biological and Radiological Defence*“
- J. Kassa – member of Editorial board of „*Challenge Medical CBRN Defense International*“
- L. Klein – Secretary General, Committee of the International Association for Humanitarian Medicine Chisholm - Gunn (IAHM)
- L. Klein – Assistant Secretary General, International Committee of Military Medicine (ICMM)
- L. Klein – member of the European Burns Association (EBA)
- L. Klein – member of the International Society for Burn Injuries (ISBI)
- L. Klein – member of the Mediterranean Council for Burns and Fire Disasters (MBC)
- L. Klein – member of the Academic Council on the United Nations System (ACUNS)
- L. Klein – Honorary member of the United States Army Medical Department Regiment
- L. Klein – member of Editorial board of „*Annals of Burns and Fire Disasters*“
- J. Korábečný – member of the Society for Neuroscience
- K. Kubelková – member of the European Radiation Research Society

- M. Link – member of the Human Proteome Organization (HUPO)
- P. Lochman – member of the European Society of Surgical Oncology
- P. Lochman – member of the European Wound Management Association
- P. Lochman – member of the FACS – American College of Surgeons
- J. Mišík – member of the Society for Neuroscience
- A. Myslivcová – member of the Human Proteome Organization (HUPO)
- V. Pavlík – member of NATO RTO HFM-154
- J. Pejchal – member of the CBRN Joint Assessment Team
- M. Pohanka – member of Editorial board of *„Mini Reviews In Medicinal Chemistry“*
- M. Pohanka – member of Editorial board of *„Sensors“*
- M. Pohanka – member of Editorial board of *„Interdisciplinary Toxicology“*
- M. Pohanka – member of Editorial board of *„Journal of Mellomics and Nanotechnologies“*
- M. Pohanka – member of Editorial board of *„BioMed Research International“*
- J. Smetana – member of the International Society for Infectious Diseases
- O. Soukup – member of the Society for Neuroscience
- H. Střítecká – member of Editorial board of *„Journal of Obesity & Weight loss Therapy“*
- H. Střítecká – member of Editorial board *„Journal of Food Security“*
- H. Střítecká – member of the International Association for the Study of Obesity
- H. Střítecká – member of the European Association for the study of obesity (EASO)
- H. Střítecká – member of the European Federation of the Associations of Dietitians (EFAD)
- J. Stulík – member of Editorial board of *„Frontiers in Cellular and Infection Microbiology“*
- Z. Šinkorová – member of NATO CBRN Medical Working Group
- Z. Šinkorová – member of the NATO RTO HFM - 222
- Z. Šinkorová – member of the European Radiation Research Society
- P. Špidlová – member of the American Society for Microbiology
- M. Šplíňo – member of the European Study Group on Nosocomial Infection
- M. Šplíňo – member of the International Board for the Investigation and Control of Influenza and Other Epidemic Diseases
- M. Šplíňo – member of the International Biographical Centre - Advisory Council
- M. Šplíňo – member of the American Biographical Institute

## ***INTERNATIONAL COOPERATION***

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- M. Špliňo – member of the International Society for Tropical and Travel Medicine
- M. Špliňo – member of the International Society for Infectious Diseases
- A. Tichý – member of the NATO HFM Panel RTG-291
- A. Tichý – member of the American Society for Mass Spectrometry
- A. Tichý – member of the European Society of Radiation Biology
- A. Tichý – member of the European Society for Radiotherapy and Oncology (ESTRO)

**SCIENTIFIC AND RESEARCH ACTIVITIES**

**Completed full professorships**

**Bošťíková Vanda**

Department of Epidemiology, Faculty of Military Health Sciences, University of Defence, Hradec Králové

*area of specialization:* Medical Microbiology

*professor's lecture:* Concept of scientific work and training in the field of Medical Microbiology

**Completed associate professorships**

**Lochman Petr**

Department of Military Surgery, Faculty of Military Health Sciences, University of Defence, Hradec Králové

*area of specialization:* Military Surgery

*habilitation thesis:* The current position of proximal resection of the stomach in the treatment of stomach tumors and ezophagogastric junction

*habilitation lecture:* History and current resection performance on the stomach

**Soukup Ondřej**

Department of Toxicology and Military Pharmacy, Faculty of Military Health Sciences, University of Defence, Hradec Králové

*area of specialization:* Toxicology

## ***SCIENTIFIC AND RESEARCH ACTIVITIES***

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*habilitation thesis:* On the toxicity of acetylcholinesterase reactivators

*habilitation lecture:* Presence and future of the therapy for nerve agents poisoning

### **Dissertation defences**

#### **Hlávka Aleš**

Department of Medical and Radiation Oncology, Regional Hospital Pardubice and Multiscan Ltd., Pardubice

*study programs:* Military Radiobiology

*dissertation:* Role of IGRT in the treatment of breast cancer

#### **Suchánková Kamila**

Department of Radiobiology, Faculty of Military Health Sciences, University of Defence, Hradec Králové

*study programs:* Military Radiobiology

*dissertation:* Meaning of DNA damage repair in radiosensitivity of normal and cancer cells

#### **Fabrik Ivo**

Department of Molecular Pathology and Biology, Faculty of Military Health Sciences, University of Defence, Hradec Králové

*study programs:* Infection Biology

*dissertation:* Analysis of host cell proteome during the early interaction with an intracellular pathogen

**Slaninka Igor**

Department of Plastic Surgery, University Hospital Hradec Králové

*study programs:* Military Surgery

*dissertation:* Use of autologous platelet-rich plasma in healing skin graft donor sites

**Bareková Lucie**

Department of Clinical Microbiology, Regional Hospital Pardubice

*study programs:* Medical Microbiology

*dissertation:* The monitoring of antibiotic resistance in selected agents of nosocomial infections

**Šošovičková Renáta**

Department of Epidemiology, Faculty of Military Health Sciences, University of Defence Brno, Hradec Králové

*study programs:* Epidemiology

*dissertation:* Seroprevalence of measles and mumps antibodies in the adult population in the Czech Republic

**Blažek Pavel**

Department of Military Medical Service Organization and Management, Faculty of Military Health Sciences, University of Defence Brno, Hradec Králové

*study programs:* Applied Informatics

## ***SCIENTIFIC AND RESEARCH ACTIVITIES***

---

*dissertation:* The framework of a secured information and management system in the context of biomedical laboratories

### **Fabriková Daniela**

Department of Molecular Pathology and Biology, Faculty of Military Health Sciences, University of Defence, Hradec Králové

*study programs:* Infection Biology

*dissertation:* Molecular mechanisms of *Francisella tularensis* pathogenesis

### **Vajrychová Marie**

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*study programs:* Infection Bioogy

*dissertation:* Identification of intraamniotic infection and fetal inflammatory response syndrome biomarkers

### **Martinková Pavla**

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*study programs:* Toxicology

*dissertation:* Biosensors and analytical devices for diagnosis of pathological states developing during poisoning



**Jošt Petr**

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*study programs:* Toxicology

*dissertation:* The sulphur mustard-induced DNA damage and its relationship with cytotoxicity

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*study programs:* Military Surgery

*dissertation:* The use of new technologies to treatment of blow-out fractures

**THE REVIEW OF RESEARCH PROJECTS CARRIED OUT AT THE  
FACULTY OF MILITARY HEALTH SCIENCES IN 2018**

**THE INTERNAL GRANT AGENCY OF THE CZECH REPUBLIC  
HEALTH SERVICE**

***Principal investigators***

**Pavel Bošтік**

(NV17-31765A) The potential of xanthohumol and beta-bitter acids in the therapy of nosocomial infections

**Daniel Jun**

(NV18-09-00181) Development of polyvalent decontamination mean

***Co-investigators***

**Jiří Páral**

(NV15-29241A) Nanofibrous biodegradable small-diameter vascular bypass graft

**Pavel Bošтік**

(NV15-31847A) Development of novel disinfectants against pathogens occurring in the hospital environment

**Vanda Bošтікová**

(NV15-31847A) Development of novel disinfectants against pathogens occurring in the hospital environment

## **THE REVIEW OF RESEARCH PROJECTS CARRIED OUT AT THE FMHS**

### **Radek Sleha**

(NV15-31847A) Development of novel disinfectants against pathogens occurring in the hospital environment

### **Jan Marek**

(NV15-31847A) Development of novel disinfectants against pathogens occurring in the hospital environment

### **Vanda Boštíková**

(NV17-31765A) The potential of xanthohumol and beta-bitter acids in the therapy of nosocomial infections

### **Jiří Páral**

(NV17-31765A) The potential of xanthohumol and beta-bitter acids in the therapy of nosocomial infections

### **Daniel Jun**

(NV17-32801A) Centrally acting antidotes for the treatment of organophosphorus poisoning

## **THE CZECH REPUBLIC MINISTRY OF INTERNAL AFFAIRS**

### ***Principal investigators***

### **Aleš Tichý**

(VH20172020010) New approaches in diagnostics and therapy of irradiated persons

## **THE REVIEW OF RESEARCH PROJECTS CARRIED OUT AT THE FMHS**

### ***Co-investigators***

#### **Zuzana Kročová**

(VH20172020012) Preparation of a standard collection of biologically important toxins - EBLN (European Biodefence Laboratory Network)

#### **Alena Myslivcová**

(VH20172020012) Preparation of a standard collection of biologically important toxins - EBLN (European Biodefence Laboratory Network)

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#### **Valeria Sheshko**

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#### **Helena Řehulková**

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## **THE CZECH REPUBLIC GRANT AGENCY**

### ***Principal investigators***

#### **Zuzana Šinkorová**

(GA17-13541S) Development of novel radioprotective agents based on small molecular inhibitors

**Jiří Stulík**

(GA17-04010S) Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the interaction with the host

**Co-investigators**

**Jana Klimentová**

(GA17-04010S) Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the interaction with the host

**Ivona Pávková**

(GA17-04010S) Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the interaction with the host

**Klára Kubelková**

(GA17-04010S) Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the interaction with the host

**Daniel Jun**

(GA18-01734S) SCAVENGERS – Butyrylcholinesterase reactivators for preparation of pseudo-catalytic scavengers applicable for organophosphorus intoxications

**THE MINISTRY OF EDUCATION, YOUTH AND SPORTS**

***Principal investigators***

**Tomáš Válek**

(SV/FVZ201701) MICRORGANISMS – Isolation of enzymes from unique microbial species and their practical application

**Alžběta Filipová**

(SV/FVZ201703) CILIA – Primary cilia as an indicator of cell stress

**Markéta Němcová**

(SV/FVZ201606) THYMOCYTES – Effect of radioprotection in the development of thymocytes after whole body irradiation

**Monika Kopečková**

(SV/FVZ201603) FRANCISELLA T – The role of glyceraldehyd-3-phosphate dehydrogenase and transcription factor HU in the virulence of the pathogenic bacterium *Francisella tularensis*

**Pavla Stojková**

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**Lukáš Górecki**

(SV/FVZ201601) ORGANOPHOSPHATE – Development and preparation of novel acetylcholinesterase reactivators as potent antidotes against organophosphorous intoxication

**Marek Matula**

(SV/FVZ201702) TENSIDES – Development of decontamination substances against chemical warfare agent based on surfactants

**Marcela Jeličová**

(SV/FVZ201602) ELECTROCHEMISTRY – Electrochemical detection of DNA damage after gamma irradiation

**Tereza Kobrlová**

(SV/FVZ201708) MDCK – The development and validation of new in vitro methodology based on MDCK cell lines for the study of the penetration of potential drugs across the blood brain barrier

**Valeria Sheshko**

(SV/FVZ201801) PROTEIN – Testing of protein expression system in the *Francisella tularensis* microbe

**Kateřina Hašková**

(SV/FVZ201809) CLOSTRIDIUM – Colonization of the intestine of medical personnel with *Clostridium difficile* as a potential source of hospital acquired infections

**Martina Hrabínová**

(SV/FVZ201810) BACE 1 – Isolation and purification of beta-secretase (BACE 1) from cell matrix and validation of colorimetric method for the determination of their activity

**Pavel Skořepa**

(SV/FVZ201811) PARENTERAL NUTRITION – Influence of parenteral

nutrition on selected metabolic markers in critically ill patients

**Ivana Holmquist**

(SV/FVZ201812) BREASTFEEDING – Factors influencing initiation and continuation of breastfeeding in the South-East United States

**Věra Vozandychová**

(SV/FVZ201802) INFECTION – Analysis of changes in host cell ubiquitinylation system during infection of pathogen *Francisella tularensis*

**Jan Bavlovič**

(SV/FVZ201804) VESICLES – Study of the secretion of outer membrane vesicles in *Francisella tularensis* and their role in the host-pathogen interaction

**Věra Radochová**

(SV/FVZ201806) PHOSPHINE – Phosphine and mechanism of phosphine toxicity on the organism of laboratory animal

**Anna Lierová**

(SV/FVZ201805) ACID – Application of nanoparticles from hyaluronic acid in protection against ionizing radiation

**Jan Konečný**

(SV/FVZ201803) AGENTS – Development of new agents with anti-inflammatory effect



**David Herman**

(SV/FVZ201807) EXPOSURE – Determination of toxicological parameters and markers of exposure to potential chemical warfare agents

**Aneta Marková**

(SV/FVZ201808) BIOFILM – Synthesis and evaluation of novel compounds based on quaternary ammonium salts for eradication of microbial bio films

***Co-investigators***

**Pavla Martinková**

(SV/FVZ201701) MICRORGANISMS – Isolation of enzymes from unique microbial species and their practical application

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**Jiří Stulík**

(SV/FVZ201801) PROTEIN – Testing of protein expression systém in the *Francisella tularensis* microbe

**Vanda Boštíková**

(SV/FVZ201809) CLOSTRIDIUM – Colonization of the intestine of medical

## **THE REVIEW OF RESEARCH PROJECTS CARRIED OUT AT THE FMHS**

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### **Daniel Jun**

(SV/FVZ201810) BACE 1 – Izolation and purification of beta-secretase (BACE 1) from cell matrix and validation of colorimetric method for the determination of thei activity

### **Jan Horáček**

(SV/FVZ201811) PARENTERAL NUTRITION – Influence of parenteral nutrition on selected metabolic markers in critically ill patients

### **Vanda Boštíková**

(SV/FVZ201812) BREASTFEEDING – Factors influencing initiation and continuation of breastfeeding in the South-East United States

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### **Jana Klimentová**

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**Nela Váňová**

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**Jakub Mišík**

(SV/FVZ201807) EXPOSURE – Determination of toxicological parameters and markers of exposure to potential chemical warfare agents

**Jan Marek**

(SV/FVZ201808) BIOFILM – Synthesis and evaluation of novel compounds based on quaternary ammonium salts for eradication of microbial bio films

**TECHNOLOGY AGENCY OF THE CZECH REPUBLIC**

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**Adam Kostelník**

(TJ01000478) Construction of sensor for quantitative detection of antibodies against tissue transglutaminase for celiac disease diagnostics

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**Miroslav Pohanka**

(TH03030336) Colorimetric sensor for diagnosis of pesticides poisoning

**Pavla Martinková**

(TJ01000478) Construction of sensor for quantitative detection of antibodies against tissue transglutaminase for celiac disease diagnostics

**Anna Kostelníková**

(TJ01000478) Construction of sensor for quantitative detection of antibodies against tissue transglutaminase for celiac disease diagnostics

**Miroslav Pohanka**

(TJ01000478) Construction of sensor for quantitative detection of antibodies against tissue transglutaminase for celiac disease diagnostics

**RESEARCH AIMS**

**Daniel Jun**

A long-term organization development plan 1011 – Health problems of the weapons of mass destruction

**Jiří Páral**

A long-term organization development plan 1011 – Clinical fields

**ARTICLES IN JOURNALS WITH IMPACT FACTOR**

1. ANDRŠ, M., POSPÍŠILOVÁ, M., SEIFRTOVÁ, M., HAVELEK, R., TICHÝ, A., VEJRYCHOVÁ, K., POLEDNÍKOVÁ, M., GÓRECKI, L., JUN, D., KORÁBEČNÝ, J., REZÁČOVÁ, M. Purin-6-one and pyrrolo[2,3-d]pyrimidin-4-one derivatives as potentiating agents of doxorubicin cytotoxicity. *Future Medicinal Chemistry*. 2018, **10**(17), 2029–2038. ISSN 1756-8919. IF **3.969**
2. BOGDANOVÁ, K., RÖDEROVÁ, M., KOLÁŘ, M., LANGOVÁ, K., DUŠEK, M., JOŠT, P., KUBELKOVÁ, K., BOŠTÍK, P., OLŠOVSKÁ, J. Antibiofilm activity of bioactive hop compounds humulone, lupulone and xanthohumol toward susceptible and resistant staphylococci. *Research in Microbiology*. 2018, **169**(3), 127–134. ISSN 0923-2508. IF **2.372**
3. CAISBERGER, F., PEJCHAL, J., MISÍK, J., KASSA, J., VALIŠ, M., KUČA, K. The benefit of combinations of oximes for the ability of antidotal treatment to counteract sarin-induced brain damage in rats. *BMC Pharmacology & Toxicology*. 2018, **19**(1), Article number 35. ISSN 2050-6511. IF **1.865**
4. CUNNINGHAM, AL., HEINEMAN, TC., LAL, H., GODEAUX, O., CHLÍBEK, R., HWANG, S., MCELHANEY, JE., VESIKARI, T., ANDREWS, C., CHOI, WS., ESEN, M., IKEMATSU, H., KOVAC CHOMA, M., PAUKSENS, K., RAVAUULT, S., SALAUN, B., SCHWARZ, TF., SMETANA, J., VANDEN ABEELE, C., VAN DEN STEEN, P., VASTIAU, I., WECKX, LY., LEVIN, MJ., ZOE-50/70, SG. Immune responses to a recombinant glycoprotein E herpes zoster vaccine in adults age 50 years or older. *Journal of Infectious Diseases*. 2018, **217**(11), 1750–1760. ISSN 0022-1899. IF **5.186**
5. DE ALMEIDA, J., DOLEŽAL, R., KREJCAR, O., KUČA, K., MUSÍLEK, K., JUN, D., FRANCA, T. Molecular modeling studies on the interactions of aflatoxin B1 and its metabolites with human acetylcholinesterase. Part II: interactions with the catalytic anionic site (CAS). *Toxins*. 2018, **10**(10), Article Number: 389. ISSN 2072-6651. IF **3.273**
6. DOLEŽAL, R., KARÁSKOVÁ, N., MUSIL, K., NOVÁK, M., MALTSEVSKAYA, N., MALIŇÁK, D., KOLÁŘ, K., SOUKUP, O., KUČA, K., ŽDÁROVÁ KARASOVÁ, J. Characterization of the penetration of the blood-brain barrier by high-performance liquid chromatography (HPLC) using a stationary phase with an immobilized artificial membrane. *Analytical Letters*. 2018, **51**(15), 2401–2414. ISSN 0003-2719. IF **1.206**



7. DOSTÁLOVÁ, V., SCHREIBEROVÁ, J., DOSTÁLOVÁ, V. Jr., PÁRAL, J., KRAUS, J., TICHÁ, A., RADOCHOVÁ, V., DOSTÁL, P. Effects of hypertonic saline and sodium lactate on cortical cerebral microcirculation and brain tissue oxygenation. *Journal of Neurosurgical Anesthesiology*. 2018, **30**(2), 163–170. ISSN 0898-4921. IF **3.238**
8. ĎURÁČOVÁ, M., KLIMENTOVÁ, J., FUČÍKOVÁ, A., DRESLER, J. Proteomic methods of detection and quantification of protein toxins. *Toxins*. 2018, **10**(3), Article Number: 99. ISSN 2072-6651. IF **3.273**
9. ĎURIŠOVÁ, K., ČECHÁKOVÁ, L., JOŠT, P., ŠINKOROVÁ, Z., KMOCHOVÁ, A., PEJCHAL, J., ONDREJ, M., VÁVROVÁ, J., TICHÝ, A. DNA repair inhibitors as radiosensitizers in human lung cells. *Journal of Applied Biomedicine*. 2018, **16**(1), 66–74. ISSN 1214-021X. IF **1.783**
10. DUŠEK, T., ŮRHÁLMÍ, J., SOTONA, O., KRČMOVÁ KUJOVSKÁ, L., JVOVSKÁ, L., DOLEJŠ, J., PÁRAL, J. Neopterin, kynurenine and tryptophan as new biomarkers for early detection of rectal anastomotic leakage. *Videosurgery and Other Miniinvasive Techniques*. 2018, **13**(1), 44–52. ISSN 1895-4588. IF **0.852**
11. DVOŘÁK, J., MELICHAR, B., FILIPOVÁ, A., GRIMOVÁ, J., GRIMOVÁ, N., ROZSYPALOVÁ, A., BUKA, D., VOBORIL, R., ZAPLETAL, R., BUCHLER, T., RICHTER, I. Simulations of centriole of polarized centrosome as a mon-opole antenna in immune and viral synapses. *Journal of BUON*. 2018, **23**(2), 514–521. ISSN 1107-0625. IF **1.766**
12. FABRIK, I., LINK, M., PUTZOVÁ, D., PLZÁKOVÁ, L., LUBOVSKÁ, Z., PHILIMONENKO, V., PÁVKOVÁ, I., ŘEHULKA, P., KROČOVÁ, Z., HOZÁK, P., SANTIC, M., STULÍK, J. The early dendritic cell signaling induced by virulent Francisella tularensis strain occurs in phases and involves the activation of extracellular signal-regulated kinases (ERKs) and p38 In the later stage. *Molecular and Cellular Proteomics*. 2018, **17**(1), 95–108. ISSN 1535-9476. IF **5.232**
13. FRYZOVÁ, R., POHANKA, M., MARTINKOVÁ, P., CIHLÁŘOVÁ, H., BRTNICKÝ, M., HLADKÝ, J., KYNICKÝ, J. Oxidative stress and heavy metals in plants. *Reviews of Environmental Contamination and Toxicology*. 2018, **245**(October), 129–156. ISSN 0179-5953. IF **7.000**
14. HAMULÁKOVÁ, S., JANOVEC, L., SOUKUP, O., JUN, D., JANOČKOVÁ, J., HRABINOVÁ, M., ŠEPSOVÁ, V., KUČA, K. Tacrine-coumarin and tacrine-7-chloroquinoline hybrids with thiourea linkers: cholinesterase inhibition properties, kinetic study, molecular docking and permeability assay for blood-brain barrier. *Current*

- Alzheimer Research*. 2018, **15**(12), 1096–1105. ISSN 1567-2050. IF **3.289**
15. HEPNAROVÁ, V., KORÁBEČNÝ, J., MATOUŠKOVÁ, L., JOŠT, P., MŮČKOVÁ, L., HRABINOVÁ, M., VYKOUKALOVÁ, N., KERHARTOVÁ, M., KUČERA, T., DOLEŽAL, R., NEPOVIMOVÁ, E., ŠPILOVSKÁ, K., MEZEIOVÁ, E., PHAM, N., JUN, D., ŠTAUD, F., KAPING, D., KUČA, K., SOUKUP, O. The concept of hybrid molecules of tacrine and benzyl quinolone carboxylic acid (BQCA) as multifunctional agents for Alzheimer's disease. *European Journal of Medicinal Chemistry*. 2018, **150**(April), 292–306. ISSN 0223-5234. IF **4.816**
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## PRESENTATIONS AND POSTERES

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## PRESENTATIONS AND POSTERES

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## PRESENTATIONS AND POSTERES

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193. STRÍTECKÁ, H. *Healthy children's diet*. Brno: 2. ročník Konference Aliance výživových poradců ČR. 13.10.2018–13.10.2018.
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## INDEX

**A**

ANDREJSOVÁ  
(ZÁRYBNICKÁ) L., 30,  
117, 122, 123, 141,  
142, 150, 158, 160

**B**

BALONOVÁ, L., 60, 150,  
157

BLAŽEK, P. 28, 80, 95,  
125, 129

BOŠTÍK, P., 18, 19, 22, 26,  
27, 48, 77, 78, 80, 81,  
89, 98, 112, 120, 125,  
126, 127, 156

BOŠTÍKOVÁ, V., 18, 21,  
22, 26, 27, 48, 81, 89,  
93, 98, 99, 107, 108,  
114, 118, 120, 125,  
127, 156

BRNDIAR, M., 49, 140

**Č**

ČÍŽKOVÁ, J., 30, 158

**D**

DLABKOVÁ, A., 37, 123

DOLEŽELOVÁ, M., 57

DUŠEK, T., 20, 45, 89, 112,  
113, 126, 129, 133,  
140, 141, 151, 152

DUŠKOVÁ, K., 49, 57

**F**

FAJFROVÁ, J., 18, 21, 49,  
119, 126, 127, 141,  
149, 150

FIDRANSKÝ, M., 21

FILIPOVÁ, A., 30, 33, 77,  
102, 113, 122, 123,  
133, 141, 142, 158, 160

FINK, M., 57, 127, 141, 160

FLÉGL, V., 18

FUSEK, J., 19, 28, 126,  
129

**H**

HANOVCOVÁ, I., 22, 121,  
132, 138, 156

HEPNAROVÁ, V., 21, 37,  
79, 114, 115, 121, 135,  
136, 137, 138, 139,  
142, 143, 147, 148,  
149, 151, 159

HERCÍK, K., 60, 75, 143,  
156, 160

HORÁČEK, J., 19, 20, 49,  
56, 81, 89, 108, 114,  
125, 126, 129, 133,  
134, 135, 136, 137,  
139, 141, 142, 143,  
146, 149, 150, 153,  
154, 158, 160

HRABINOVÁ, M., 37, 38,  
40, 79, 103, 113, 114,  
116, 117, 121, 134,  
135, 136, 137, 138,  
139, 142, 143, 149,  
151, 159

HRSTKA, Z., 28, 89

HUMLÍČEK, V., 28, 76,  
129, 144

## **CH**

CHLÍBEK, R., 19, 20, 22,  
24, 25, 77, 79, 90, 112,  
120, 121, 125, 126,  
127, 128, 130, 131,  
132, 133, 136, 137,  
138, 139, 144, 145,  
146, 153, 156, 158

## **J**

JAKL, M., 20, 21, 49, 76,  
90, 115, 129, 133, 140,  
146

JANOUC, J., 28, 130, 131

JANOVSKÁ, S., 22, 125

JEBAVÝ, L., 19, 49, 90,  
136, 137, 143, 149, 150

JOŠT, P., 37, 38, 97, 112,  
113, 114, 120, 121,  
126, 137, 147

JUN, D., 19, 20, 37, 40, 41,  
42, 44, 76, 98, 99, 101,  
106, 108, 109, 111,  
112, 113, 114, 115,  
116, 117, 118, 120,  
121, 123, 133, 135,  
136, 137, 138, 139,  
140, 142, 143, 147,

148, 149, 151, 153,  
156, 159

JUNOVÁ, L., 37, 116, 135,  
137, 142, 147

## **K**

KASSA, J., 19, 37, 75, 79,  
90, 112, 115, 117, 118,  
120, 135, 137, 140,  
147, 148

KLEIN, L., 45, 90, 126, 117,  
126, 148, 150

KLIMENTOVÁ, J., 60, 65,  
67, 75, 100, 101, 108,  
113, 117, 140, 148

KOČÍ, J., 45, 118, 122, 127,  
151

KOMÁREK, J., 18

KORÁBEČNÝ, J., 37, 40,  
43, 80, 90, 106, 109,  
112, 114, 115, 117,  
118, 119, 121, 123,  
126, 133, 135, 136,  
137, 138, 139, 140,  
142, 143, 148, 149,  
153, 156, 159

KROČOVÁ, Z., 19, 60, 65,  
75, 100, 113, 116, 152,  
153, 157

KRUTIŠ, J., 57, 127, 160

KRUTIŠOVÁ, P., 20, 21,  
50, 57, 119, 149

KUBELKOVÁ, K., 20, 21,  
60, 67, 75, 77, 78, 82,  
90, 101, 112, 116, 148,  
149, 152, 153

KUPSA, T., 49, 136, 137,  
143, 149, 150

**L**

LAŠÁK, P., 49, 50, 80, 126,  
141, 150

LOCHMAN, P., 20, 45, 46,  
47, 78, 91, 93, 123,  
126, 127, 128, 151

**M**

MACELA, A., 60, 77, 116,  
152, 153

MALÝ, O., 45, 77, 140, 151

MAREK, J., 22, 25, 26, 33,  
40, 42, 80, 99, 110,  
118, 119, 123, 138,  
140, 142, 151, 156

MATOUŠEK, R., 57

MISÍK, J., 37, 80, 91, 112,  
114, 118, 119, 138,  
142, 151

MUSÍLEK, K., 37, 43, 44,  
106, 112, 116, 117,  
120, 121, 133, 135,  
136, 137, 138, 139,  
140, 142, 143, 147,  
148, 149, 151, 153, 159

**N**

NOVOTNÝ, P., 57, 118,  
120

**P**

PÁRAL, J., 19, 27, 45, 47,  
48, 75, 79, 98, 99, 111,  
113, 115, 126, 127,  
128, 140, 151, 152

PÁVKOVÁ, I., 60, 63, 67,  
75, 101, 106, 113, 148,  
149, 152, 157

PAVLÍK, V., 20, 49, 80, 91,  
119, 125, 126, 127,  
141, 149, 150, 152

PEJCHAL, J., 37, 91, 112,  
113, 116, 117, 118,  
122, 123, 126, 139,  
142, 150, 152, 159

PLODR, M., 18, 57

POHANKA, M., 3, 18, 19,  
21, 60, 63, 64, 69, 75,  
80, 91, 105, 108, 110,  
111, 113, 115, 116,  
118, 119, 120, 126,  
128, 131, 133

POTÁČ, M., 21, 28

PÚDELKA, L., 57, 77

**R**

RADOCHOVÁ, V., 61, 64,  
69, 104, 68, 113, 115,  
122, 127

RŮŽIČKA, M., 28, 127,  
128, 132, 156, 158, 160

**Ř**

ŘEHULKA, P., 60, 64, 76,  
78, 108, 113, 120, 121,  
149, 153, 157, 160

**S**

SHESHKO, V., 60, 61, 65,  
76, 81, 100, 103, 157

SKOŘEPA, P., 49, 50, 56,  
80, 103, 125, 127, 133,  
134, 142, 146, 154, 155

SLEHA, R., 22, 26, 99, 125,  
140, 156

SMETANA, J., 21, 22, 77,  
80, 91, 112, 121, 127,  
128, 130, 131, 132,  
138, 139, 153, 155,  
156, 158

SMOLA, P., 28, 127, 156,  
158, 160

SOUKUP, O., 26, 41, 43,  
91, 93, 107, 37, 112,  
113, 114, 115, 116,  
117, 118, 119, 121,  
123, 135, 136, 137,  
138, 139, 140, 142,  
147, 148, 149, 151,  
156, 159

STRÍTECKÁ, H., 21, 49,  
91, 114, 125, 142, 157

STULÍK, J., 60, 65, 67, 76,  
78, 91, 101, 107, 113,  
121, 122, 139, 140,  
148, 149, 150, 152,  
153, 156, 157, 158, 160

SUCHÁNEK, Z., 28, 127,  
132, 156, 158, 159

SVOBODOVÁ, H., 37, 120

SVOBODOVÁ, R., 20

## **Š**

ŠAFKA, V., 49, 119, 126,  
127, 141, 150

ŠIMEK, J., 45, 46, 47

ŠINKOROVÁ, Z., 19, 20,  
30, 31, 33, 34, 35, 91,  
100, 105, 107, 109,  
113, 117, 122, 123,  
126, 141, 142, 146,  
147, 150, 158, 160

ŠMEJKAL, K., 45, 118

ŠOŠOVIČKOVÁ, R., 22,  
23, 95, 121, 126, 127,  
128, 130, 132, 138,  
139, 153, 156, 158

ŠPIDLOVÁ, P., 60, 63, 76,  
91, 106, 121, 122, 139,  
152, 156, 157, 158

ŠPLIŇO, M., 19, 22, 91, 92,  
121, 128, 130, 132

ŠUBRT, Z., 19, 21, 45, 46,  
47, 150, 159

## **T**

TICHÝ, A., 21, 30, 35, 76,  
82, 92, 99, 112, 113,  
118, 120, 122, 123,  
141, 142, 158, 159

## **V**

VÁŇOVÁ, N., 37, 42, 81,  
82, 109, 38, 123, 139,  
159

VAŠEK, T., 28, 50, 128,  
132, 156, 158, 159

VÁVROVÁ, J., 30, 113

VOPLATKOVÁ, Z., 21, 70

**Z**

ZÁRYBNICKÁ,  
(ANDREJSOVÁ), L.,  
30, 117, 122, 123, 141,  
142, 150, 158, 160

**Ž**

ŽDÁRA, J., 28, 124, 127,  
128, 132, 156, 158,  
159, 160

ŽDÁROVÁ KARASOVÁ, J.,  
37, 112, 116, 117, 123,  
124, 137, 147, 148, 149

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