

INSTITUTE FOR MEDICAL RESEARCH AND OCCUPATIONAL HEALTH

Annual Report



ZAGREB, 2020

14. ORGANISATION OF THE INSTITUTE

Date and place of founding: 27 Dec 1947 in Zagreb.

Founder: Prof Andrija Štampar, PhD, president of the Yugoslav Academy of Sciences and Arts.

Status: public research institute under the Ministry of Science and Education of the Republic of Croatia.

Fields of research: general, genetic, and molecular toxicology, allergotoxicology, radiation and chemical weapon protection, environmental radioactive contamination, air quality, determination of drug abuse, occupational medicine, distribution of metals and inorganic and organic pollution in the environment, and the exposure of human beings to such exposures, as well as various psychogenic factors.

Types of registered fields: scientific, professional, teaching, and publishing.

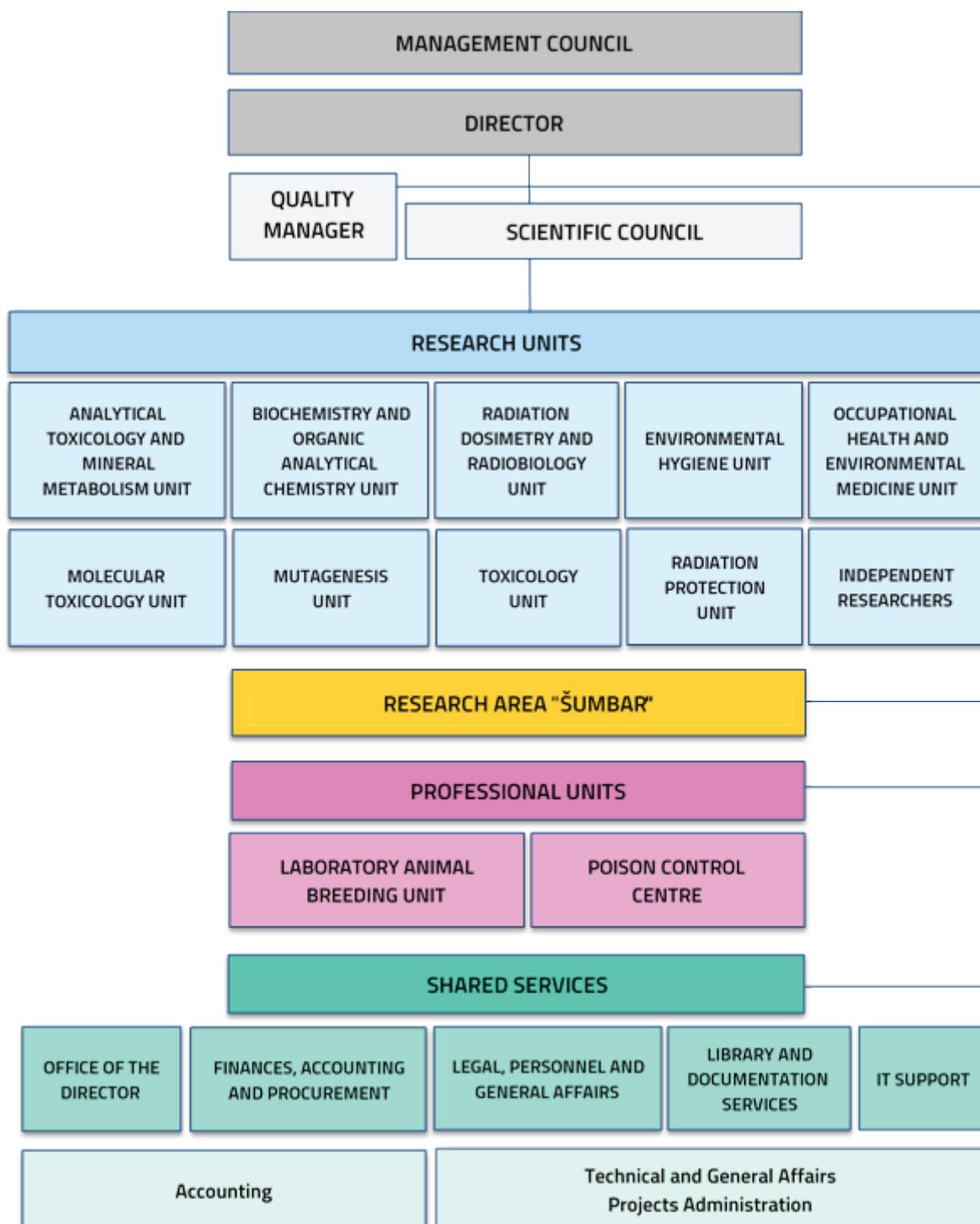
The mission of the Institute is to become:

- a research institute of excellence in central and south-eastern Europe that shifts the boundaries of discovery regarding anthropogenic impacts on health and the environment
- a standard and role model of academic distinction and quality.

The vision of the Institute is to:

- insist on high standards of scientific excellence
- create new values in science
- ensure the transfer of knowledge to the wider community
- contribute to the economy through outcomes of research and development
- educate future leaders in the fields of fundamental and applied sciences.

TOTAL NUMBER OF EMPLOYEES (31 DEC 2019): 157		Number of employees	%
Funding sources	State budget	147	94
	IMROH	4	2
	Croatian Science Foundation	6	4
Sex	Women	115	73
	Men	42	27
Academic titles	PhD	74	47
Teaching titles	Assis Prof (4); Assoc Prof (1); Full Prof (4)	9	6
Specialist titles	Epidemiology (1); Occupational Medicine and Sports (2)	3	2
	Permanent Scientific Advisor	17	11
Scientific work positions	Scientific Advisor	8	5
	Senior Scientific Associate	15	10
	Scientific Associate	16	10
	Total	56	36
Associate work positions	Postdoctoral researcher	15	10
	PhD student, Assistant	15	10
	Total	30	19
Professional work positions	Professional Advisor	3	2
	Senior Professional Associate	1	<1
	Professional Associate	10	6
	Total	14	9
Technicians		28	18
Shared Services		29	18



The organisational structure of IMROH

MANAGEMENT OF THE INSTITUTE

MANAGEMENT COUNCIL

Prof Nikola Ružinski, PhD, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb (Chair)

Prof Stipan Jonjić, PhD, School of Medicine, University of Rijeka (Deputy Chair)

Božo Pavičin, Croatian Chamber of Economy

Zdenko Franić, PhD (Representative of the Institute's research staff)

Branka Roić, BEc (Representative of the Institute's employees)

DIRECTOR

Prof Ana Lucić Vrdoljak, PhD

DEPUTY DIRECTORS

Irena Brčić Karačonji, PhD

Prof Radovan Fuchs, DVM, PhD (International Affairs)

SCIENTIFIC COUNCIL

Assoc Prof Branko Petrinec, PhD (Chair)

Davorka Breljak, PhD (Deputy Chair)

ETHICS COMMITTEE

CHAIR

Prim Jelena Macan, MD, PhD

MEMBERS

Prof Radovan Fuchs, DVM, PhD

Maja Peraica, MD, PhD, ERT

Martina Piasek, MD, PhD

Prof Jure Zovko, PhD, Faculty of Philosophy, University of Zadar

Marija Kujundžić Brkulj, BSc (Secretary until 15 Oct 2019)

Jagoda Mandić (from 16 Oct 2019)

QUALITY MANAGER

Zdenko Franić, PhD

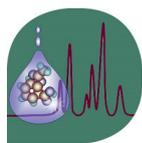
14.1. Ethics Committee

All of the provided requests were considered according to the criteria of the Code of Ethics of the Institute for Medical Research and Occupational Health, and applicants were given written opinions which were then officially registered. The number of requests and given opinions was 2.5 times greater in 2019 than in the previous year. In all, 13 meetings and consultations via e-mail were held and ethical principles were considered in 25 claims:

- project proposals submitted by Institute's researchers as leaders or associates on Croatian Science Foundation calls (9 projects)
- proposals for internal projects to be implemented through institutional funding (3 projects)
- research for doctoral or graduation theses of the Institute's and other students (4 projects)
- proposals for international projects with the Institute's researchers as associates (2 projects)
- project proposals from other research institutions (School of Medicine, University of Rijeka, Faculty of Food Technology and Biotechnology, University of Zagreb, Faculty of Veterinary Medicine, University of Zagreb) in cooperation with the Institute (3 projects)
- project proposals from other research institutions (Genos Ltd, Outpatient Clinic Bonifarm, Faculty of Food Technology and Biotechnology, University of Zagreb, Faculty of Economics and Business, University of Zagreb) (4 projects).

15. RESEARCH UNITS

UNIT	CODE	HEAD	CONTACTS
Analytical Toxicology and Mineral Metabolism	604	Jasna Jurasović, PhD	Tel. (01) 4682 530 e-mail: jurasovic@imi.hr
Biochemistry and Organic Analytical Chemistry	609	Snježana Herceg Romanić, PhD	Tel. (01) 4682 553 e-mail: sherceg@imi.hr
Environmental Hygiene	610	Assist Prof Gordana Pehnec, PhD	Tel. (01) 4682 580 e-mail: gpehnec@imi.hr
Molecular Toxicology	606	Davorka Breljak, PhD	Tel. (01) 4682 622 e-mail: dbreljak@imi.hr
Mutagenesis	616	Nevenka Kopjar, PhD	Tel. (01) 4682 630 e-mail: nkopjar@imi.hr
Occupational Health and Environmental Medicine	615	Prim Jelena Macan, PhD	Tel. (01) 4682 600 e-mail: jmacan@imi.hr
Radiation Dosimetry and Radiobiology	608	Ivica Prlić, PhD	Tel. (01) 4682 570 e-mail: iprlic@imi.hr
Radiation Protection	602	Gordana Marović, PhD	Tel. (01) 4682 650 e-mail: marovic@imi.hr
Toxicology	603	Maja Peraica, PhD, ERT	Tel. (01) 4682 640 e-mail: mperaica@imi.hr
Independent Researcher	387	Aleksandra Fučić, PhD	Tel. (01) 4682 522 e-mail: afucic@imi.hr
Independent Researcher	389	Ante Miličević, PhD	Tel. (01) 4682 524 e-mail: antem@imi.hr
Independent Researcher	373	Jasmina Sabolović, PhD	Tel. (01) 4682 526 e-mail: jsabolov@imi.hr



15.1. Analytical Toxicology and Mineral Metabolism Unit

EMPLOYEES

HEAD

Jasna Jurasović, PhD, permanent scientific advisor

RESEARCH STAFF

Martina Piasek, PhD, permanent scientific advisor

Alica Pizent, PhD, permanent scientific advisor

Zorana Kljaković-Gašpić, PhD, scientific advisor

Assist Prof Ivana Vinković Vrček, PhD, scientific advisor

Nataša Brajenović, PhD, senior scientific associate

Irena Brčić Karačonji, PhD, senior scientific associate (Deputy Director)

Maja Lazarus, PhD, senior scientific associate

Anja Katić (Mikolić), PhD, scientific associate

Tatjana Orct, PhD, scientific associate

Blanka Tariba Lovaković, PhD, scientific associate

Ankica Sekovanić, PhD, postdoctoral researcher

Antonija Sulimanec Grgec, PhD, postdoctoral researcher since 17 Dec 2019

Tanja Živković Semren, PhD, postdoctoral researcher since 11 Sep 2019

Rinea Barbir, MSc, PhD student-assistant (HrZZ)

Andreja Jurič, MSc, PhD student-assistant

Nikolina Kalčec, MSc, PhD student-assistant (HrZZ) since 2 Dec 2019

Barbara Pem, MSc, PhD student-assistant

TECHNICAL STAFF

Mladen Komesar, senior technician

Vesna Triva, senior technician

Snježana Mataušić, technician

Krešimir Nekić, technician

PARTICIPATING RETIRED RESEARCHERS

Maja Blanuša, PhD, permanent scientific advisor

SCIENTIFIC RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

Long-term research activities

Assessment of exposure and intake of essential and toxic elements in mother-newborn pairs

In healthy postpartum women from continental ($n = 197$) and coastal Croatia ($n = 203$), the intake of omega-3 fatty acids (eicosapentaenoic acid + docosahexaenoic acid, EPA + DHA), essential elements Na, K, Ca, Mg, Fe, Zn, Cu and Se, toxic metals Hg, Cd and Pb, and the metalloid

As was assessed through seafood consumption. The profile of fatty acids was determined by gas chromatography (GC) in the most commonly consumed fish ($n = 84$) species sardine, European hake, gilthead seabream, and seabass. In addition, multielement analysis was carried out by inductively coupled plasma mass spectrometry (ICP-MS) in wild-caught ($n = 813$) and farmed fish from the eastern Adriatic Sea ($n = 24$) as well as in frozen ($n = 64$) and canned fish ($n = 37$). The results on analytes in fish were related to the data on study participants from the questionnaires and element status in mother and offspring was estimated in relation to seafood intake and predetermined element levels in maternal hair, blood and serum, and umbilical cord blood. It was shown that sardines and anchovies are a valuable food source of Fe, Zn and Cu, and sardines and picarels for Se. The estimated intake through medium size fish meal of 130 g is on average 956 mg EPA + DHA, i.e. about 4 times the dietary reference value (DRV), up to 20 % of the DRVs for measured essential macroelements, about 10 % of the DRVs for microelements, and >60 % of the DRV for Se. In the samples of mother-infant pairs from the continental *vs.* coastal area higher concentrations of Fe, Zn and Cu (as red meat and cereals are their main dietary sources) and lower Se in maternal serum, lower Hg and Se in maternal hair, and lower Hg and As in maternal and cord blood were determined. In all of the measured biological samples the levels of Hg, As and Se positively correlated with the frequency of fish consumption. Given the average fish consumption per week of 130 g and the content of toxic metals in fish with $<0.16 \text{ mg Hg kg}^{-1}$ (with the exception of $>0.42 \text{ mg Hg kg}^{-1}$ in wild red mullet and gilthead seabream) and $<0.02 \text{ mg kg}^{-1}$ for both Cd and Pb plus the values of tolerable weekly intake (TWI) that were <15 % for methyl-Hg and several hundreds lower for both Cd and Pb, it was concluded that there was no risk of increased toxic metal intake. Regarding As, its main chemical form in marine fish is arsenobetaine, which is non-toxic. The original contribution of this research is evidence that marine fish in Croatia can be recommended as nutritionally highly valuable food for all population groups. Moreover, these results can serve in drawing up national guidelines on fish consumption in women during the reproduction period due to health risks of prenatally exposed offspring, especially by consumption of fish species from the Adriatic Sea for which increased levels of Hg ($>0,5 \text{ mg kg}^{-1}$ muscle meat) were determined (181).

Inductively coupled plasma mass spectrometry (ICP-MS) method for the determination of essential and toxic elements As, Ca, Cd, Cu, Mg, Mn, Mo, Fe, Hg, Pb, Se and Zn in human hair was developed and validated together with the exploration of different solution efficiency in hair sample washing to remove the external metal contamination as no standard procedure for that purpose has yet been accepted. Hair washing procedures by ethyl acetate, methanol, ethanol, acetone, and detergent, with or without the use of an ultrasonic bath gave satisfactory results, whereas usage of nitric and hydrochloric acid was found unsuitable. The tested validation parameters were within previously defined eligibility criteria. In the analyzed hair samples of healthy postpartum women ($n = 167$) from coastal *vs.* continental Croatia, concentrations of Hg, Fe, Mn, Se, and Zn were higher and Ca and Mg were lower, which may be related with the differences in intake of fish, dairy products and mineral-vitamin supplements as well as different soil mineral content in two studied areas (188).

In-house scientific projects (Chapter 16.1.A.3.)

1. *Investigation of interactions between irinotecan and tetrahydrocannabinols on laboratory rodents using integrated biochemical, molecular biology, pathohistological, and analytical methods*

We published results on the effects of tetrahydrocannabinol (THC) on DNA in white blood and brain cells of Wistar rats (34, 312). Effects of rat exposure to irinotecan (IRI), THC, and their combination on haematological and biochemical parameters, cholinesterase activities, markers of oxidative stress, and levels of primary DNA damage were presented at the 4th Congress of the Slovenian Society

of Toxicology "Cannabis under scrutiny: their toxicity and medical utility" (337). Extraction and gas chromatography-mass spectrometry (GC-MS) analysis conditions were optimised for determining THC and its metabolite in rat urine. Enhanced urinary THC metabolites excretion was noted in rats administered combined treatment compared to single THC treatment (21, 279). Genotoxic and cytotoxic effects of irinotecan on human hepatocellular carcinoma cell line (HepG2) and the colon adenocarcinoma cell line (Caco-2) (296). The effect of IRI on levels of primary DNA damage were investigated in white blood cells, liver, and brain of rats (301).

2. *Nutritive and toxicological properties in organic vs. conventional honeys*

Since the beginning of the project (August 2019), 15 certified organic honey producers from Banovina, Baranja, Istra, island Rab, Ozalj, and Velebit area have been contacted, as well as conventional producers matching the same areas. Element levels, total phenolic content, and antioxidative properties were measured in 63 samples of chestnut, acacia, sage, and winter savory honey. Quantification of antibiotic and chemotherapeutic residuals (sulphonamides, aminoglycosides, tetracyclines and tylosin), 112 pesticides and their metabolites, physicochemical parameters and melissopalynological analysis are underway at our collaborative institutions (Croatian Veterinary Institute, Faculty of Agriculture University of Zagreb).

3. *Evaluation of reproductive toxicity of commonly used pesticides followed by chronic low-dose exposure in vivo*

The planned research is a continuation of the project of the Institute for Medical Research and Occupational Health OPENTOX (Organic Environmental Pollutants – Markers and Biomarkers of Toxicity, IP-2014-8366, lead by D. Želježić), supported by the Croatian Science Foundation. The implementation of the project began in December 2019. The aim of the project is to investigate the potential toxic effects of insecticides α -cypermethrine and imidacloprid and herbicides terbutylazine and tembotrione on reproductive health in *in vivo* conditions (male Wistar strain rats). Analyses of oxidative stress parameters are underway, and a Master's thesis ("Effects of α -cypermethrine and imidacloprid on oxidative stress parameters in testes and epididymis of male Wistar strain rats") has been applied to the Faculty of Science in Zagreb by A. Jančec (under the supervision of B. Tariba Lovaković).

Other research activities

Results on the protective role of strong antioxidant strawberry tree (*Arbutus unedo* L.) honey and its main bioactive constituent homogentisic acid against the cyto/genotoxic effects induced by UVB radiation in human peripheral blood lymphocytes *in vitro* were presented at the 12th Symposium of the Croatian Radiation Protection Association (131).

Radionuclides and stable elements combined with risk/benefit analysis for consumers of wildlife meat were reported for exotic Barbary sheep (*Ammotragus lervia*) population residing on Mt. Mosor, Croatia (39).

A quantitative profile of free amino acids and elements in urine and levels of oxidative stress parameters in blood were compared between men with testicular cancer ($n = 99$) and control subjects ($n = 68$). The subjects with testicular cancer had significantly higher concentrations of aspartic acid, manganese, and zinc and higher activity of superoxide dismutase and significantly lower concentrations of threonine, serine, histidine, cobalt and glutathione, as well as lower total oxidant status in comparison to control subjects. Additionally, linear discriminant analysis (LDA) performed to examine whether the created amino acid profile discriminated subjects with testicular cancer from control subjects showed a discrimination rate of 86 % when all amino acids were included in the model. A qualitative profile of volatile organic metabolites in urine was created

to detect which species, depending on their functional groups, can be detected in urine of men with testicular cancer. GC-MS analysis resulted in about 200 peaks of volatile organic metabolites detected in urine, and 123 of them were identified and 17 confirmed by standard. After receiving chemotherapy (bleomycin, etoposide and cisplatin), men with cancer had increased concentrations of the majority of amino acids and elements in urine and glutathione in blood plasma in comparison to values measured before chemotherapy. One year after chemotherapy, the results showed that the concentrations of most amino acids and elements were similar to those measured in control subjects, except for threonine, serine and mercury which had significantly higher values, and manganese and platinum, which had significantly lower values than the control subjects (182, 184, 260, 261).

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Assessment of daily exposure to metals and maternal individual susceptibility as factors of developmental origins of health and disease (METALORIGINS, HrZZ-IP)
- Interaction of metallic nanoparticles with sulphur-containing biomolecules – implications for nano-bio interface (NanoFaceS, Hrzz-IP)
- Application of Nanobiotechnology for Nutritional Supplementation with Selenium (NutriTENSE, HrZZ-IP)
- Development, validation and application of analytical methods for PBDE determination (DeValApp, HrZZ-UIP)
- Biological monitoring of the effects of volatile aromatic hydrocarbons (BTEX) on the health of the Primorje-Gorski Kotar County population (UNIRI)
- Opportunistic pathogens in the water supply system: a new challenge in water treatment (UNIRI)

International projects (Chapter 16.2.)

- European Concerted Programme on Radiation Protection Research (CONCERT, Horizon 2020)
- Science-based risk governance of nano-technology (RiskGONE, H2020)
- Safe-by-Design Approach for Development of Nano-Enabled-Delivery Systems to Target the Brain (SENDER, HrZZ-PZS)
- Anti-Microbial Coating Innovations to prevent infectious diseases (AMICI, COST)
- Cancer nanomedicine – from the bench to the bedside (Nano2Clinic, COST)
- The pharmacokinetic profile of silver nanoparticles: the role of biological barriers (Bilateral CRO-AT)
- Multiplex characterization platform for nanobio interfaces (Bilateral CRO-DE)

PROFESSIONAL SERVICES

Professional analyses were carried out on the request of various institutions, companies, and individuals on metals and metalloids in samples of different origins (by ICP-MS and AAS) and drugs of abuse in hair and urine samples (by GC-MS).

A total of 320 analyses of specific indicators of exposure and effect to toxic metals/metalloids and essential trace element status in the human organism were performed. Most of the analyses were related to determining biological markers of Pb exposure [concentrations of Pb and erythrocyte protoporphyrin (EP) and activity of δ -aminolevulinic acid dehydratase (ALAD) in blood] during the assessment of professional exposure in workers at different workplaces ($n = 116$). Concentrations of Hg in urine, blood, and hair (48 analyses) and a wide range of elements (Al, As, Cd, Co, Cr, Cu, I, Li, Mg, Mn, Mo, Ni, Pb, Se, Sn, Tl and Zn) in those biological samples (156 analyses) were also

determined. Based on a contract signed with the Institute of Public Health of Brod-Posavina County, analyses of Pb, Ni, Cr, V, Mn, and Tl in whole blood, serum, urine, and hair samples of 41 subjects, in total 738 analyses (341), were performed. Apart from analyses of human biological samples, Cd was measured in dried tobacco leaves (6 samples) on the manufacturer's request.

Pursuant to the contract with the Pčelarska udruga Petrinja on the characterisation of conventional honey from Banovina (Banski med), levels of 25 elements, total phenolic content, and antioxidative potential were measured in 25 samples of Banski med.

Drugs of abuse from the amphetamine and opiate groups, methadone, and cocaine were determined in 39 hair samples (60 analyses in total). THC-COOH and buprenorphine (5 samples) and opiates (1 sample) were analysed in urine. A total of 60 queries were received regarding the analysis of drugs of abuse via the e-mail address infodroge@imi.hr.

List of intercomparisons

ORGANISER	TEST	AREA	DATE
Society of Hair Testing, Strasbourg, France	Proficiency Test 2019	Analysis of drugs of abuse in hair	6/2019 and 12/2019 (two times per year, three hair samples)

PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

I. Brčić Karačonji

Member of the Working Group on the Early Warning System on New Psychoactive Substances in the Republic of Croatia at the Croatian Institute for Public Health; member of the Presidency of the Croatian Society of Toxicology.

J. Jurasović

Member of the Presidency of the Croatian Society of Toxicology.

M. Lazarus

Secretary of the Croatian Laboratory Animal Science Association (CroLASA); member of the Organising Committee of professional Symposium "Education of professional and technical staff involved in the care of animals used in biomedical research", Zagreb, 18 Oct 2019 and professional workshop "How successfully apply for animal experiment licence", Zagreb, 9 Apr 2019.

M. Piasek

Member of the international professional associations International Commission on Occupational Health – ICOH and MEDICHEM, also an ICOH scientific committee for occupational health in chemical industry; member of the Presidency (until 13 Nov 2019) and member of the Supervisory Board (since 13 Nov 2019) of the Croatian Society of Toxicology.

I. Vinković Vrček

Member of the Working Group of the Ministry of Health for Development of the Position of the Republic of Croatia in the New Food Area; member of the Referent Group of the Ministry of Science and Education for Nanotechnology, Advanced Materials, Biotechnology, Advanced Production Processes; member of the Thematic Innovation Council for Health and Quality of Life of the Ministry of Economy, Entrepreneurship and Crafts of the Republic of Croatia; member of the Editorial Board of the journal *Diacovensia*.

SCIENTIFIC, TEACHING AND ACADEMIC ADVANCEMENT OF EMPLOYEES

Scientific degree of scientific advisor was gained by *M. Lazarus*.

Scientific degree of permanent scientific advisor was gained by *Z. Kljaković-Gašpić*.



15.2. Biochemistry and Organic Analytical Chemistry Unit

EMPLOYEES

HEAD

Snježana Herceg Romanić, PhD, permanent scientific advisor

RESEARCH STAFF

Zrinka Kovarik, PhD, permanent scientific advisor

Goran Šinko, PhD, scientific advisor

Anita Bosak, PhD, senior scientific associate

Sanja Fingler Nuskern, PhD, senior scientific associate

Maja Katalinić, PhD, senior scientific associate

Gordana Mendaš Starčević, PhD, senior scientific associate

Sanja Stipičević, PhD, senior scientific associate since 11 Jul 2019

Darija Klinčić, PhD, scientific associate

Marija Dvorščak, PhD, postdoctoral researcher

Nikolina Maček Hrvat, PhD, postdoctoral researcher

Josip Madunić, PhD, postdoctoral researcher since 2 Oct 2019

Nikola Maraković, PhD, postdoctoral researcher

Tamara Zorbaz, PhD, postdoctoral researcher since 20 Feb 2019

Tena Čadež, MSc, PhD student-assistant (HrZZ) since 2 Feb 2019

Karla Jagić, MSc, PhD student-assistant (HrZZ) since 1 Feb 2019

Ana Matošević, MSc, PhD student-assistant

Antonio Zandona, MSc, PhD student-assistant

TECHNICAL STAFF

Maja Meštrović, technician

PARTICIPATING RETIRED RESEARCHERS

Prof Vlasta Drevenkar, PhD, permanent scientific advisor

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

Scientific collaborations

Our collaboration with Dr D. Opsenica from the Institute of Chemistry, Technology and Metallurgy, IHTM, Belgrade, Serbia, continued. A series of quinoline derivatives were synthesized and shown to have an inhibitory potential for human acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) (10).

The results of determination of scoring functions and *in silico* parameters for the interactions of 68 AChE-ligand complexes were published for the purposes of a tool for predicting inhibition potency (78).

In collaboration with colleagues from the Faculty of Science University of Zagreb (principal investigator: Prof S. Tomić), a series of 14 novel heterocyclic β -D-glucoconjugates and β -D-galactoconjugates were designed and synthesized, but 4 of them showed an inhibitory effect with benzimidazolium and 1-benzylbenzimidazolium substituents in a 10-50 micromolar range. The

molecular modelling analysis indicated key residues of the BChE active site, which contributed to a higher affinity toward the selected compounds. It was shown that benzimidazole derivatives of pyranosyl sugars represented the structural scaffold in the development of anti-Alzheimer's disease drugs (9).

A part of research on the topic of the diploma thesis by PhD student A. Zandona was published within the results of the project HrZZ-IP-2013-11-9158 (principal investigator Prof B. Šantek) at the Faculty of Food Technology and Biotechnology under supervision of Prof I.K. Svetec (79).

Cooperation with scientific institutions in Serbia, Institute of Physics Belgrade and Faculty of Chemistry, University of Belgrade continued for the purpose of complementary analysis of persistent compounds in environmental samples and application of advanced statistical methods. Within the framework of the collaboration, preliminary data on the application of sophisticated methods such as numerical and statistical modeling, as well as the use of machine learning algorithms in processing the results of persistent compounds in breast milk, have been published (31). This cooperation is linked to the long-term collaboration with the Department of Health Studies of the University of Zadar.

In collaboration with the Environmental Hygiene Unit, a method for the determination of PCBs in atmospheric deposition was developed and evaluated. The method was applied to determine PCBs in monthly samples collected during 2018 and 2019 (156, 252, 253, 331).

The occurrence and distribution of persistent organochlorine compounds in soil collected near a coal-fired power plant and urban soil (16) and in lake sediment cores from the Plitvice Lakes National Park, Croatia (15) were investigated.

In collaboration with the University of Zagreb Faculty of Agriculture, the phytotoxic effects of mesotrione residues on sugar beet (*Beta vulgaris* L.) were determined in two agricultural soils in order to indicate the relevance of soil characterisation in crop rotation practice (108).

Sampling continued within the framework of the MONET project, which has been conducted since 2009 under the auspices of the RECETOX, Regional Center for Environmental Chemistry and Toxicology, Masaryk University, Brno, Czech Republic (272).

In-house scientific projects (Chapter 16.1.A.3.)

1. Design, synthesis and evaluation of selective inhibitors of butyrylcholinesterase

The interactions of human cholinesterases and selected quinolines were analyzed (10).

2. Persistent Organic Pollutants – Environmental Impact Assessment and Stability of Human Genetic Material

The results of the study of persistent organic pollutants (POPs) in edible fish from different fishing zones of the Croatian Adriatic will be presented in Graduate thesis of Mirna Štrbac "Organochlorine compounds in fish from the Adriatic Sea", University of Rijeka, Department of biotechnology, Drug research and development, 2020. POPs were investigated in farmed tuna and in wild tuna.

3. Investigation of interactions between irinotecan and tetrahydrocannabinols on laboratory rodents using integrated biochemical, molecular biology, pathohistological, and analytical methods

An analytical procedure consisting of solid phase extraction and final HPLC analysis of irinotecan and its metabolite SN-38 in whole blood of mice was developed.

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Analysis of Butyrylcholinesterase Interactions with Novel Inhibitors and Reactivators

(AnalyseBChE, HrZZ-IP)

- Activity and guided design of bioactive small molecules (Adesire, HrZZ-IP)
- Development, validation and application of analytical methods for PBDE determination (DeValApp, HrZZ-UIP)
- Molecular Mechanisms Underlying the Toxicity of Antidotes and Potential Drugs (CellToxTargets, HrZZ-UIP)
- Cell response to exposure to chlorinated bispyridinium compounds (HAZU)

International projects (Chapter 16.2.)

- CNS-active, Orally Bioavailable, Zwitterionic Oximes for Organophosphate (DTRA, USA)
- Effects of selected pesticides on neuronal acetylcholinesterase expression (Bilateral CRO-CN)
- Persistent organochlorine compounds in human milk and their potential effect on the level of primary DNA damage in human cells (Bilateral CRO-RS)
- Multiplex characterization platform for nanobio interfaces (Bilateral CRO-DE)

PROFESSIONAL SERVICES

Spatial and temporal distribution of pollutants (nitrates, phosphates, pesticides, heavy metals) from agriculture in different agroecological conditions

Interdisciplinary project of the Hrvatske vode, 2017-2019; Project manager: Prof G. Ondrašek, Faculty of Agriculture, University of Zagreb.

The soil mobility of glyphosate herbicide was evaluated at two contrasting vineyards in terms of soil properties and landscape position by lysimeter and soil column studies (211, 237, 338). Parameters affecting the retention of glyphosate in soil were determined with respect to the physicochemical properties of soils under different climates (327).

PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

A. Bosak

Member of the Executive Board of the Croatian Society of Natural Sciences; a shop steward representing scientific staff at the Independent Trade Union of Science and Higher Education for the branch IMROH.

S. Fingler Nuskern

Member of the TO-147 Water Quality at the Croatian Standards Institute.

S. Herceg Romanić

Member of the Working Group for monitoring and meeting the requirements of the Second National Plan for the Implementation of the Stockholm Convention on Persistent Organic Pollutants.

M. Katalinić

Secretary and member of the Executive Board of the Society and Science Committee of the Croatian Society of Biochemistry and Molecular Biology (HDBMB); secretary and a member of the Organising Committee of the congress of the Croatian Society of Biochemistry and Molecular Biology HDBMB2019 (25-28 Sep 2019, Lovran); chair of the Organisation committee of the FEBS Young Scientists' Forum (1-4 Jul 2020, Lovran); member of the International Committee of the 45th Congress of the Federation of European Biochemical Societies – FEBS2020 (4-9 Jul 2020, Ljubljana, Slovenia).

Z. Kovarik

President of the the Croatian Society of Natural Sciences; vice-president and member of the Executive Board of HDBMB; member and vice-chair for technological development and inovations,

Chemistry Board, Croatian Agency for Science and Higher Education; member of the Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons (SAB OPCW); member of International Advisory Board on Cholinesterases, International Advisory Board on Cholinergic Mechanisms, and NATO Working Group in The Human Factors And Medicine Panel (HFM) "Translating Medical Chemical Defence Research Into Operational Medical Capabilities Against Chemical Warfare Threat Agents"; member of the Editorial Board of *Molecules*; organizer of one-day symposium about OPEN science (19 Feb 2019, Zagreb); member of the International Scientific Committee, 3rd International conference on CBRNE Research and Innovation (20-23 May 2019, Nantes, France); member of the Scientific Committee, HDBMB2019 (25-28 Sep 2019, Lovran); member of the Organizing Committee, 45th Congress of the Federation of European Biochemical Societies – FEBS2020 (4-9 Jul 2020, Ljubljana, Slovenia).

G. Mendaš Starčević

Member of the Working Group for monitoring and meeting the requirements of the Second National Plan for the Implementation of the Stockholm Convention on Persistent Organic Pollutants; member of the Working Group for Codex Alimentarius, Food Contaminants Committee.

M. Meštrović

Delegate representing the non-scientific staff at the Independent Trade Union of Science and Higher Education for the branch IMROH.



15.3. Radiation Dosimetry and Radiobiology Unit

EMPLOYEES

HEAD

Ivica Prlić, PhD, professional advisor in science, scientific associate

RESEARCH STAFF

Ivan Pavičić, PhD, senior scientific associate

Ana Marija Marjanović Čermak, PhD, scientific associate

Marija Surić Mihić, PhD, scientific associate

Krunoslav Ilić, MSc, PhD student-assistant

Luka Pavelić, MSc, PhD student-assistant

Ana Buinac, MSc, senior professional advisor in science since 7 May 2019 (3 h per week, IMROH-funded)

Tomislav Meštrović, MSc, senior professional associate in science

Branimir Zauner, PhD, professional associate in science since 29 Oct 2019

Mihaela Justić, MSc, professional associate in science until 17 Oct 2019

Jerko Šiško, MSc, professional associate in science

TECHNICAL STAFF

Selvijski Sefić, BSc, senior technician

Silvija Kobeščak, BSc, technician

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

Long-term research activities

Integrated hardware-software system for monitoring microlocation environmental parameters

The IPPSO project contributes in a very direct way to sustainable development, in particular environmental protection, with the aim of protecting the health and well-being of humans as well as biota. In order for appropriate institutions to make the correct implementation, and in particular health conclusions, they must have as many relevant validated data as possible. This is especially important in case of natural disasters or accidental events, when the amount of credible information on the ground enables rapid decision-making by those responsible for mitigating such complex situations and then directly contributes to the reduction of damage to all species and mortality of humans and animals. The project contributes directly to the economy by creating databases and cartography of the state of the environment and urban areas. The project was designed at IMI, based on the results of years of research in the fields of radiation protection and environmental hygiene (air protection). The Unit's employees are experienced field workers who encounter daily ionizing and non-ionizing radiation in the environment, medicine, industry and life in general. In May 2016, the final report for the IPPSO project (<http://ippso.imi.hr/>) was issued. Considering that project visibility lasts five years after its formal completion, this project is still in progress, and a report was issued during 2019 after the third year of project implementation on 30 Jun 2019 (362). The visibility of all activities done by IMROH as an applicant for the IPPSO project in the field and in new project activities, using equipment (infrastructure) or knowledge acquired through the implementation of the IPPSO project, continues to be systematically presented in every public and written communication.

In-house scientific projects (Chapter 16.1.A.3.)*1. Thermometry, thermography and sensory evaluation of electromagnetic radiation in medicine (TTSem2)*

Research was completed (WP1) within our investigations regarding thermographical characteristics of the healing process of the brisk bone fracture in adult subjects. A PhD thesis was written on the topic by Damir Halužan, MD, School of Medicine, University of Zagreb. Further research is in progress, with the support of experimental IR thermography methods conducted at the University Hospital Centre Zagreb (WP5).

We also studied the thermographical characteristics of breasts in women who have invasive ductal cancer. This was the subject of another PhD thesis accepted by the School of Medicine, University of Zagreb and written by plastic surgery specialist Marko Mance, MD. Research regarding the thermographical characteristics of the healing process of clavicle bones in children (WP4) is in progress in cooperation with the University Hospital Centre Zagreb and Children's Hospital Zagreb. Preliminary results obtained during 2019 are being processed for the purpose of publication.

The Unit is also preparing for the continuation of clinical research (WP2) regarding the mapping of the temperature symmetry of the skin region, in children and adults in both sexes. The measurements will be performed during examinations at the University Hospital Centre Zagreb, Clinic for Surgery. The aim of this study is to standardise physiological deviations in healthy populations and measure standard deviations for individual anatomic regions. So far, similar measurements have been made, but there are no real studies of age-related differences. The clinical part of the study (WP3) has to do with skin thermometry below substrate immobilization in thoracic fractures. After repeated testing, experiment-ready IMROH thermometers, specially designed by the Institute's partners, are available for contact measuring and storage of information regarding the temperature of the given skin/tissue throughout the time of carrying immobilization on hand. The measurement plan is implemented in patients at the University Hospital Centre Zagreb, Clinic for Surgery, which are in the standard treatment of fractures as soon as the optimal number of thermometers becomes available. In the process of research, a protocol is being prepared for patients' consent to participate in the measurement project settlement.

2. Development of UV radiation sensors (SUVIndex)

The Unit, together with its external associates from the companies ALARA Uredaji, Haj-Kom, and clinics of the University Hospital Centre Zagreb, is developing ultraviolet radiation sensors that will, together with a computer processor, enable the continuous individual monitoring of exposure to sunlight by persons working in the open and exposed to UV radiation (agriculture, seafarers, fishermen, etc.), which will be the basis for the design of Occupational Health Protocols on the implementation of preventive protection against excessive exposure to UV radiation. Several pilot prototypes are ready for field measurements that will be launched early in the spring of 2020 in cooperation with the Occupational Health and Environmental Medicine Unit.

Other research activities

Within research funded by the Unit, the development of an eye lens dosimeter started. A prototype of an eye lens dosimeter holder was designed and printed using a 3D printer, as the first of its kind in the world to be made and has been validated by the Secondary Standard Dosimetry Laboratories (SSDL) of the Jožef Stefan Institute. Irradiations for type testing were performed using irradiation sources of SSDL of Ruđer Bošković Institute in Zagreb and Jožef Stefan Institute in Ljubljana, Slovenia. The results of type testing for photon energies are promising and the results were presented at the 4th European Radiological Protection Research Week in Stockholm, Sweden. The research on the development of the eye lens dosimeter will be the objective of an internal project of the Institute in 2020.

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Determination of the radiological status of the working environment in IPNP, INA Group
- Significance of interaction of metal nanoparticles with sulfur biomolecules for nano-bio interface (NanoFaceS, IP-HrZ7)
- Quantum-chemical design, preparation and biological properties of organometallic nucleobase derivatives(OrDeN, IP-HrZ7)

International projects (Chapter 16.2.)

- European Concerted Programme on Radiation Protection Research (CONCERT, H2020)
- Science-based risk governance of nano-technology (RiskGONE, H2020)
- Safe-by-Design Approach for Development of Nano-Enabled-Delivery Systems to Target the Brain (SENDER, HrZZ-PZS)
- Single layer gamma-ray polarimeter for medical imaging applications and fundamental physics research (SiLGaP, HrZZ-PZS)
- The pharmacokinetic profile of silver nanoparticles: the role of biological barriers (Bilateral CRO-AT)
- Multiplex characterization platform for nanobio interfaces (Bilateral CRO-DE)

PROFESSIONAL SERVICES

For the needs of INA Group members involved in drafting protocols for the implementation of business activities involving the manipulation of natural radioactive materials (NORM), in particular for residues, the preparation of a plan of activities in the event of an incident involving radiological risks and to determine the need for specialized vocational education and the implementation of safety measures related to ionising radiation and the appearance of residues at INA Group's production sites, a number of studies were contracted, one of which was created for STSI d. o. o. in 2019.

Professional experimental work at the STSI company in Strušac resulted in the development of an internal institute research project whose experimental development part during 2018 was piloted in collaboration with RIT Croatia – Rochester Institute of Technology, Rochester, New York, US and external collaborators ALARA Uredaji and Haj-Kom, stemming from our recent cooperation with Ericsson Nikola Tesla through the ERDF project IPPSO.

A pilot measurement system of the ALARA UAV (Unmanned Aerial Vehicle) was developed to be prepared for field measurements of ionising radiation (and other agents) on large areas of the environment using UAVS. We plan to prepare documentation for the application of this pilot project for international funding and experimental technological development in full experimental form (research/technological development of measuring instrumentation).



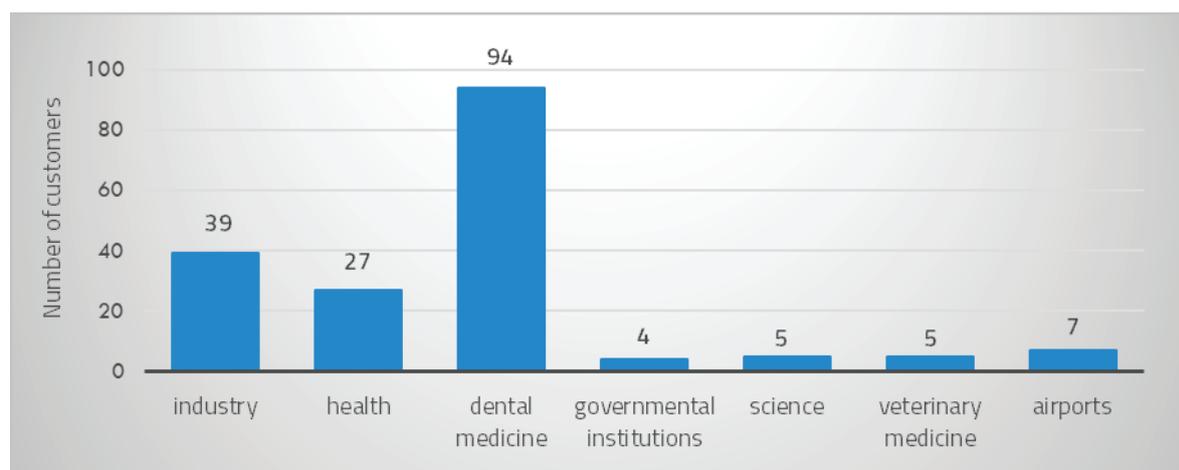
Unmanned aircraft (UAV; colloquially drone) and the measuring system ALARA UAV-IPPSO

Professional risk assessment studies

In total, 11 risk assessment studies were performed focusing on the use of ionising radiation sources in medicine, dental medicine, research, and industry:

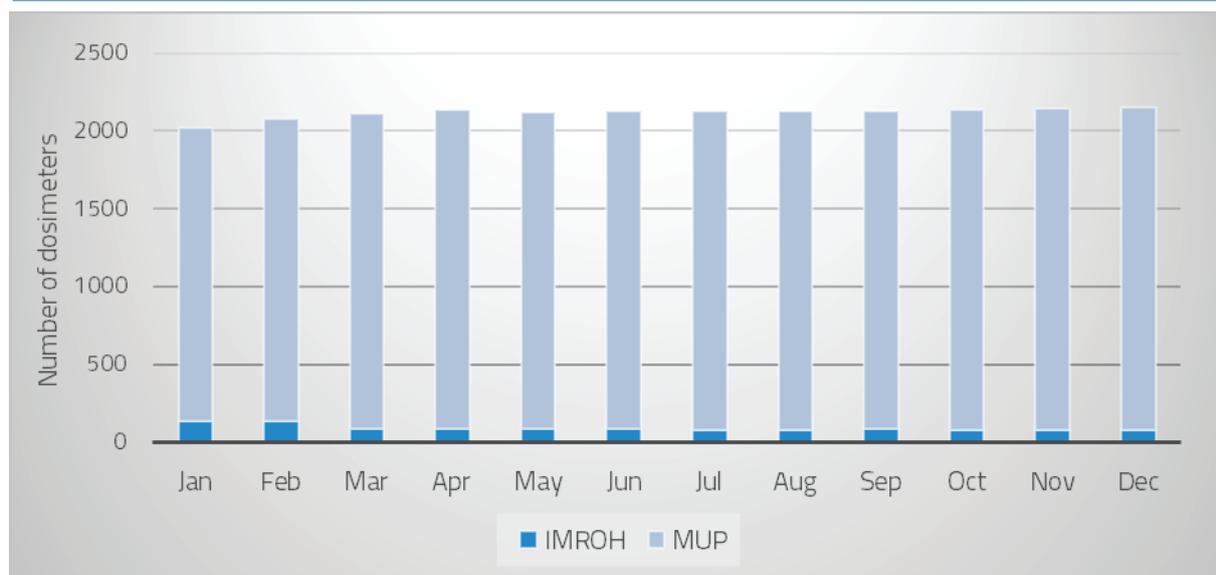
CONTRACTOR	REPORT AUTHOR
Poliklinika Radiochirurgia Zagreb	M. Surić Mihić
Mio dentist d. o. o.	M. Surić Mihić
Zara dental centar d. o. o.	M. Surić Mihić
Ordinacija dentalne medicine Ivana Lijić, dr. med. dent.	M. Surić Mihić
3D Maxio centar dentalne radiologije j. d. o. o.	M. Surić Mihić
Đuro Đaković Centar za istraživanje i razvoj d. o. o.	M. Surić Mihić
Đuro Đaković kompenzatori d. o. o.	M. Surić Mihić
Đuro Đaković održavanje i usluge d. o. o.	M. Surić Mihić
Hrvatska brodogradnja Trogir d. o. o.	M. Surić Mihić
Našicecement d. d.	M. Surić Mihić
HERMED Servis medicinske opreme d. o. o.	M. Surić Mihić

During 2019, the Unit conducted the personal dosimetry control and testing of ionizing radiation for 181 contractual users from various fields of activity.



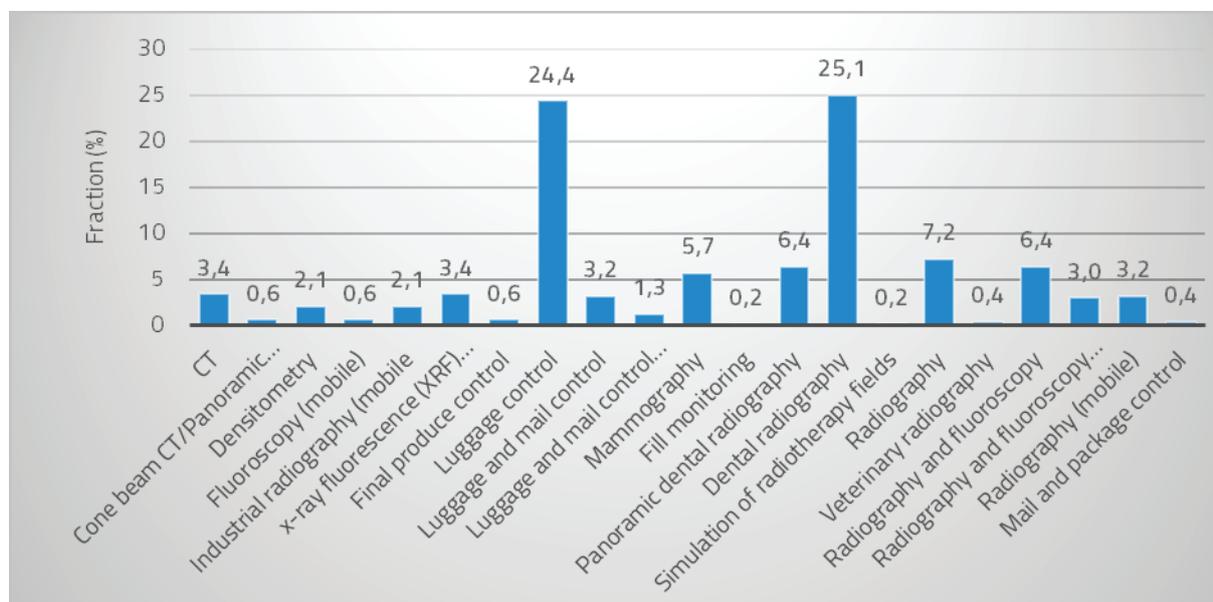
Number of contracting customers of the Unit by field of work

During 2019, more than 25,000 dosimetry measurements were made, based on which more than 3,000 dosimetric reports were prepared for contracting users of personal dosimetry monitoring. The unit is working on the preparation of a protocol that will enable the online delivery of dosimetric reports to the users of authorized technical service and thus further modernize the business and relationship with customers.



Number of tested dosimeters per month

In 2019, more than 600 field tests were conducted – quality control and radiological protection parameters for about 550 electrical devices that produce ionizing radiation (X-ray devices and linear accelerators) and about 50 radioactive sources used in medicine, industry and scientific institutions. Based on the examination, more than 1,200 expert reports and more than 1,300 expert opinions have been prepared.



Distribution of tested ionizing radiation electrical devices by their type

In our laboratory, we conducted testing of the human serum immune response to specific allergens of 7 individuals. Identification of all types of asbestos in solid materials was accompanied according to the International Organization for Standardization (General requirements for the competence of testing and calibration laboratories International Standards Organisation (ISO), Geneva: 1999). We performed eight analysis of solid materials sent from commercial companies to determine the presence and type of asbestos. Analysis of the material was performed by a standardized

method for the stereomicroscopy and polarized microscopy MDHS 77-HSE Document Method for the Determination of Hazardous Substances; series 77 – Asbestos in bulk materials (In: HSG 248 Asbestos: The analysts' guide for sampling, analysis and clearance procedures. Appendix 2: Asbestos in bulk materials: sampling and identification by polarized light microscopy).

List of intercomparisons

ORGANISER	TEST	AREA	PLACE AND DATE
EURADOS	Extremity & Eye lens dosimeter intercomparison IC2019exteye	Personal dosimetry – Hp(0,07) and Hp(3) measurements	Cavendish Nuclear Limited, UK 9 May 2019

List of accredited methods

TEST METHOD	TYPE OF TEST, RANGE
ME-608-001 (In-house method)	Personal dosimetry of the photon radiation using TL dosimeters in the range 85 μ Sv – 100 mSv and energy range 33 keV – 1.3 MeV
ME-608-002 (In-house method)	Determination of ambient equivalent dose rate; H*(10)/t data dose range 100 nSv/h – 100 mSv/h and energy range 36 keV – 1.3 MeV

The Unit's quality manager: *T. Meštrović* (until Feb 2019) and *J. Šiško* (from Feb 2019).

PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

T. Meštrović

Member of the TO-45 Nuclear instrumentation at the Croatian Standards Institute; radiation protection expert since 2018.

L. Pavelić

Associate member of the European Radiation Dosimetry Group (EURADOS) Working Group WG3-S2.

I. Pavičić

Member of the Working Group in charge of drafting the Position of Croatia in the area of protection against electromagnetic fields.

I. Prlić

Appointed member of the Committee in charge of producing a Draft of the Amendments to the Act on Radiological and Nuclear Safety; member of the Working Group formed by the State Office for Standardisation and the Ministry of Health for legal metrology in the field of medical equipment (especially the one producing radiation); member of the Executive Board of the Croatian Biomedical Engineering and Medical Physics Society (CROMBES); member of the Education and Training Committee of European Federation of Organisations for Medical Physics (EFOMP); member of the TO Non-destructive testing, TO-45 Nuclear instrumentation, and TO-62 Electronical equipment in medical practice; head of the section TO-62B Imaging in medicine at the Croatian Standards Institute; member of the Working Group for drafting and applying a Country Frame Programme (CFP) of the Republic of Croatia; member of the International Atomic Energy Agency (IAEA); member of the Working group of the European Commission Environmental Radiation-Effect: International Perspectives – part of the project relating to Croatia; the Croatian representative in the International Organization for Medical Physics and International Union for Physical and Engineering Sciences in Medicine; member of the Ministry of Health's Committee for the revision and evaluation of studies in the field of use of nonionizing radiation sources; member and expert of the European ALARA Network for Naturally Occurring Radioactive Materials (EAN NORM) group; international expert for the International Road Transport Union (IRU) and International Labour Organization (ILO); member of the Management Committee of MELODI (Multidisciplinary European Low Dose Initiative); member of the Management Committee of the international project COST4BUILDING Materials, Transport

and Urban Development COST Action TU1301.

M. Surić Mihić

Associate member of the European Radiation Dosimetry Group (EURADOS); member of the Working Groups WG2 and WG3-S2; member of the TO-62 Electrical equipment in medical practice at the Croatian Standards Institute; radiation protection expert since 2018; appointed expert for accreditation scheme Testing laboratories (HRN EN ISO/IEC 17025) for field T18 Ionising radiation since 2019 (Croatian accreditation agency); appointed professional member with the IAEA for field TSA2 – radiation protection of exposed workers within RASIMS system since 2019 (Civil protection directorate of the Republic of Croatia Ministry of the Interior).

J. Šiško

Associate member of the European Radiation Dosimetry Group (EURADOS) Working Group WG3-S2; radiation protection expert since 2018.



15.4. Environmental Hygiene Unit

EMPLOYEES

HEAD

Assist Prof Gordana Pehnac, PhD, scientific advisor

RESEARCH STAFF

Ivan Bešlić, PhD, senior scientific associate

Ranka Godec, PhD, scientific associate

Silva Žužul, PhD, scientific associate

Silvije Davila, PhD, postdoctoral researcher

Ivana Jakovljević, PhD, postdoctoral researcher

Jasmina Rinkovec, PhD, postdoctoral researcher

Iva Šimić, MSc, PhD student-assistant since 23 May 2019

Suzana Sopčić, PhD, professional associate in science

Valentina Gluščić, BSc, professional associate in science

Zdravka Sever Štrukil, BSc, professional associate in science

TECHNICAL STAFF

Ana Filipec, statistician, senior technician

Zvonimir Frković, senior technician until 23 Sep 2019

Samuel Ljevar, senior technician

Magdalena Vincetić, MSc, senior technician since 17 Jun 2019

Marija Antolak, technician

Matea Kuzel, technician

Karmenka Leš Gruborović, technician

Martin Mihaljević, technician

Martina Šilović Hujčić, MSc, technician

PARTICIPATING RETIRED RESEARCHERS

Krešimir Šega, PhD, permanent scientific advisor

Vladimira Vađić, PhD, permanent scientific advisor

Mirjana Čačković, PhD, senior scientific associate

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

Long term research activities

Measurements of metals in the PM₁₀ fraction of particulate matter and total deposited matter by inductively coupled plasma mass spectrometry (ICP-MS) continued at different locations with different pollution sources. Application of the energy dispersive X-ray fluorescence (ED-XRF) method was investigated for preliminary analysis of metal content in filter media before the sampling of airborne particulate matter. The results showed high content of some elements in quartz microfiber filter blanks and high variability between packagings. ED-XRF analysis can be used for preliminary qualitative analysis of Fe, Zn, Ba, Mn, Ni, and Cu. For more accurate quantitative analysis at low

concentration levels further improvements in the calibration of the method are required (148). Several types of filter media for elemental analysis of $PM_{2.5}$ particulate matter were investigated for method optimization. Influence on limits of detection and pretreatment of filter media were also tested. Results have shown that quartz filter media are least suitable for sampling and analysis of low concentration levels of elements because of high filter blanks. The lowest detection limits were found for membrane nitrocellulose and teflon filters (137). In cooperation with University of Rijeka and Faculty of Science in Sarajevo, BIH, analysis of PM_{10} particle fraction at several sampling sites in the Sarajevo Canton, BIH were carried out in order to characterise the organic and inorganic atmospheric pollutants. Preliminary results of mass concentrations of PM_{10} and As, Cd, Ni, and Pb showed high values of particulate matter in winter as well as significant difference in metal concentrations between measuring sites (263).

In addition to the continuous measurement of polycyclic aromatic hydrocarbons (PAHs) in PM_{10} particle fraction at locations with different pollution sources (traffic, industry, households) (143, 245), the determination of PAHs in the PM_1 particle fraction was continued (130, 153, 219, 300). PAH mass concentrations in $PM_{2.5}$ particle fraction at one traffic location in Zagreb (245, 246) were investigated as well. In cooperation with University of Rijeka and Faculty of Science in Sarajevo, BIH, carcinogenic activity of PAHs at urban locations in Zagreb and Sarajevo was determined (154, 318). The results showed high PAH mass concentrations in Sarajevo air compared to Zagreb air, and thus significantly higher carcinogenic activity in Sarajevo. Benzo(a)pyrene (BaP) had the highest contribution to the total carcinogenicity regardless of the relatively small contribution to the total PAH mass, which pointed BaP as a good indicator for estimation of the carcinogenicity of PAH mixture (318). Optimisation of new accelerated solvent extraction method was started in order to increase preparation efficiency (220).

Measurements of elemental and organic carbon in $PM_{2.5}$ particle fraction continued at monitoring sites with different characteristics (urban background, urban traffic and rural background). The influence of maritime traffic and sea spray on carbon pollution was studied for the city of Rijeka (152, 251, 292, 293). Measurements carried out in the coastal area showed that air pollution in this area is not only of local origin, but also from the long-range transport. Comparison of carbon levels in different particle fractions showed that the seasonal distribution of carbon in smaller particles (PM_1) followed seasonal distribution in $PM_{2.5}$ particle fraction.

The development of analytical method for the determination of molecular markers of organic carbon in particulate matter in air has started. Specific carbohydrates which originate from biomass burning and the natural processes during the vegetation of trees and plants will be determined. Measurements of ozone and its precursors nitrogen oxides and carbon monoxide were continued in order to study their trends and relationships (230).

Measurements of anion (Cl^- , NO_3^- , SO_4^{2-}) and cation (Na^+ , NH_4^+ , K^+ , Mg^{2+} , Ca^{2+}) content in particle fraction as well as measurements of acidic components (Cl^- , NO_3^- , SO_4^{2-}) in total deposited matter continued at different locations (151, 205, 280, 291). Trend of anions in total deposited matter were studied at different locations in Zagreb. In the northern, residential part of the town with moderate traffic nitrate levels showed statistically significant decreasing trend, while chloride and sulphate levels showed decreasing but statistically insignificant trend (213). Nitrate levels in total deposited matter at the measuring station in the centre of Zagreb with dense traffic and at the measuring station on the western, industrial part of the town also show significant decreasing trend, while chloride and sulphate levels in total deposited matter fluctuate without clear trend (214).

Investigation of sensors for air quality monitoring started in 2017 within the project Ecological Map of the City of Zagreb and in cooperation with Andrija Štampar Teaching Institute of Public Health continued in 2019. Results obtained by parallel measurements with sensors (AQMeshPod) and with reference methods at IMROH location during one year were analysed. Statistical analysis showed great discrepancy of sensor measurements compared to reference methods as well as on the importance of calibration of sensors prior measurements at the measuring site (150, 281). Results of interlaboratory comparison of the sensors conducted by the French Central Air

Quality Monitoring Laboratory (LCSQA) for 6 weeks in Lille were analysed. As part of the parallel measurement, 16 participants from seven countries participated with 44 sets of air quality sensors. There are great differences in the accuracy of sensor measurements between different manufacturers as well as large differences in measuring accuracy with the same type of device but with different electrochemical cells. The results also indicate the problem with sensor performances of several manufacturers (206).

In-house scientific projects (Chapter 16.1.A.3.)

1. Levels of platinum group elements (PGE) near roads

In previous investigations at IMROH the method for determination of Pt, Pd, and Rh in PM₁₀ particulate matter was developed as a part of doctoral dissertation. The first measurements of Pt, Pd, and Rh in particulate matter samples collected at three locations with different traffic load showed that at all three measurement sites, the PGE concentration followed the sequence Pd > Pt > Rh, and that there are statistically significant differences between locations with high traffic and those with moderate traffic. The measured concentrations were compared with the published results of similar studies in the world (65). The sampling of particulate matter continued at three locations in Zagreb in differently polluted parts of the city, as well as collecting vegetation samples (grass, plantain) and also soil samples at two different depths (0–5 cm and 5–10 cm) were collected twice a year (at the beginning of vegetation and at the end of vegetation). In cooperation with the Faculty of Agriculture, University of Zagreb, basic agrochemical analyses [soil reaction (pH), conductivity (EC), organic matter (OM), hydrolytic acidity of soil (HA), a cation exchange capacity of the soil (CEC), the determination of the exchangeable ions of Na⁺, K⁺, Ca²⁺ and Mg²⁺, the content of H₂O and carbonates, the total nitrogen, sulphur and plants accessible phosphorus and potassium (PAL and KAL)] were done for the collected samples. Similar studies in the world to date regarding PGE determination in soil and vegetation have shown that PGE concentrations are highest along roads and at high traffic intensities. There was also a trend of decreasing concentration with increasing soil depth (33). The study will provide the first information on Pt, Pd and Rh levels in the environment (vegetation, soil) in Croatia and the five year trend of PGE concentrations in particulate matter will be determined.

2. Organic content of PM₁ particle fraction

Collection of 24-hour PM₁ fractions of particulate matter continued during the year at IMROH location and the location in the centre of Zagreb. Organic and elemental carbon and polycyclic aromatic hydrocarbons were analysed in the collected samples. The results are systematized and statistically processed. Measurements of PM₁ organic content in winter period showed the high value of the OC/EC ratio which suggests a large amount of secondary organic carbon (SOC). The low values of PAHs with a small number of rings (floranten and pyrene) and high PAHs concentrations with a higher number of aromatic rings [benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(j)fluoranthene, benzo(ghi)perylene and indene(1,2,3-c,d)pyrene] indicate the traffic as the dominant source of PAHs in PM₁ fraction of particle matter at this location. The first results were presented as oral presentations and posters at one international and two national conferences with international participation (130, 143, 219, 245, 251).

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Biochemical responses of oligotrophic Adriatic surface ecosystems to atmospheric deposition inputs (BiREADI, HrZZ-IP)

International projects (Chapter 16.2.)

- Project of extension and modernisation of the national network for continuous air quality monitoring (AIRQ, ERDF)
- Enhancing the Inventory of Aerosol Source Profiles Characterized by Nuclear Analytic Techniques in Support of Air Quality Management (IAEA)

PROFESSIONAL SERVICES

The monitoring of air pollution continued in Zagreb at 6 measuring stations of the local measuring network. At Zagreb stations, the Environmental Hygiene Unit measured different pollutants in the air: sulphur dioxide, black carbon, PM₁₀ particle fraction, metals: As, Cd, Ni, Pb, Mn, Fe, Cu, and Zn, and PAHs in PM₁₀ particle fraction, PM_{2.5} particle fraction, nitrogen dioxide, ozone, carbon monoxide, benzene, total deposited matter, and metals: As, Cd, Ni, Pb, and Mn in the total deposited matter.

Pursuant to contracts with the Ministry of Environment and Energy and Meteorological and Hydrological Service of Croatia and the Air Protection Act (OG 130/11, 47/14, 61/17, 118/18, 127/19), the Environmental Hygiene Unit as a reference laboratory performs the sampling of particulate matter (PM₁₀ and PM_{2.5}) and its physical and chemical analysis at measuring sites within the Croatian State Network for Air Quality Monitoring. The Unit also carries out equivalency of non-reference methods for the determination of particulate matter mass concentration (PM₁₀ and PM_{2.5}) in the air. In 2018, air pollutants were measured at the monitoring sites Zagreb-1, Zagreb-3, Sisak-1, Slavonski Brod-1, Slavonski Brod-2, Plitvice Lakes National Park, Ksaverska cesta, Velika Gorica, Kutina, and Rijeka-2. Cooperation with the Ministry of Environment and Energy in the air quality data processing continued.

The monitoring of air, water, soil, agricultural, and forest ecosystems and control of wild animals in the vicinity of the Central Gas Station (CGS) Molve continued. In cooperation with the Institute of Public Health of the Koprivnica-Križevci County, the Institute performed measurements of hydrogen sulphide, mercaptans, and sulphur dioxide at five locations in the proximity of the CGS Molve.

The monitoring of air quality within the zone of influence of the Waste Water Treatment Plant in Zagreb was continued. The monitoring of levels of hydrogen sulphide, ammonium, and total mercaptans and meteorological parameters was carried out at five measuring stations.

In line with the contract with the Meteorological and Hydrological Service of Croatia, metals in total deposited matter were analysed at one monitoring station located on the military training polygon of Slunj.

In the vicinity of the Jakuševac waste site, the levels of PM₁₀ and mercaptans are continuously measured. During different seasons, levels of Pb, As, Ni, Cd, and PAHs in PM₁₀ fraction were also measured.

Measurements of particle fraction PM₁₀ and polycyclic aromatic hydrocarbons in PM₁₀ fraction were carried out at a measuring site within Zagreb International Airport.

Measurements of PM₁₀ particle fraction were carried out at one location near an asphalt facility in Žminj.

Measurements of total deposited matter were carried out at two locations at "Brezovi Rebar" sand excavation near Karlovac.

List of intercomparisons

ORGANISER	TEST	AREA	DATE
LGC	LGC-AIR PT Workplace Air, Ambient Air and Stack Emissions, Round 30 (ARO30); 16-Diesel Fume	Determination of mass concentration of elemental carbon in particles	Jan/Feb 2019
ACTRIS	Interlaboratory comparison exercise for TC and EC measurements (ref: OCEC-2019-1)	Determination of mass concentration of total and elemental carbon in particles	Feb/Mar 2019
INERIS	Analytic interlaboratory comparisons organized for laboratories involved in regulatory emissions control	Determination of mass concentration of benzo(a)anthracene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(ghi)perylene, fluoranthene and indeno(1,2,3-cd)pyrene in particles at filter	May/Jun 2019
Lab Service Analytica S.r.l., Italia	InterCinD2019SE (Summer2019) QA/QC study	Determination of polycyclic aromatic hydrocarbons in air: benzo(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene – expressed as benzo(b+j+k)fluoranthene; dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene, chrysene, benzo(ghi)perylene	Sep/Oct 2019

List of accredited methods

METHOD	TYPE OF TEST, RANGE
HRN EN 14625:2012 (EN 14625:2012)	Determination of the concentration of ozone in the ambient air
HRN EN 14626:2012 (EN 14626:2012)	Determination of the concentration of carbon monoxide in the ambient air
HRN EN 14902:2007 (EN 14902:2005), HRN EN 14902/AC:2007 (EN 14902:2005/AC:2006)	Determination of the concentration of Pb, Cd, As and Ni in the PM ₁₀ fraction of suspended particulate matter
HRN EN 16909:2017 (EN 16909:2017)	Determination of the mass concentration of elemental and organic carbon in the suspended particulate matter in the ambient air
HRN EN 15549:2008 (EN 15549:2008)	Determination of the concentration of benzo(a)pyrene in the ambient air
HRN EN 14211:2012 (EN 14211:2012)	Determination of the concentration of nitrogen oxide in the ambient air
HRN EN 12341:2014 (EN 12341:2014)	Determination of mass concentration of PM ₁₀ and PM _{2.5} particle fraction
HRN EN 14212:2012 (EN 14212:2012), HRN EN 14212:2012/Ispr. 1:2014 (EN 14212:2012/AC:2014)	Determination of the concentration of sulphur dioxide in the ambient air
HRI CEN/TR 16269:2017 (CEN/TR 16269:2011)	Determination of the mass concentration of anions and cations in the suspended particulate matter
VDI 4320 Part 2: 2012 (VDI 4320 Part 2:2012)	Determination of the dust deposition according to the Bergerhoff method

HRS CEN/TS 16645:2016 (CEN/TS 16645:2014)	Determination of the concentrations of benz(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene and benzo(ghi)perylene in ambient air
HRN EN 15841:2010 (EN 15841:2009)	Determination of arsenic, cadmium, lead and nickel in atmospheric deposition
In-house method OP-610-UTT-TI Edition 01, 2018-06-03	Determination of thallium in atmospheric deposition

The Unit's quality manager: *R. Godec*.

PROFESSIONAL ACTIVITIES OF EMPLOYEES OUTSIDE THE INSTITUTE

I. Bešlić

Member of the Croatian Air Pollution Prevention Association's Presidency; member of the Working Group in charge of monitoring the activity plan for the national network for permanent air quality monitoring at the Ministry of Environment and Energy of the Republic of Croatia; member of the Commission for Reference Laboratory Work Monitoring at the Ministry of Environment and Energy of the Republic of Croatia; member of the Commission for the Selection of the Measuring Stations in the National Air Quality Monitoring Network; member of the Working Group for Air of the Croatian Accreditation Agency; member of the TO-146 Air Quality Committee of the Croatian Standards Institute; member of the "Air Protection '19" conference Scientific Committee.

S. Davila

Member of the Croatian Air Pollution Prevention Association's Presidency; member of the "Air Protection '19" conference Organizing Committee.

R. Godec

President of the Croatian Air Pollution Prevention Association; member of the TO-146 Air Quality Committee of the Croatian Standards Institute; member of the "Air Protection '19" conference Organizing Committee.

G. Pehnec

International coordinator and member of the Croatian Air Pollution Prevention Association's Presidency; member of the Working Group in charge of monitoring the activity plan in the national network for permanent air quality monitoring at the Ministry of Environment and Energy of the Republic of Croatia; member of the Commission for Air Quality Improvement Monitoring in the area of Slavonski Brod; president of the "Air Protection '19" conference Organizing Committee.

J. Rinkovec

Member of the "Air Protection '19" conference Organizing Committee.

Z. Sever Štrukil

Treasurer and member of the Croatian Air Pollution Prevention Association's Presidency.

S. Žužul

Member of the Croatian Air Pollution Prevention Association's Presidency; member of the "Air Protection '19" conference Scientific Committee.

SCIENTIFIC, TEACHING AND ACADEMIC ADVANCEMENT OF EMPLOYEES

The scientific degree of scientific associate was gained by *I. Jakovljević* and *J. Rinkovec*.



15.5. Occupational Health and Environmental Medicine Unit

EMPLOYEES

HEAD

Prim Jelena Macan, MD, PhD, permanent scientific advisor
(90 % of working hours and 10 % in the Institute's company)

RESEARCH STAFF

Prof Selma Cvijetić Avdagić, MD, PhD, permanent scientific advisor
Jasminka Bobić, PhD, permanent scientific advisor until 13 Oct 2019
Veda Maria Varnai, MD, PhD, permanent scientific advisor
Assist Prof Adrijana Bjelajac, PhD, scientific associate
Željka Babić, PhD, postdoctoral researcher
Jelena Kovačić, PhD, postdoctoral researcher
Zrinka Franić, MD, PhD student-assistant
Rajka Turk, MSc, professional advisor in science

TECHNICAL STAFF

Marija Kujundžić Brkulj, BSc, senior technician
Marija Lieberth, administrator, senior technician until 20 Feb 2019
Rajka Luzar, nurse, senior technician
Franka Šakić, BSc, senior technician (90 % of working hours and 10 % in the Institute's company)
Monika Vuletić, MSc, senior technician since 1 Jun 2019
Jagoda Mandić, nurse, technician since 3 Apr 2019

PARTICIPATING RETIRED RESEARCHERS

Božica Kanceljak-Macan, MD, PhD, permanent scientific advisor
Assist Prof Biserka Ross, PhD, scientific advisor

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

In-house scientific projects (Chapter 16.1.A.3.)

1. *Interaction of constitutional and occupational risk factors on the incidence of occupational contact dermatitis in hairdressing apprentices during vocational training (SkinWork)*

In the period between April and June 2019, 406 hairdressing apprentices were included in the second follow-up of the prospective cohort study and evaluated according to the protocol. The study was performed in 25 schools from 25 towns in Croatia (Zagreb, Krapina, Čakovec, Varaždin, Oroslavje, Ivanić Grad, Opatija, Split, Makarska, Omiš, Sinj, Imotski, Garešnica, Slavonski Brod, Osijek, Beli Manastir, Đakovo, Vinkovci, Županja, Samobor, Velika Gorica, Sisak, Đurđevac, Vukovar, and Našice). Moreover, in 32 hairdressing apprentices who reported skin symptoms that were present for at least 3 months, patch testing with European baseline series and additional hairdresser series was performed. Initial results showed high prevalence of self-reported atopy symptoms (45 %), and moderate prevalence of self-reported and clinically observed skin symptoms (12 % and 18 %, respectively).

respectively) on the hands/wrists of hairdressing apprentices at the beginning of their vocational education. Filaggrin gene mutations were not indicated as a risk factor, as such a mutation was found in only one apprentice (268).

2. *Contact hand dermatitis in dentists and medical doctors: prevalence and risk factors*

The recruiting of subjects and data collection were finished in 2019. Examination is performed in 185 subjects divided in 5 groups (37 subjects in each group): medical doctors-surgeons and non-surgeons, dentists (surgeons and non-surgeons), and control subjects occupationally not exposed to skin irritants/allergens. Methods included an questionnaire, skin examination, skin prick and patch test, and measurement of skin pH and transepidermal water loss. The highest prevalence of hand eczema was found in both groups of dentists, and medical doctors-surgeons, ranging from 37.8 to 56.8 %. This result suggests that these groups of healthcare workers are at high risk for development of occupational hand eczema. The completion of doctoral and graduate theses performed within this project is planned for 2020.

3. *Determination of body composition and chronic stress by bioimpedance method*

In approximately 400 subjects, body composition and functioning of the autonomic nervous system were assessed using bioimpedance. In order to validate the bioimpedance device, in about half of the subjects body composition measurements were made with another devices. Cortisol saliva samples were taken in about 70 subjects. Nutritional and sleeping habits were assessed in students. The preliminary results showed a significant association of obesity with increased sympathetic nervous system activity (increased LF/HF ratio and decreased heart rate biovariability), as well as the low values of the HPA index, which estimates the daily rhythm of cortisol secretion (339).

4. *Relationship between chronic inflammation and osteopenia in patients on chronic hemodialysis*

The project has started, which assesses the impact of chronic inflammation on sarcopenia, bone remodeling, and bone density in hemodialysis patients. About 70 participants are planned. Results have been published on the prevalence of osteoporosis and calcium intake in people living in nursing homes (13).

5. *Preventing child poisonings by educational intervention aimed at parents of preschool children*

The project finished in February 2019. Data from the pilot phase of the project (spring 2018) was published (4), the most important findings are that around 80 % of parents of preschool children keep the products which can cause poisoning in children out the reach of children, but not in locked compartments, and that around one third of parents sometimes keep the products in non-original packaging which could easily lead to poisoning. Data collected in the main phase of the project (second half of 2018 and beginning of 2019) from 527 parents of children attending kindergartens in the city of Zagreb was statistically analysed. The most important result was that parents who underwent intervention started keeping the Poison Control Centre number by the telephone or in the list of important numbers: 1 % of parents in the intervention group reported this habit in the baseline questionnaire and 65 % in the follow-up questionnaire after the intervention, which was significantly larger increase than that noted in the control group (3 % vs. 12 %). The results remained significant also in the more complex statistical model which included personal characteristics of parents (sex, employment status, number of children, education level). Publishing of these results in a scientific journal is currently in progress.

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Assessment of daily exposure to metals and maternal individual susceptibility as factors of developmental origins of health and disease (METALORIGINS, HrZZ-IP)
- Well-being of different family generations in contemporary work designs (UNIZg)

International projects (Chapter 16.2.)

- European Concerted Programme on Radiation Protection Research (CONCERT, H2020)
- Identification of Member State guidance and support materials linked to exposure to dangerous substances at work places from Croatia and Slovenia (EU OSHA)
- Network on the Coordination and Harmonisation of European Occupational Cohorts (OMEGA-NET, COST)
- Diagnosis, Monitoring and Prevention of Exposure-Related Noncommunicable Diseases (DiMoPEX, COST)
- Genomics of MusculoSkeletal traits Translational Network (GEMSTONE, COST)

PROFESSIONAL SERVICES

Professional activities of the Unit included the organisation and implementation of teaching modules for medical doctors, residents in occupational and sport medicine, and clinical pharmacology and toxicology. A training course for 6 residents in occupational and sport medicine over one month was conducted in the field of "Occupational diseases, work-related diseases, and occupational toxicology". A training in "Clinical Toxicology" of one week duration was conducted for one resident. J. Macan was appointed as main supervisor by the Croatian Ministry of Health for 7 residents in occupational and sports medicine.

For hairdressers, teachers in vocational schools in the sectors for health and social services, and personal and other services, lectures were delivered in the field of health and safety at work. Additional lecture about actual epidemiological investigations performed in this field within the Unit for Occupational and Environmental Health was delivered.

In collaboration with Poison Control Centre and Unit for Analytical Toxicology and Mineral Metabolism metal concentration measurement in biological samples for residences in Slavonski Brod was carried out. This was followed by the health risk assessment of determined metal levels (341).

PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

Ž. Babić

Member of the Committee for Safe Use of Medicines of the Agency for Medicinal Products and Medical Devices of Croatia.

A. Bjelajac

Member of the Committee for evaluation of programs for propaedeutics in psychotherapy of the Association of Psychotherapy Societies of Croatia; member of the founding committee for the preparation of the foundation of Croatian Chamber of Psychotherapists; member of the Ethics Committee of the Croatian society of gestalt and integrative psychotherapists.

J. Bobić

Member of the committee for acknowledgement of clinical psychologists at the Croatian Psychological Chamber.

Zr. Franić

Member of the Croatian Society of Toxicology; member of the Croatian Medical Chamber.

J. Kovačić

External expert of the Agency for Medicinal Products and Medical Devices of Croatia.

J. Macan

Member of the Croatian Academy of Medical Sciences, Collegium for Public Health; member of the Croatian Society of Occupational Health Management Committee; member of the European Initiative for Prevention of Occupational Skin Diseases at the European Academy for Dermatology and Venereology; member of the Committee for Medical Ecology, the Working Group for developing

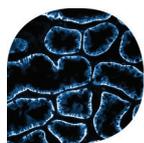
national positions in the field of protection from electromagnetic fields, and Working group for climate changes at the Ministry of Health, Republic of Croatia; court expert witness in occupational medicine; member of the Croatian Medical Chamber.

R. Turk

Member of the Biocidal Products Committee of the Ministry of Health and a substitute member of the Biocidal Products Committee of the European Chemicals Agency; member of the Committee for Safe Use of Medicines of the Agency for Medicinal Products and Medical Devices of Croatia; member of the Committee for the development of Ordinance on the conditions for distribution and sale of pesticides of the Ministry of Agriculture.

V. M. Varnai

Member of the Committee for Risk Assessment (RAC) at the European Chemicals Agency (ECHA).



15.6. Molecular Toxicology Unit

EMPLOYEES

HEAD

Davorka Breljak, PhD, scientific advisor

RESEARCH STAFF

Marija Ljubojević, PhD, senior scientific associate

Ivana Vrhovac Madunić, PhD, scientific associate

Dean Karaica, PhD, postdoctoral researcher

TECHNICAL STAFF

Ljiljana Babić, technician

PARTICIPATING RETIRED RESEARCHERS

Ivan Sabolić, PhD, MD, permanent scientific advisor

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

During 2019, our scientific collaborations continued and a new collaborative studies was established at institutional, national, and international levels. In the frame of collaborative research with Analytical Toxicology and Mineral Metabolism Unit of IMROH, two original scientific articles were published in journals indexed in the *Web of Science* (WoS) bibliographic database (7, 56). Within the frame of collaborative studies with the Veterinary Faculty of the University of Zagreb (Croatia), one review scientific article was published in the WoS-indexed journals (54), whereas some results were presented at The 10th Meeting of the Young Generation of Veterinary Anatomists, YGVA 2019, and published in the Abstract Book (317). Furthermore, one original scientific article was published in the WoS-indexed journal (17) within the frame of new collaborative studies that have been established with the Croatian Institute for Biodiversity – CIB (Zagreb, Croatia) and Biota (Grubišno Polje, Croatia). Also, one diploma thesis was defended (183) in co-operation with the Faculty of Pharmacy and Biochemistry of University of Zagreb (Croatia).

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Aging-related expression of membrane transporters in rat (AGEMETAR, HrZZ-IP)
- Adverse effects of single and combined mycotoxins produced by *Aspergilli* (MycotoxA, HrZZ-IP)
- Molecular mechanisms underlying the toxicity of antidotes and potential drugs (CellToxTargets, HrZZ-UIP)

International projects (Chapter 16.2)

- Correlated Multimodal Imaging (COMULIS, COST)
- European Network of Multidisciplinary Research and Translation of Autophagy (TransAutophagy, COST)
- Assessment of Toxicological Safety of Foodborne Toxins (SafeFood, Bilateral CRO-SI)

● PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

D. Karaica

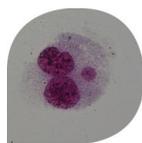
Management Committee member for COST Action CA17121 COMULIS; member of Board for Inclusiveness Target Countries (ITC) grants for COST Action COMULIS.

M. Ljubojević

Management Committee member for COST Action CA15138 TransAutophagy.

I. Vrhovac Madunić

Member of the Commission for Science and Society of the Croatian Society of Biochemistry and Molecular Biology (HDBMB); Management Committee member for COST Action CA17121 COMULIS; Coordinator of Board for Inclusiveness Target Countries (ITC) grants for COST Action COMULIS.



15.7. Mutagenesis Unit

EMPLOYEES

HEAD

Nevenka Kopjar, PhD, permanent scientific advisor

RESEARCH STAFF

Vilena Kašuba, PhD, permanent scientific advisor

Prof Davor Želježić, PhD, ERT, permanent scientific advisor

Mirta Milić, PhD, senior scientific associate

Goran Gajski, PhD, scientific associate

Marko Gerić, PhD, scientific associate

Vedran Mužinić, MSc, PhD student-assistant (HrZZ)

TECHNICAL STAFF

Maja Nikolić, senior technician

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

In vitro studies

In the past year, research focused on *in vitro* investigations of the toxicological profile of various physical and chemical agents (biotoxins, copper complexes, cytostatics, natural products, probiotics, waste waters, etc.) for their cyto/genotoxic effects has been continued. The obtained results indicating either their harmful or beneficial effects were published in a series of scientific papers, proceedings, and conference abstracts (27, 77, 94, 164, 210, 270, 271, 290, 294, 295, 296, 304). The aneugenic potential of low concentrations of pesticides chlorpyrifos, imidacloprid, alpha-cypermethrin, terbutilazine, and glyphosate was investigated on human peripheral blood lymphocyte model using cytokinesis-blocked micronucleus assay coupled with fluorescence *in situ* hybridization (FISH) with directly labeled pancentromeric probes for chromosomes 9, 18, X, and Y. Obtained results suggest treatment-related defects in chromosome segregation, and aneuploidy induction for chromosomes 18, 9, X and Y, increasing the risk of malign transformation (50, 236, 273). Cyto-/genoprotective and antioxidant effects of strawberry tree honey and its constituent homogentisic acid on UVB-induced damage were investigated on a human lymphocyte model. The observed effects are the result of several mechanisms, the most important of which are free radicals scavenging, as well as changed activities of antioxidant enzymes and glutathione levels (131). *In vitro* testing of dandelion (*Taraxacum officinale* L.) and rosemary (*Rosmarinus officinalis* L.) extracts on the squamous cell carcinoma cell line CAL27 indicated that both possessed genoprotective properties, suggesting their possible use as effective herbal remedies (297).

Human biomonitoring studies

Studies were continued on different human populations to determine the sensitivity and specificity of molecular-biology methods applicable in biomonitoring (96) and the importance of new biomarkers in the early detection of disease (313). The cytogenetic status of subjects with thyroid disease (43), genome sensitivity in patients with papillary carcinoma (284), and the influence of periodontitis on genome changes in gingival epithelial cells of patients (82) were investigated.

We continued with assessments of different occupational hazards and cytogenetic risks associated with exposure to physical and chemical hazards at the workplace (28, 81, 139), risks of exposure to asbestos (168), investigated genotoxic effects of toothpaste ingredients (80), and estimated levels of DNA damage in buccal cells after exposure to antiseptic mouthwash (118). The impact of dietary preferences on levels of DNA damage was investigated as well (286, 287). The buccal micronucleus assay cytome assay provided preliminary data on the impact of radiological diagnostics on genome stability in children (138). The results of all biomonitoring studies indicate the high sensitivity and specificity of the methods used and their great importance in human biomonitoring, regardless of the routes of exposure or entry of genotoxic agents into the body. Furthermore, the role of the comet assay, the standard micronucleus assay and novel version of the buccal micronucleus cytome assay as additional biomarkers in assessing the health status of subjects with various diseases was confirmed.

Research on animal models

Using the alkaline comet assay, the adverse effects of 28-day oral exposure of male Wistar rats to low doses (0.0007, 0.0013, and 0.7 mg kg⁻¹ *b. w.* per day) of the herbicide tembotrione were studied. The tested doses correspond to the acceptable operator exposure level (AOEL), residential exposure level (REL), and 1000×AOEL values. All three doses produced statistically significant deviations in the levels of DNA damage in the kidney cells according to the control group of rats. Doses of AOEL and 1000×AOEL caused significantly higher levels of DNA damage in liver parenchymal cells, while significant increases of DNA damage in non-parenchymal liver cells were observed only at the dose corresponding to the AOEL. In the same animals, the activity of the enzyme glutathione peroxidase was also measured, which at the tested doses of tembotrione did not significantly deviate from the control values (97). Using the alkaline comet assay, we investigated the temporal dynamics of the occurrence and elimination of DNA damage inflicted by cytostatic irinotecan in leukocytes, liver, and brain cells of male Wistar rats. The highest level of DNA damage in liver and brain cells was measured on the fourth day and in leukocytes on the eighth day after treatment. The observed pattern of DNA damage is a consequence of both the induction and repair of lesions, whose mechanisms cause additional breaks in the DNA molecule that can be detected using the comet assay. Brain cells are most sensitive to irinotecan activity (301). The effects of the anesthetic isoflurane and γ -radiation (2 Gy dose) were investigated using a comet assay on Swiss albino mouse model. Six hours after exposure, the leukocytes and kidney cells of mice demonstrated synergistic effects of the tested agents on the level of DNA damage. Twenty-four hours later, higher levels of damage were observed in kidney cells than in leukocytes, probably due to the metabolism of the tested anesthetic. The results obtained indicate that the potential adverse effects of anesthetics during medical procedures using ionizing radiation should be anticipated (124).

RESEARCH Project FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Aging-related expression of membrane transporters in rat (AGEMETAR, HrZZ-IP)
- Adverse effects of single and combined mycotoxins produced by *Aspergilli* (MycotoxA, HrZZ-IP)
- Interaction of metallic nanoparticles with sulphur-containing biomolecules – implications for nanobio interface (NanoFaceS, HrZZ-IP)
- Genotoxic and Oxidative Status of Imatinib Mesylate in Non-Target Human Cells (HAZU)

International projects (Chapter 16.2)

- European Concerted Programme on Radiation Protection Research (CONCERT, H2020)
- A sustainable future for the Danube river basin as a challenge for the interdisciplinary humanities (Danube: Future)
- The comet assay as a human biomonitoring tool (hCOMET, COST)

- Personalized nutrition in aging society: Redox Control of major age-related diseases (NutRedOx, COST)
- "Good biomarker practice" to increase the number of clinically validated biomarkers (CliniMARK COST)
- Occupational exposure to cytotoxic agents in veterinary hospitals and clinics (CytoVet, IPL, PT)
- El proyecto general es evaluación del riesgo genotóxico por exposición a contaminantes ambientales (University of Tlaxcala, MX)
- Assessment of toxicological safety of foodborne toxins (SafeFood, Bilateral CRO-SI)
- Acetylcholinesterase Inhibitors as Potential Anti-Alzheimer Drugs: Prooxidative and Cytogenotoxic Properties (SafeAChE, Bilateral CRO-RS)
- Persistent organochlorine compounds in human milk and their potential effect on the level of primary DNA damage in human cells (Bilateral CRO-RS)
- Distribution of antibiotic resistance genes in waste water treatment plants and receiving environments of China and Croatia (Bilateral CRO-CN)

● PROFESSIONAL SERVICES

The Mutagenesis Unit performs five different analyses: analysis of chromosomal aberrations; analysis of sister chromatid exchanges (SCE); micronucleus assay; comet test; cell viability assay.

The professional services provided by the Mutagenesis Unit included collaboration with occupational health specialists and occupational medicine clinics involved in medical examinations of workers occupationally exposed to physical mutagens (ionising and non-ionising radiation) and/or chemical mutagens (cytotoxic drugs and other genotoxic agents). During 2019, two analyses of chromosomal aberrations and one of micronucleus assay were performed for the purpose of health surveillance of occupationally exposed medical workers.

● PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

G. Gajski

Member of the Supervisory Board of the Croatian Association for Cancer Research (HDIR); member of the Editorial board of *Medicine* (Wolters Kluwer Health, Inc.); Guest Editor of Special Issue: Comet Assay (ICAW 2019) of *Toxicology Letters* (Elsevier); Scientific committee of 13th International ICAW Workshop, Russia; member of the Working Group on Biotechnology of the Applied Genomics Committee of the Croatian Academy of Sciences and Arts (HAZU).

N. Kopjar

Member of the Presidency of the Croatian Society of Toxicology.

M. Milić

Member of the Court of Honor (until 13 Nov 2019) and a member of the Presidency of the Croatian Society of Toxicology (since 13 Nov 2019); member of the Presidency of the Croatian Society of Toxicology; member of the Scientific Committee of the 10th International Congress of the Turkish Society of Toxicology (16 – 19 Oct 2019, Antalya, Turkey).

D. Želježić

Member of the Editorial board of *BioMed Research International*; vice-president and a member of the Presidency of the Croatian Society of Toxicology (till 13 Nov 2019); expert in biological methods of testing in the Member State Committee of the European Chemicals Agency (ECHA); expert in genotoxicity of the Working Group for Food Enzymes of the Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids (CEF) – European Food Safety Authority (EFSA).



15.8. Toxicology Unit

EMPLOYEES

HEAD

Maja Peraica, MD, PhD, ERT, permanent scientific advisor

RESEARCH STAFF

Prof Radovan Fuchs, DVM, PhD, permanent scientific advisor (Deputy Director, International Affairs)

Prof Ana Lucić Vrdoljak, PhD, permanent scientific advisor (Director)

Ivana Novak Jovanović, PhD, senior scientific associate

Dubravka Rašić, PhD, scientific associate

Suzana Žunec, PhD, scientific associate

TECHNICAL STAFF

Jasna Mileković, senior technician

Lea Stančin, technician

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

In-house scientific projects (Chapter 16.1.A.3.)

1. *Investigation of interactions between irinotecan and tetrahydrocannabinol on laboratory rodents by integrating biochemical, molecular biology, pathohistological and analytical methods*

Due to growing public interest for the antitumor potential of delta-9-tetrahydrocannabinol (THC) and its possible role as an agent for alleviating side-effects of chemotherapy, some oncology patients often take unregistered cannabis preparations that may contain up to 90 % THC. Taking into account the fact that the metabolic pathways of one of the most commonly used cytostatics for the treatment of advanced colon cancer, irinotecan (IRI) and THC in the body overlap, we conducted a pilot study on healthy male Wistar rats in order to investigate how high THC concentrations affect the toxicity of IRI. Effects rats exposure to IRI (100 mg kg⁻¹, single dose, *i. p.*) and THC (7 mg kg⁻¹, consecutively for 24 hours, 3 days, and 7 days, *p. o.*) and their combination on haematological and biochemical parameters. Cholinesterase activity, markers of oxidative stress, and primary DNA damage were presented at the 4th Meeting of the Slovenian Toxicological Society "Cannabis under scrutiny: their toxicity and medical utility". Overall, the results indicated a significant synergistic enhancement of IRI toxicity caused by the concomitant administration of THC (337).

The mechanism of antitumor activity of IRI is based on binding to topoisomerase I-DNA complex causing double-strand DNA breakage and cell death. Considering the well-established sensitivity of the alkaline comet assay for detection of DNA damage in single cells, we have expanded the IRI toxicity study to elucidate (I) dynamics of DNA instability in liver, leukocyte, and brain cells of rats that were administered single IRI dose of 100 mg kg⁻¹ and (II) differences between levels of DNA damage produced in the studied cell types. The results were evaluated at the first, fourth, and eighth day after exposure to IRI. Appropriate control groups were studied in parallel. To establish the overall toxic effects of IRI, we also estimated changes in total body, liver, and brain weights of experimental animals. Treatment with IRI reduced the total body weight of rats at all time points and also affected liver and brain weights compared to controls. The highest level of primary DNA damage

was determined on the fourth day after treatment in liver and brain cells and on the eighth day in leukocytes (301). The cytotoxic and genotoxic effects of IRI and the ability to induce free radicals depending on the concentration and time of exposure were examined in greater detail *in vitro* on two types of cell lines. The results showed that IRI toxicity increased depending on its concentration in the liver cell line, whereas no concentration dependence was demonstrated in colon cells. Also, the cytotoxic effect of IRI was shown to be related to the induction of free radicals. The genotoxic effect of IRI was observed on both treated cell lines with the prolongation of incubation time (296).

Although THC is known today to be anti-emetic, anticonvulsant, anti-inflammatory and analgesic, existing knowledge about this cannabinoid is controversial in many aspects. For example, the acute effects of THC are known to be associated with cognitive impairment (reaction time, motor coordination and attention, learning perception). THC has been found to reduce the synthesis of the neurotransmitter acetylcholine in the hippocampus, suggesting its negative effects on cognitive processes. On the other hand, based on the high lipophilicity and coupled tricyclic structure of THC, some authors have suggested that THC can bind to the enzyme acetylcholinesterase (AChE). Inhibition of this enzyme by THC may result in the improvement of neurological deficits. Computational modeling of THC-AChE interactions showed that THC binds to the allosteric peripheral anion site (PAS) of AChE, which has a link to the aetiology of Alzheimer's disease (AD) as a concomitant prevention of AChE-promoted A β E protein aggregation. The related enzyme butyrylcholinesterase (BChE) is also present in neurite plaques characteristic of AD and could be another target for THC inhibition. Therefore, we tested *in vitro* the ability of THC to inhibit human recombinant AChE and BChE isolated from human plasma. THC caused inhibition of AChE and BChE in the micromolar range with some selectivity for BChE indicating that, in addition to affecting the endocannabinoid system, THC may also affect other neural systems, including central cholinergic neurotransmission crucial for cognitive function (262). The fact that the increase in the use of illegal highly concentrated THC preparations for consumers may mean an even greater likelihood of adverse and unpredictable reactions motivated us to evaluate the toxicity of THC *in vivo* on the Wistar rat model. In blood and brain samples of rats acutely exposed to a dose of THC comparable to those found in illicit preparations (7 mg kg^{-1}), we determined the proportion and dynamics of primary DNA damage, the level of oxidative stress, and cholinesterase activity. The results of the alkaline comet assay showed higher levels of DNA damage in brain cells relative to leukocytes, posing a threat to neurons in terms of genome viability and stability, while ineffective DNA repair could lead to their progressive loss. High levels of DNA damage in the brain were accompanied by an increased concentration of lipid peroxidation products and glutathione and a decrease in the activity of the antioxidant enzyme superoxide dismutase. Acute exposure to high doses of THC did not affect cholinesterase activities in the plasma and brain of rats (34, 312).

Furthermore, we developed an analytical method for the determination of the mass concentration of THC and its metabolites [11-hydroxy- Δ^9 -tetrahydrocannabinol (THC-OH) and 11-nor- Δ^9 -carboxy- Δ^9 -tetrahydrocannabinol (THC-COOH)] in the urine of rats treated only with THC and treated simultaneously with THC and irinotecan. For this purpose, hydrolysis and solid phase extraction conditions of the investigated analytes were optimised and a gas chromatography-mass spectrometry (GC-MS) method was developed to determine all three analytes in rat urine. Enhanced urinary THC-COOH excretion was noted in rats administered combined treatment compared to single THC treatment (21, 279).

Three lectures were held at a partner institution at the University Center of Varaždin, University of the North, presenting the results published so far and presenting a plan for further experiments on an experimental model of mice that will be injected with tumor cells (CT26WT line) for induction of intestinal tumors aimed at investigating the impact of THC and IRI on tumor biology and pathophysiology. The lectures were given for the teachers and students of the undergraduate and university graduate studies of Nursing and undergraduate professional study of Physiotherapy of the University of the North.

2. *Investigation of electrochemical and antioxidant properties of polyphenols and their complexes with essential metals*

RESEARCH Project FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- Aging-related expression of membrane transporters in rat (AGEMETAR, HrZZ-IP)
- Analysis of Butyrylcholinesterase Interactions with Novel Inhibitors and Reactivators (AnalyseBChE, HrZZ-IP)
- Adverse effects of single and combined mycotoxins produced by Aspergilli (MycotoxA, HrZZ-IP)
- Exploring the antioxidative potential of benzazole scaffold in the design of novel antitumor agents (AntioxPot, HrZZ-IP)

International projects (Chapter 16.2.)

- European Concerted Programme on Radiation Protection Research (CONCERT, H2020)
- CNS-active, Orally Bioavailable, Zwitterionic Oxime Antidote to Organophosphates (DTRA, USA)

PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

A. Lucić Vrdoljak

Member of the Working Group in charge of monitoring the activity plan for the National Network for Permanent Air Quality Monitoring of the Meteorological and Hydrological Service and the Institute for Medical Research and Occupational Health at the Ministry of Environment and Energy of the Republic of Croatia.

M. Peraica

President and member of the Croatian Society of Toxicology's Presidency; member of the Medical Academy of Croatian Physicians Association.

D. Rašić

Secretary and member of the Croatian Society of Toxicology's Presidency.

S. Žunec

Member of the Court of Honor of the Croatian Society of Toxicology (since 13 Nov 2019).

SCIENTIFIC, TEACHING AND ACADEMIC ADVANCEMENT OF EMPLOYEES

The scientific degree of scientific advisor was gained by *I. Novak Jovanović*.



15.9. Radiation Protection Unit

EMPLOYEES

HEAD

Gordana Marović, PhD, permanent scientific advisor until 31 Dec 2019

RESEARCH STAFF

Zdenko Franić, PhD, permanent scientific advisor since 23 May 2019

Assist Prof Dinko Babić, PhD, scientific advisor

Gina Branica, PhD, senior scientific associate

Assoc Prof Branko Petrinec, PhD, senior scientific associate

Tomislav Bituh, PhD, scientific associate

Davor Rašeta, PhD, postdoctoral researcher since 22 Jul 2019

Božena Skoko, PhD, postdoctoral researcher since 10 Sep 2019

Iva Franulović, BSc, professional associate in science (replacement: Helena Jauk, MSc, until 19 Sep 2019)

Milica Kovačić, BSc, professional associate in science

TECHNICAL STAFF

Mak Avdić, senior technician

Jasminka Senčar, senior technician

Ljerka Petroci, technician

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

The study of radioactive contamination of the environment with natural and fission radionuclides (6, 18, 20, 44, 58, 59, 95) continued, with particular attention being paid to risk analysis (58, 76).

The results of long-term post-Chernobyl studies of concentrations of ^{134}Cs and ^{137}Cs in multiflora and chestnut honey sampled in northwestern Croatia were analysed. Concentrations of radiocesium activity in honey correlate well with fallout, indicating that fallout is the primary source of radioactive contamination of honey. The results of the research have shown that the consumption of honey in Croatia is not a critical route for the intake of radioactive cesium from the environment (18, 20).

The results of long-term post-Chernobyl studies of the concentrations of ^{134}Cs and ^{137}Cs in chicken eggs and chicken meat in northwestern Croatia were analysed. Concentrations of radiocesium activity correlated well with fallout, indicating that fallout was the primary source of radioactive contamination. The results of the study showed that the consumption of chicken meat and eggs is also not a critical route of intake of radioactive cesium from the environment (95).

Data on elevated concentrations of ^{106}Ru activity measured in 2017 in the air in Croatia were also investigated. These data were compared with test results (1,100 atmospheric data and 200 atmospheric deposition data) conducted in other European countries. It was concluded that a huge atmospheric release of radioactive ^{106}Ru occurred in Eurasia in 2017, which must have been caused by a significant, but not yet reported, nuclear accident (44).

Between 2013 and 2015, concentrations of radon activity at more than 1000 randomly selected locations in Istria were investigated. Due to the geological structure of the Istrian peninsula, which is mainly composed of limestone, characterized by karst topography on its surface, it is expected that there are areas with elevated radon levels in the soil, as well as within buildings, with particularly high risk for objects with children (homes, kindergartens, schools). The average value of indoor radon in

homes was 102 Bq m^{-3} , while the average radon concentrations in kindergartens and schools were twice as high as in households. In accordance with the obtained results, areas with elevated radon levels indoors as well as radon levels in the soil were identified and radon maps were prepared using different geostatistical approaches (59).

A radiological risk analysis of coal ash for terrestrial wildlife was conducted. Specifically, the ashes generated by the combustion of coal and slag in landfills have an increased content of radionuclides from the uranium series. Using the ERICA computer model, dose rates in the environment and the risk of resulting radiobiological effects on wild fauna were estimated. The estimated dose rates for reference animals and lichens and flycatchers were above the rate of the screening dose rate for most organisms and averaged 13 times the estimated dose rate of the baseline radiation. The results of the study indicated the need to further gather experimental data related to radiological risk assessments to mitigate the conservatism of the ERICA model that overestimates environmental dose rates (76).

Particular attention was paid to the issue of field radioactivity measurement methods in order to achieve better and faster efficiency in obtaining data in the event of adverse events, nuclear/radiological accidents, where the crucial role of mobile radiological measuring laboratories is demonstrated.

Radiochemical and measurement methods for monitoring radioactivity in various media are still being developed. By monitoring new knowledge in the field of radiation science and radiation protection, as well as in metrology and sampling, procedures are standardized and methods harmonized through the implementation of quality assurance procedures. Appropriate radiation protection measures are being developed in the event of a nuclear/radiological accident, with an emphasis on the role of mobile radiological measurement laboratories in order to achieve better and faster efficiency in obtaining relevant data (58).

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

International projects (Chapter 16.2.)

- Science-based Risk Governance of Nano-technology (RiskGONE, H2020)
- Ensuring Radiation Safety (INTERREG CRO-SI)

PROFESSIONAL SERVICES

List of international intercomparisons

ORGANISER	TEST	AREA	DATE
IAEA	IAEA-TEL-2019-04	Determination of radioactivity in water, soil, and surface contamination	May 2019 – Oct 2019
IAEA	IAEA-RML-2019-01	Determination of tritium, strontium and caesium isotopes in sea water	Aug 2019 – in progress
IAEA	IAEA-NAEL-2019	Determination of radionuclides in shrimps	Aug 2019 – in progress

List of accredited methods

TEST METHOD	TYPE OF TEST, RANGE
RU-602-5.4-1 (In-house method)	Determination of radionuclides by high-resolution gamma spectrometry in energy range 40 – 2000 keV
RU-602-5.4-4 (In-house method)	Determination of ^{90}Sr activity concentration
RU-602-5.4-5 (In-house method)	Determination of ^{226}Ra activity concentration

The Unit's quality manager: *T. Bituh*.

PROFESSIONAL ACTIVITIES OF THE EMPLOYEES OUTSIDE THE INSTITUTE

T. Bituh

Technical evaluator of projects Support to the development of competence centers – CEKOM; Partner (Deputy Representative of the Republic of Croatia) on the IAEA project RER7014 Improving environmental monitoring and assessment for radiation protection in the region.

Z. Franić

Member of Management board of the Croatian Radiation Protection Association; member of the TO-45 (Nuclear Instrumentation) of the Croatian Standards Institute; member of the European Commission Board of Governors of Joint Research Centre JRC EC (until November 2019); member of the Programme Committee HORIZON 2020 for SC5 (Climate Activities, Environment, Resource Efficiency and Raw Materials); member of Ethics Committee in the Dental Polyclinic Zagreb; Chairperson of "Zrinska gora" NGO; Lead auditor of Croatian Accreditation Agency for accreditation schemes HRN EN ISO/IEC 17025:2017 (General requirements for the competence of testing and calibration laboratories) and HRN EN ISO 14065 (Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition).

G. Marović

Member of the Supervisory Board of the Croatian Radiation Protection Association; member of the Management Board of the Croatian Nuclear Society; member of the Public Committee of the Croatian Nuclear Society; member of the Scientific Committee of 12th Symposium of the Croatian Radiation Protection Association (10-12 Apr 2019, Varaždin).

B. Petrinec

President of the Firefighters Community of the Town of Ivanić-Grad; member of the Governing Council of the Firefighters Community of the Town of Ivanić-Grad; vice-president of the City Council of the Town of Ivanić-Grad; member of the Presidency of the Firefighters Community of the Zagreb County; quality manager for the Firefighters Community of the Town of Ivanić-Grad; firefighter judge; Senior firefighting officer 1st class; firefighter with special authorisations and responsibilities; head of IMROH's defence preparation; member of the TO-45 (Nuclear Instrumentation) of the Croatian Standards Institute; member of the Editorial Board of the journal *Fire and Fire management*.

D. Rašeta

Member of the Croatian Nuclear Society; member of the IAEA Nuclear Safety Standards Committee.

J. Senčar

Member of the Management Board of the Croatian Radiation Protection Association; member of the Organising Scientific Committee of 12th Symposium of the Croatian Radiation Protection Association (10-12 Apr 2019, Varaždin).

15.10. Independent researchers



15.10.1. Independent researcher Aleksandra Fučić, PhD permanent scientific advisor

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

A book entitled "Medical Genetics" (ISBN 987-5-98811-4) has prepared for publication in collaboration with Dr A. Aghajanyan, Peoples' Friendship University of Russia in Moscow. The book will be published by Practical Medicine and used by medical colleges of the Russian Federation. Editors: Aghajanyan, Fucic, Chovrebova, Lasan.

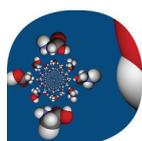
RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National projects (Chapter 16.1.)

- The role of oestrogen and androgen receptor activation in the stroma of oral cancer and their impact on the survival of patients (ACTIVESTROMORALCANCER, HrZZ- IP)

International projects (Chapter 16.2.)

- Scientific Centre of Excellence for Reproductive and Regenerative Medicine: Reproductive and Regenerative Medicine – Exploring New Platforms and Potentials (CERRM, EFRR)
- European Human Biomonitoring Initiative (HBM4EU, H2020)



15.10.2. Independent researcher Jasmina Sabolović, PhD scientific advisor (since 11 Jun 2019)

RESEARCHER

Jelena Pejić, MSc, PhD student-assistant (HrZZ)

RESEARCH

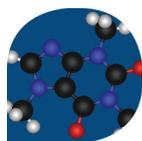
RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National project (Chapter 16.1.)

1. Combined molecular modelling and experimental studies of physiologically and stereochemically important copper(II) amino acid complexes (CopperAminoAcidates, HrZZ-IP)

SCIENTIFIC, TEACHING, AND ACADEMIC ADVANCEMENT OF EMPLOYEES

The scientific degree of scientific advisor was gained by *J. Sabolović*.



15.10.3. Independent researcher

Ante Miličević, PhD
scientific advisor

RESEARCH

RESEARCH ACTIVITIES WITH INSTITUTIONAL FINANCING

In-house scientific project (Chapter 16.1.A.3.)

1. *Investigation of electrochemical properties and antioxidant activity of polyphenolic compounds and their complexes with essential elements*

In 2019 we compared semi-empirical (PM6) with density functional theory (DFT) calculations, on the set of 20 flavonoids for which we measured first oxidation potentials, E_{p1} , at pH 3 and pH 7, used for making models for the estimation of E_{p1} values (46, 47). PM6 method yielded significantly better results than much demanding DFT calculations. In the third paper (45), on the set of 14 flavonoids, we showed that by averaging of the antioxidant activities (AA) measured by four different methods the correlation of AA with E_p is better ($r^2 = 0.960$) than separate correlations ($r^2 = 0.561 - 0.848$) using AA values measured by one method. On paper about benzimidazole derivatives (51), we identified electroactive groups of eight analyzed molecules using theoretical PM6 calculations.

RESEARCH PROJECTS FUNDED BY EXTERNAL SOURCES

National project (Chapter 16.1.)

- Interaction of metallic nanoparticles with sulphur-containing biomolecules – implications for nano-bio interface (NanoFaceS, HrZZ-IP)

PROFESSIONAL ACTIVITIES OUTSIDE THE INSTITUTE

A. Miličević

The chief shop steward at the Independent Trade Union of Science and Higher Education for the branch IMROH.

16. PROJECTS

16.1. NATIONAL PROJECTS



16.1.A. RESEARCH PROJECTS LED BY IMROH RESEARCHERS

16.1.A.1. Croatian Science Foundation

Research projects (5 projects)



LEADER	PROJECT	DURATION
Davorka Breljak, IMROH	Aging-related expression of membrane transporters in rat (AGEMETAR, IP-2013-11-1481)	1 Oct 2014– 31 Mar 2019

IMROH ASSOCIATES: G. Gajski, M. Gerić, J. Jurasović, D. Karaica, M. Ljubojević, V. Micek, I. Novak Jovanović, T. Orct, M. Peraica, D. Rašić, I. Sabolić, I. Vrhovac Madunić
EXTERNAL ASSOCIATES: L. Nanić and I. Rubelj (Ruđer Bošković Institute, Zagreb)

SUMMARY

In accordance with the working project plan, various tissues/organs were collected from males/females following 21-mo H₂O (control) and EtOH treatment in the rat experimental model. For the immunofluorescence analysis, organs were fixed by perfusion *in vivo*, whereas for monitoring of the renal/hepatic endocytosis, animals were perfused with FITC-dextran *in vivo*. Furthermore, total cell membranes/cytosolic fractions/RNA/DNA were isolated from the renal/hepatic tissues. Within the project framework, two group seminars and one presentation were held at IMROH, showing the results of the performed scientific research. Also, we published one original scientific article in a *WoS*-indexed journal (40). Furthermore, results were disseminated through the poster/oral presentation at international scientific meeting 1st Science & Wine World Congress (325) and international scientific workshop "Mouse genetics; models for human diseases" ICGEB Course. Other results will be published within the scientific articles under preparation. Following the submission of the final project report, AGEMETAR was rated by the final grade B having good progress and achieving most of the project objectives. Also, it was highlighted that reasons for the some project discrepancies were objective. Even though the project AGEMETAR was formally finished, we continue to work in order to finish all the planned activities that could not be finished in the given project period. In organs/tissues of all experimental groups following the 21-mo EtOH treatment, various parameters were measured in urine, blood serum, kidneys, liver, and brain using various techniques such as DNA/RNA isolation, reverse transcription, RT-PCR (end-point/quantitative), SDS-PAGE/western analysis, immunocytochemistry/fluorescence microscopy, ELISA, comet assay, ICP-MS, HPLC and telomer's length determination. Upon completion of the AGEMETAR project, several work meetings were additionally held at IMROH in order to prepare data for further dissemination of results in relevant scientific publications.

LEADER	PROJECT	DURATION
Zrinka Kovarik, IMROH	Analysis of Butyrylcholinesterase Interactions with Novel Inhibitors and Reactivators (AnalyseBChE, IP-2018-01-7683)	1 Oct 2018– 30 Sep 2022

IMROH ASSOCIATES: A. Bosak, N. Maček Hrvat, G. Šinko, M. Katalinić, S. Žunec, A. Matošević
 EXTERNAL ASSOCIATES: V. Gabelica Marković (Faculty of Chemical Engineering and Technology, University of Zagreb), A. Knežević (Ruđer Bošković Institute, Zagreb), Z. Radić (University of California at San Diego, La Jolla, USA)

SUMMARY

This project is aimed at studying of the mechanisms of interaction of butyrylcholinesterase (BChE) with known and novel compounds using a comprehensive analysis of findings and results of a past project funded by the Croatian Science Foundation (CHOLINESTERASE, HrZZ-IP-2013-11-4307) (37). The biochemical mechanism of enzymatic interactions is studied at the molecular level by *in silico*, *in vitro*, and *ex vivo* methods in line with the defined four project objectives: (a) Identification of the structural characteristics of new BChE ligands, (b) Determination of related reaction rate constants, (c) Conversion of BChE from stoichiometric to a catalytic OP bioscavenger, and (d) Development of new BChE therapeutics and purposeful scientific activities. Already in the first year of the project, our findings have made it possible to identify reversible BChE inhibitors from a series of newly synthesized 4-aminoquinolines (10) and oxazole benzylamine derivatives (111) as potential candidates for the treatment of neurodegenerative diseases. Then, a series of pyridinium triazole oximes was investigated as reactivators of BChE phosphorylated by nerve agents – tabun, VX, sarin, and cyclosarin (38, 103, 123). Efficient reactivators of BChE inhibited by cyclosarin and sarin were identified among the high-affinity phenyltetrahydroisoquinoline aldoximes (103). From the reactivation study on a series of chlorinated pyridinium compounds dichlorinated bispyridinium oxime with a propyl linkage stood out (89). Its BChE reactivation potency was shown to be promising when compared to the standard oximes used in medical practice (HI-6 and 2-PAM), especially in case of sarin and tabun. This finding could be used in the pseudo-catalytic scavenging of the most nerve agents due to its cumulative capacity to reactivate both BChE and related acetylcholinesterase, a key enzyme for in neurotransmission.

LEADER	PROJECT	DURATION
Martina Piasek, IMROH	Assessment of Daily Exposure to Metals and Maternal Individual Susceptibility as Factors of Developmental Origins of Health and Disease (METALORIGINS, IP-2016-06-1998)	1 Jun 2017– 31 May 2021

IMROH ASSOCIATES: J. Jurasović (Deputy Leader), T. Orct, A. Pizent, M. Lazarus, I. Brčić Karačonji, N. Brajenović, A. Katić, B. Tariba Lovaković, A. Sekovanić, A. Sulimanec Grgec, T. Živković Semren, Z. Kljaković-Gašpić, J. Kovačić, A. Jurić
 EXTERNAL ASSOCIATES: D. Pašalić, S. Stasenko, K. Branović Čakanić, L. Škratić, I. Miškulin

SUMMARY

The project evaluates the health effects of the daily exposure and intake of essential and major toxic elements in vulnerable population groups – pregnant women that, in addition to individual susceptibility of the expectant mother, may have an impact on foetal epigenetic regulation and act as the factors of developmental origins of health and disease in adulthood (according to the concept of developmental origins of health and disease, DOHaD). A cross-sectional epidemiological study is carried out by the methods of human biological monitoring in mother-newborn pairs connected to previously collected compatible data and biological samples from >200 participants.

We completed the recruitment of in total 156 participants, healthy non-smoking and cigarette smoking postpartum women, which included collection of the data on study participants by questionnaire and biological samples from mother-newborn pairs closely before or after vaginal term birth in maternity wards of the collaborating clinical hospitals. All biological samples, maternal urine and blood, umbilical cord blood and whole placentas, were prepared for the planned analyses and stored according to the project protocols.

Part of the planned element analysis in biological samples collected before and during the current project was conducted. Concentrations of Hg were determined (by ICP-MS method) in the samples of maternal blood and hair, placenta, and umbilical cord blood in association with the consumption of seafood in mother-infant pairs after normal delivery at a maternity hospital in coastal Croatia ($n = 96$, mean age of participants 29 years). Concentrations of Hg in all of the measured samples were proportional to seafood intake and expectedly higher in maternal hair (about 220 times) and cord blood (about 1.6 times) than in maternal blood.

The high correlation coefficient of Hg concentrations (>0.80) in all measured samples proves that in the studies on mother-infant pairs, non-invasively collected samples of the placenta and umbilical cord blood are valuable biological samples, and their Hg concentration can serve as reliable biomarkers of exposure to highly toxic Hg due to maternal seafood consumption, mainly fish. Therefore, invasive sampling of maternal blood can be avoided and hair sample collection may not be necessary (which participants may refuse to give or the sample is unsuitable for analysis due to insufficient length or chemical treatment of the hair) (244).

The following results have been obtained to date: the antioxidant protection indicators by determining the activities of antioxidant enzyme superoxide dismutase (SOD) and glutathione peroxidase (GPx) in maternal and cord blood plasma and the levels of metallothionein (MT) in maternal and cord blood serum samples of non-smoking and smoking postpartum women as well as the mass concentrations of cotinine in urine as a biomarker of exposure to tobacco smoke.

The preliminary results on candidate miRNAs in the samples of maternal blood plasma from non-smokers ($n = 13$) and smokers ($n = 13$) pointed to aberrant expression of miR-21 and miR-146a related to tobacco smoke exposure, whereas miR-1537 and miR-190b were not expressed or with threshold cycle (Ct) value >35 in 95 % and 50 % of analysed samples (274). We further optimized the protocol for circulating miRNA analysis (by Qiagen miRNA assays) and tested the preamplification step to increase the sensitivity of quantitative polymerase chain reaction (qPCR) analysis and the number of detectable extracellular miRNAs in 19 paired maternal and umbilical cord blood plasma samples. By using the $\Delta\Delta\text{Ct}$ method of relative quantification, we analysed fold change for miRNA expression in the samples from healthy smoking ($n = 10$) and non-smoking ($n = 9$) postpartum women collected immediately after delivery. Preamplification facilitated the detection of all assayed candidate miRNAs and yielded a mean Ct improvement of 6.7 ± 1.1 ($p < 0.01$) compared with Ct values derived from the direct qPCR method. Values of ΔCt between the compared methods were highly correlated ($r > 0.9$) for miR-16, miR-21 and miR-146a, and their Ct values previously determined by direct qPCR were less than 35. Our results confirm that preamplification is a useful and reliable procedure to facilitate detection of the expression of circulating miRNA in blood plasma. Determined fold changes for miR-1537 and miR-190b in cord blood plasma of 3.5 and 1.6 showed their upregulation related to tobacco smoke exposure (221).

Among our internal dissemination activities, continuous mutual consultations and exchange of experiences within the project consortium carried on with the presentations for methods and new procedures to be used during the study and on the of the first results on the project during three internal seminars. The information on the project's website and the entries on the research data in the project database sheets are regularly updated.

LEADER	PROJECT	DURATION
Jasmina Sabolović, IMROH	Combined molecular modelling and experimental studies of physiologically and stereochemically important copper(II) amino acid complexes (CopperAminoAcidates, IP-2014-09-3500)	1 Sep 2015– 28 Feb 2020

IMROH ASSOCIATE: J. Pejić

EXTERNAL ASSOCIATES: D. Vušak (Faculty of Science, University of Zagreb), M. Ramek (Technische Universität Graz, Graz, Austria), G. Szalontai (NMR laboratórium, Pannon Egyetem, Veszprém, Hungary)

SUMMARY

According to the work plan of the project, the experimental and computational research of copper(II) complexes with amino acids has been performed. In collaboration with M. Ramek, A-M. Kelterer, M. Marković, and I. Mutapčić (Technische Universität Graz, Graz, Austria), theoretical results of conformational analyses of the physiological bis(L-asparinato)copper(II) $[\text{Cu}(\text{L-Asn})_2]$ and (L-histidinato)(L-asparinato)copper(II) $[\text{Cu}(\text{L-His})(\text{L-Asn})]$ complexes obtained by the density functional theory (DFT) method in vacuum and aqueous solution were published (60). The structural properties and energy landscapes were explored. The conformational analyses in the gas phase and implicitly modeled water medium, and magnetic parameters of electron paramagnetic resonance spectra were attained. The apical Cu(II) coordination and hydrogen bonding were analysed. The predicted lower-energy structures enabled the confirmation and, for apical bonding, also the refinement of structural proposals from the literature. Available experimental results were indecisive regarding the amido-group binding in the Cu(II) equatorial plane in solutions, but the examination of the relative stability of $\text{Cu}(\text{L-Asn})_2$ conformers in 30 binding modes confirmed the glycine-like mode as the most stable one. Previously reported experimental results for $\text{Cu}(\text{L-His})(\text{L-Asn})$ were interpreted for L-His to have a tridentate histamine-like mode. However, our prediction is that the aqueous conformers with L-His in the glycinato mode also have low energies, which does not contradict the tridentate L-His binding.

The predicted magnetic parameters of conformers with an apical oxygen atom (intramolecular or from a water molecule) can reproduce the experimental data (60, 326). An extent of conformational flexibility and abundance of L-His-containing ternary copper(II) amino acid complexes under physiological conditions may be related (60). The DFT conformational analyses of several other physiological copper(II) amino acid complexes are under progress.

In collaboration with the scientists of the Department of Chemistry at the Faculty of Natural Sciences and Mathematics in Zagreb, D. Vušak and D. Matković-Čalogović, and G. Szalontai of the Pannonian University (Veszprém, Hungary), we worked on exploring different approaches in syntheses and preparations of new crystal forms of the copper(II) complexes with leucine, the X-ray crystal structure refinement (222), and solid-state and solution NMR characterization. Besides, the theoretical conformational analyses were performed using DFT and a molecular mechanics force field to rationalize why a specific conformer/stereoisomer had crystallized.

LEADER	PROJECT	DURATION
Ivana Vinković Vrček, IMROH	Interaction of metallic nanoparticles with sulphur-containing biomolecules – implications for nano-bio interface (NanoFaceS, IP-2016-06-2436)	15 Mar 2017– 14 Mar 2021

IMROH ASSOCIATES: M. Milić, G. Šinko, I. Pavičić, A. Miličević

EXTERNAL ASSOCIATES: I. Capjak, S. Šupraha Gopreta, M. Milić, B. Vuković, V. Šerić, W. Goessler, D. Horak, E. Omanović-Miklićanin

SUMMARY

The main objective of the proposed project is to provide new information on the nature of the “nano-bio” interface between metallic theranostic nanomaterials and sulphur-containing biomolecules (S-biomolecules), which play an important and complex functional role in living systems. The model of this project consists of: i) a set of silver, gold and iron oxide nanoparticles with different physicochemical properties (size, surface charge and chemical composition) and (ii) five important S-biomolecules: cysteine, glutathione, metallothionein, albumin, and insulin. The project is a multimethodological and multidisciplinary approach that will provide new insights into the nature of specific biological interactions of NPs with S-biomolecules, thus significantly contributing to the knowledge of the nanomedical field.

During 2019, the following was investigated: 1) interactions of AgNPa and SPION with cysteine (CYS) and glutathione (GSH) in various biological media (related to WP3 and WP6), 2) interactions of AgNPa and SPION with, albumin (ALB), glycosylated transferrin (gTRF) and non-glycosylated transferrin (ngTRF) and in different biological media (related to WP3 and WP6), 3) dissolution processes of AgNP and SPION in the presence of S-biomolecules in different biological media (related to WP4), and 4) biological effects of AgNP- and to human cells *in vitro*. One PhD thesis was drafted and submitted for evaluation. All members of the research team actively participated in the dissemination activities.

Installation research projects (2 projects)



LEADER	PROJECT	DURATION
Maja Katalinić, IMROH	Molecular mechanisms underlying the toxicity of antidotes and potential drugs (CellToxTargets, UIP-2017-05-7260)	1 Mar 2018– 28 Feb 2023

IMROH ASSOCIATES: A. Zandona, I. Vrhovac Madunić, J. Madunić (since 2 Oct 2019)

EXTERNAL ASSOCIATE: S. Pirkmajer (Institute for Pathophysiology, Ljubljana, Slovenia)

SUMMARY

During 2019 we continued with the research of cell effects of antidotes against organophosphorus compounds (OP) according to the project's work plan. The main goal this year was to uncover the trigger mechanism leading to the unwanted effects and define possible structural features/moieties of tested compounds triggering certain effects. We tested the time- and dose-dependent effect of selected compounds (based on results from previous year) on the set of selected cells and determined potential cell targets (223). Results indicated that the tested 3-hydroxy-2-pyridinium, pyridinium and quinuclidinium compounds activated specific enzymes, caspases, which govern the process of regulated cell death known as apoptosis (335). On the other hand, the tested imidazolium compounds changed the cell membrane integrity and by that, cell death by necrosis (258). We analysed these results in terms of structure-activity relationship and compared them to the structures of known actions from available databases (229). We tested the cytotoxic effect of several new sets of compounds investigated as treatment in OP poisoning (227, 308, 336).

The second topic from this project focused on the investigation of neuropathy target esterase-related enzyme (NRE). During 2019, we followed changes in NRE mRNA and protein level in the muscle cells exposed to different stimuli (changes in nutrients/oxygen level, differentiation stimulators hormones, cytokines). Based on the obtained results we gained insight into the potential physiological role of NRE and set the course for the future research (302, 303). Along with that, we isolated the NRE mRNA sequence from the muscle tissue, prepared cDNA and cloned it into a vector. A plasmid was sent to analysis and our sequence confirmed.

The importance of this research was presented at scientific conferences as well as in the form of popular and professional lectures (171).

LEADER	PROJECT	DURATION
Darija Klinčić, IMROH	Development, validation and application of analytical methods for PBDE determination (DeValApp, UIP-2017-05-6713)	1 Oct 2018– 30 Sep 2023

IMROH ASSOCIATES: M. Dvorščak, K. Jagić, A. Jurič

SUMMARY

The first activities of the project involved the purchase of the planned equipment and chemicals, and furthermore, the sensitivity and selectivity of gas chromatographic determination of polybrominated diphenyl ethers (PBDEs) with electron capture detectors, mass spectrometers and coupled tandem mass spectrometry systems were determined. Microwave assisted extraction (MAE) using various combinations of organic solvents was used to extract selected PBDE congeners from house dust samples. After selecting the most suitable solvent, the other parameters for MAE (solvent volume, extraction temperature and extraction time) were optimized by a mathematical modeling procedure in collaboration with T. Safner (Faculty of Agronomy, Zagreb). We started the optimization of extract purification by solid phase extraction and/or shaking with concentrated sulfuric acid. A review paper was published (98) summarizing the literature data on the levels and distribution of PBDEs in samples from humans and the environment reported in the last five years. The project theme was presented in popular scientific lectures by participating in teaching within the course "Hygiene and Preventive Medicine" for the students of the Nursing School Vrapče, Zagreb.

16.1.A.2. Croatian Academy of Science and Art Foundation (2 projects)



LEADER	PROJECT	DURATION
Goran Gajski, IMROH	Genotoxic and Oxidative Status of Imatinib Mesylate in Non-Target Human Cells	2018–2019

IMROH ASSOCIATE: M. Gerić
EXTERNAL ASSOCIATE: A-M. Domijan

SUMMARY

The aim of the project is to investigate the genotoxic effect of imatinib mesylate (IM), a selective tyrosine kinase inhibitor used in cancer therapy, at concentrations relevant to environmental, occupational, and therapeutic exposure and oxidative stress mechanisms in normal human cells in *in vitro* conditions. At higher concentrations, IM exposure produced oxidative stress that affected non-target cells (23, 191, 217).

LEADER	PROJECT	DURATION
Antonio Zandona, IMROH	Cell response to exposure to chlorinated bispyridinium compounds	2018–2019

IMROH ASSOCIATES: M. Katalinić, Z. Kovarik, T. Zorbaz

SUMMARY

The activity of one group of oximes (chlorinated bispyridinium) was measured on cell level, since their efficacy as antidotes in organophosphorus poisoning in previous *in vitro* studies. The aim was to determine which molecular mechanism: internal (mitochondrial pathway) or external signal pathway (receptor pathway) would lead to cell death (apoptosis) and which part of the structure is responsible for this signal. In order to determine the mechanism of death, the cell membrane integrity and the caspase-8 and caspase-9 activity were monitored. In addition, since apoptosis is an active process, the ATP ratio in cells was quantified over time and at certain oxime concentrations. The theme and importance of this project as well as the project results will be presented at upcoming congresses and workshops.

16.1.A.3. In-house scientific projects (16 projects)

LEADER	PROJECT
Ž. Babić	Preventing child poisonings by educational intervention aimed at parents of preschool children
IMROH ASSOCIATES: R. Turk, J. Macan, A. Bjelajac, V. M. Varnai, Lj. Prester, S. Cvijetić Avdagić, Zr. Franić, J. Kovačić, M. Kujundžić Brkulj, M. Deranja (until 7 Nov 2018), F. Šakić	
A. Bosak	Design, synthesis and evaluation of selective inhibitors of butyrylcholinesterase
IMROH ASSOCIATES: M. Katalinić, G. Šinko, Z. Kovarik, A. Miličević, A. Zandona EXTERNAL ASSOCIATES: I. Primožić and A. Ramić (Faculty of Science, University of Zagreb)	
S. Cvijetić Avdagić	Determination of body composition and chronic stress by bioimpedance method
IMROH ASSOCIATES: A. Bjelajac, J. Macan, Ž. Babić, J. Jurasović, Zr. Franić, T. Orct, R. Luzar, F. Šakić EXTERNAL ASSOCIATES: I. Colić Barić, I. Keser (Faculty of Food Technology and Biotechnology, University of Zagreb), J. Ilich Ernst (Florida State University, Tallahassee, USA)	
S. Cvijetić Avdagić	Relationship between chronic inflammation and osteopenia in patients on chronic hemodialysis
IMROH ASSOCIATES: J. Macan, V. M. Varnai, R. Luzar, J. Mandić EXTERNAL ASSOCIATES: K. Altabas i P. Kovačević (KBC Sestre Milosrdnice, Zagreb), I. Keser (Faculty of Food Technology and Biotechnology, University of Zagreb), J. Ilich Ernst (Florida State University, Tallahassee, USA)	
R. Godec	Organic content of PM₁ particle fraction
IMROH ASSOCIATES: G. Pehnc, I. Bešlić, I. Jakovljević, Z. Sever Štrukil, I. Šimić	
S. Herceg Romanić	Persistent organic pollutants – environmental impact assessment and stability of human genetic material
IMROH ASSOCIATES: G. Mendaš Starčević, S. Fingler Nuskern, S. Stipičević, D. Klinčić, M. Dvorščak, D. Želježić, V. Mužinić EXTERNAL ASSOCIATES: B. Mustač (Department of Ecology, Agronomy and Aquaculture, University of Zadar), G. Vuković and A. Stojić (Institute of Physics, University of Belgrade, Serbia)	
M. Lazarus	Nutritive and toxicological properties in organic vs. conventional honeys
IMROH ASSOCIATES: Z. Franić, A. Jurić, T. Orct, A. Sekovanić, B. Tariba Lovaković EXTERNAL ASSOCIATES: N. Bilandžić i M. Denžić Lugomer (Croatian Veterinary Institute), D. Bubalo (Faculty of Agriculture, University of Zagreb)	
A. Lucić Vrdoljak	Investigation of interactions between irinotecan and tetrahydrocannabinols on laboratory rodents using integrated biochemical, molecular biology, pathohistologic and analytical methods
IMROH ASSOCIATES: Ž. Babić, N. Brajenović, I. Brčić Karačoni, M. Dvorščak, R. Fuchs, A. Jurić, N. Kopjar, G. Mendaš Starčević, V. Micek, A. Katić, I. Novak Jovanović, Lj. Prester, S. Žunec PARTNER: University North, Koprivnica	
J. Macan	Interaction of constitutional and occupational risk factors on the incidence of occupational contact dermatitis in hairdressing apprentices during vocational training
IMROH ASSOCIATES: S. Cvijetić Avdagić, V. M. Varnai, J. Bobić, Zr. Franić, Ž. Babić, J. Kovačić, A. Bjelajac, M. Deranja, M. Kujundžić Brkulj, F. Šakić, M. Milić	
J. Macan	Contact hand dermatitis in dentists and medical doctors: prevalence and risk factors
IMROH ASSOCIATES: A. Bjelajac, Ž. Babić, Zr. Franić, F. Šakić EXTERNAL ASSOCIATES: L. Lugović Mihić and I. Japundžić (School of Dental Medicine, University of Zagreb)	

A. Miličević	Investigation of electrochemical properties and antioxidant activity of polyphenolic compounds and their complexes with essential elements
IMROH ASSOCIATES: I. Novak Jovanović, I. Pavičić EXTERNAL ASSOCIATES: N. Bregović (Faculty of Science, Zagreb), G. I. Miletić (Ruđer Bošković Institute, Zagreb)	
B. Petrinec	Radiological characterization of Kopački rit
IMROH ASSOCIATES: D. Babić, T. Meštrovic, M. Šoštarić PARTNERS: Physics Department of J. J. Strossmayer University, Osijek	
I. Prlić	Development of UV radiation sensors (SUVIndex)
IMROH ASSOCIATES: J. Macan, Lj. Orešić (till 15 Sep 2017), M. Surić Mihić, L. Pavelić (since 1 Jun 2017) PARTNERS: Haj-Kom (M. Hajdinjak), ALARA Uređaji (Z. Cerovac), KBC Zagreb, ACI Marina Vodice	
I. Prlić	Thermometry, thermography and sensory evaluation of electromagnetic radiation in medicine
IMROH ASSOCIATES: M. Surić Mihić, I. Bešlić, Lj. Orešić (until 15 Sep 2017), L. Pavelić (since 1 Jun 2017), J. Šiško, M. Justić, S. Kobeščak PARTNERS: KBC Zagreb (A. Antabak, head of the clinical part of the research and associates at KBC Zagreb, Zagreb Children's Disease Clinic), General Hospital Karlovac, Haj-Kom (M. Hajdinjak), ALARA Uređaji (Z. Cerovac)	
J. Rinkovec	Levels of platinum group elements (PGE) near roads
IMROH ASSOCIATES: G. Pehnc, S. Žužul, I. Bešlić, S. Davila EXTERNAL ASSOCIATE: Ž. Zgorelec (Faculty of Agriculture, University of Zagreb)	
B. Tariba Lovaković	Evaluation of reproductive toxicity of commonly used pesticides followed by chronic low-dose exposure <i>in vivo</i>
IMROH ASSOCIATES: A. Pizent, Z. Kljaković-Gašpić, A. Sekovanić, T. Orct, V. Kašuba	

16.1.B. COLLABORATION ON RESEARCH PROJECTS OUTSIDE THE INSTITUTE



16.1.B.1. Croatian Science Foundation (6 projects)

LEADER	PROJECT	DURATION
Sanja Frka Milosavljević, Ruđer Bošković Institute, Zagreb	Biochemical REsponses of oligotrophic Adriatic surface ecosystems to atmospheric Deposition Inputs (BiREADI, IP-2018-01-3109)	29 Oct 2018 – 28 Oct 2022

IMROH ASSOCIATES: I. Bešlić, R. Godec, S. Žužul, I. Šimić, G. Pehnc (consultant)

SUMMARY

The annual meeting of the project was held on 28 Oct 2019 at the Ruđer Bošković Institute. Activities completed during the first year of the project were presented. All activities were carried out according to the schedule and all planned goals have been achieved. The aim of the project is to assess the impact of atmospheric deposition on complex biochemical responses of oligotrophic systems, considering the importance of promotion and inhibition effects on phytoplankton, and the consequent altering of the surface water chemistry, including the sea surface microlayer at the air-water interface. In the first phase of the project, concentrations, sources, and deposition fluxes of atmospheric constituents are evaluated as well as the nature of enrichments of macro-nutrients, trace metals, and organic pollutants within the sea surface layers. Associates from IMROH from February to July 2019 carried out sampling of airborne particulate matter, total deposition, and wet deposition at location Martinska near Šibenik. Chemical analysis of particulate matter content as well as the content of total deposited matter and wet deposition were performed.

LEADER	PROJECT	DURATION
Marijana Hranjec, Faculty of Chemical Engineering and Technology of the University of Zagreb	Exploring the antioxidative potential of benzazole scaffold in the design of novel antitumor agents (AntioxPot Number, IP-2018-01-4379)	1 Nov 2018– 31 Oct 2022

IMROH ASSOCIATE: I. Novak Jovanović

SUMMARY

The electrochemical behaviour of potential antitumor benzimidazole derivatives [benzo(b)thieno(2,3-b)pyrido(1,2-a)benzimidazoles and benzimidazo(1,2-a)quinolines] bearing one or two piperazine substituents was studied in detail at a glassy carbon electrode (GCE) using cyclic and square-wave voltammetry in a wide range of pH values and potential scan rates. The mechanisms of electrochemical oxidation and reduction of studied compounds were proposed (51). The assignment of electroactive sites in molecules of interest was confirmed by theoretically calculated differences of Net atomic charges between the cation (or anion) and neutral molecule, using the PM6 method. The electrochemical oxidation of four different amino-substituted benzamide derivatives (with a variable number of methoxy and hydroxy substituents) was studied for a wide range of solution conditions, using cyclic and square-wave voltammetry.

Amino-substituted benzamide derivatives are very attractive compounds due to their capacity to act as powerful antioxidants by scavenging free radicals. Knowledge on electrochemical oxidation mechanisms will provide a better understanding of the free radical scavenging activity of the antioxidants studied here. A paper describing the findings of this research is in preparation.

LEADER	PROJECT	DURATION
Tomica Hrenar, Faculty of Science, Zagreb	Activity and <i>in silico</i> guided design of bioactive small molecules (Adesire, IP-2016-06-3775)	1 Mar 2017– 28 Mar 2021

IMROH ASSOCIATE: A. Bosak

SUMMARY

The inhibitory potential of a series of carbamate derivatives of cinchonine and cinchonine against human cholinesterases and their selectivity for human AChE and BChE was determined (242). The fluorinated derivatives of *Cinchona* alkaloids were synthesised, their inhibitory potential against human cholinesterases were evaluated, and a certain structural characteristics of fluorinated quinoline derivatives responsible for the demonstrated inhibition and selectivity were determined (321).

LEADER	PROJECT	DURATION
Maja Šegvić Klarić, Faculty of Pharmacy and Biochemistry, Zagreb	Adverse effects of single and combined mycotoxins produced by <i>Aspergilli</i> (MycotoxA, IP-09-2014-5982)	8 Feb 2016– 7 Feb 2020

IMROH ASSOCIATES: D. Breljak, D. Karaica, N. Kopjar, M. Peraica, D. Rašić, D. Želježić

SUMMARY

The production of aflatoxins by *Aspergilli* (section Flavi) isolated from the air in different environments and their cytotoxic, genotoxic and proinflammatory properties *in vitro* were assessed on A549 and THP-1 cell lines. Aflatoxin caused higher levels of DNA damage than the extracts tested (30).

The study of the continuous treatment of experimental animals with nephrotoxic mycotoxins ochratoxin A (OTA) and citrinin (CTN) on oxidative stress was finished (63). In rats orally treated with OTA (0.125 and 0.250 mg kg⁻¹) for 21 days alone or together with CTN (2 mg kg⁻¹) protein carbonyls were measured in kidney and liver, as was the activity of the enzyme glutathione peroxidase (GPx), superoxide dismutase (SOD), catalase (CAT) and glutathione concentration (GSH) in kidney, liver and plasma, and malondialdehyde (MDA) concentration in kidney, liver, plasma and urine. Apart from CAT, which was not affected by treatments in kidney and liver, the other parameters of oxidative stress were modified, but not equally in all organs. The analysis of the same parameters in biological material of animals treated with OTA+CTN and resveratrol (RSV; 20 mg kg⁻¹) revealed that RSV could not fully protect animals from mycotoxin-induced oxidative stress.

The genotoxic effect of OTA and CTN on liver and kidney cells of male Wistar rats and the possible protective effect of RSV were also investigated. Results of alkaline comet assay showed increased primary DNA damage. Results of the comet assay with hOGG1 enzyme showed a significant increase in oxidative damage due to mycotoxin treatment. The level of damage was higher in kidney cells, and for OTA. Generally, RSV did not significantly reduce the level of primary damage but showed limited ability to diminish oxidative damage. It was concluded that oxidative stress does not represent the primary mechanism of genotoxic action of tested mycotoxins (64).

We have performed data analysis of individual and combined effects of mycotoxins (OTA and CTN) as well of antioxidant RSV on protein expression (western analysis) and cell localization (immunocytochemical analysis) of various membrane transporters for organic anions (Oats), including Oat1, Oat2, Oat3 and Oat5 *in vivo*. Furthermore, we have performed data analysis of protein expression/cell localization of various membrane proteins for cations Oct (including Oct1 and Oct2), glucose co-transporters Sglt (including Sglt1 and Sglt2), aquaporins AQP (including AQP1 and AQP2), membrane pump Na/K-ATPase and cytoskeletal protein beta-actin in rat kidneys following the mycotoxin/RSV treatment. In the frame of scientific manuscript, results will be published in a relevant scientific journal.

The acute effect of sterigmatocystin administered *p. o.* to male rats was investigated. The target organs of STC toxicity are liver and kidney, and the mechanism of its toxicity is not known. In our study test, animals were treated with a single STC dose of 10, 20, and 40 mg kg⁻¹, which corresponded to 1/16 LD, 1/8 LD and 1/4 LD, respectively, while the controls received the vehicle (corn oil). In their plasma, kidney and liver the activity of antioxidative enzymes CAT, GPx and SOD was measured, while the concentration of heat shock proteins (Hsp 70 and Hsp 27) was measured only in kidney and liver. Activity of CAT was unchanged in plasma, kidney, and liver of STC-treated animals. Activity of GPx was significantly lower in liver treated with 20 and 40 mg kg⁻¹ and the activity of SOD was significantly higher in kidney of animals treated with 10 and 40 mg kg⁻¹. STC treatment with the lowest dose (10 mg kg⁻¹) increased significantly Hsp 70 in liver, but returned to control values after the highest dose (40 mg kg⁻¹). STC did not cause changes in Hsp 27 in either organ. It could be concluded that STC increases oxidative stress in target organs (275). Additionally, the level of primary DNA damage was measured in the liver and kidney cells by comet assay. A single dose of sterigmatocystin led to a significant increase in primary DNA damage detected by the alkaline comet assay and oxidative DNA damage detected by hOGG1-modified comet assay. The obtained results suggest that liver cells were more susceptible to the genotoxic effect of the tested compound than the kidney cells (109).

LEADER	PROJECT	DURATION
Tomislav Vinković, Faculty of Agriculture, Osijek	Application of Nanobiotechnology for Nutritional Supplementation with Selenium (NutriNTENSE, IP-2018-01-8119)	21 Jan 2019– 31 Dec 2022

IMROH ASSOCIATE: A. M Marjanović Čermak

SUMMARY

Selenium (Se) is an essential trace element with an important role in metabolism and many other vital functions. Due to its protective activity in immune response and cancer, it is widely used as a diet supplement. As plants are the main dietary source of Se for humans and animals, different strategies such as biofortification and plant-based extracts are used to develop Se dietary supplements. Selenium bioavailability varies depending on several factors including the chemical form of Se, other dietary components, physiological status and selenium status of the organism. The major obstacles in achieving optimal Se intake are highly variable Se content in different food types and narrow safety margin of supplemental Se forms. Nanotechnology enables the application of selenium nanoparticles (SeNPs), due to their enhanced antioxidant activities and lower toxicity as compared to other Se forms. The NutriNTENSE project aims to investigate the efficacy and safety of innovative SeNPs-based nutraceuticals and functional food using nanobiotechnological tools. This will be achieved by following the development of two innovative classes of Se-nutraceuticals: functional SeNPs biofortified vegetables (FBVegs) and Se-nanoceuticals (SeNCes) using food waste extracts for biogenic synthesis of SeNPs. Both types of Se-nutraceuticals will be subjected to in vitro and/or in vivo testings to investigate their biocompatibility, safety, pharmacokinetic properties and pharmacological activity compared to selenite and chemically synthesized SeNPs. In addition, the possible synergistic action of biogenic SeNPs and specific bioactive compounds found in NutriNTENSE plants and extracts will be evaluated. Results obtained within NutriNTENSE will be of great interest for consumers, agricultural producers, and the food industry as the final beneficiaries of the project. It should be highlighted that NutriNTENSE is a green project aimed at increasing the implementation of healthy and environment-friendly products.

LEADER	PROJECT	DURATION
Valerije Vrčec, Faculty of Pharmacy and Biochemistry, Zagreb	Quantum-chemical design, preparation and biological properties of organometallic nucleobase derivatives (OrDeN, IP-2016-06-1137)	1 Mar 2017– 28 Feb 2021

IMROH ASSOCIATE: A. M. Marjanović Čermak

SUMMARY

Organometal nucleobase derivatives (OrDeNs) are a new generation of conjugates in which metallocenes are linked to the underlying superstructural elements of inheritance. Due to its electrophoretic and bioactive properties, OrDeN's use in (bio)analytical and medical chemistry and penetrate into the field of therapy, molecular diagnostics and nanotechnology. The main purpose of this project is to design and synthesize new biologically active organometallic nucleobase derivatives (OrDeNs) for which quantum-chemical calculations suggest the desirable electrochemical and biological properties. With the assistance of quantum-chemical accounts, the reaction conditions for efficient preparation of OrDeN will be defined, with a high percentage of utilization and a high degree of regioselectivity. Electroactive and biological properties of newly prepared compounds will be determined, which will be compared with the results of the obtained quantum-chemical calculations. Analogously published results that OrDeNs may be in the group of apoptosis inducer and tumor cell growth inhibitors will be subjected to biological testing on several different tumor cell lines within this project.

LEADER	PROJECT	DURATION
Vanja Vučićević Boras, School of Dental Medicine, Zagreb	The role of oestrogen and androgen receptor activation in the stroma of oral cancer and their impact on the survival of patients (ACTIVESTROMORALCANCER, IP-2014-09-6985)	1 Oct 2015– 30 Sep 2019

IMROH ASSOCIATE: A. Fučić

SUMMARY

Oral cancer was studied on tissue samples from 101 patients without metastasis and 95 patients with metastases by immunohistochemistry to determine androgen receptor (AR) and Ki-67 levels in neoplastic epithelium and stroma. More than 20% of AR-positive cytoplasmic epithelial staining was significantly associated with nuclear level of AR in epithelium and increased level of AR in stroma. In patients with metastatic disease, Ki-67 was significantly higher than in patients who did not have metastatic disease. Using a detailed questionnaire on social status, education, exposure to living and occupational environment, family and lifestyle, patients with head and neck cancer (HNC) (103 cases, 76.7% male) were compared with control subjects (244 subjects, 73% male). The results of this study showed that smoking and low education were important risk factors for HNC regardless of gender. Family HNC and breast cancer were significant predictors of HNC risk.

16.1.B.2. University projects

University of Zagreb



LEADER	PROJECT	DURATION
Jasminka Despot Lučanin, Croatian Studies, Zagreb	Well-being of different family generations in contemporary work designs	2018–2019

IMROH ASSOCIATE: A. Bjelajac

SUMMARY

The main objective of this project is to examine different indicators of well-being of three family generations in contemporary work designs in Croatia. The relationship between contemporary forms of parenting and some aspects of parental behavior and their well-being, the well-being of their children and of grandparents has been examined. The results of the research are presented at two international (208, 282) and two national meetings (207, 226).

University of Rijeka



LEADER	PROJECT	DURATION
Aleksandar Bulog, Faculty of Medicine, Rijeka	Biological monitoring of the effects of volatile aromatic hydrocarbons (BTEX) on the health of the Primorje-Gorski Kotar County population	2019–2021

IMROH ASSOCIATE: I. Brčić Karačonji

SUMMARY

The project includes the determination of the mass concentration of volatile aromatic hydrocarbons of benzene, toluene, ethylbenzene, and isomers of xylene (BTEX) in the urine of subjects in the industrial area, which we will compare with those of the control areas (209). The results obtained in the urine of the subjects will be correlated with the concentrations of the same pollutants in the ambient air. All data obtained from participants will be compared with the immune, epidemiological and respiratory data on the health status of the subjects.

LEADER	PROJECT	DURATION
Ivana Gobin, Faculty of Medicine, Rijeka	Opportunistic pathogens in the water supply system: A new challenge in water treatment	2019–2021

IMROH ASSOCIATE: I. Brčić Karačonji

SUMMARY

The aim of the project is to investigate the antimicrobial potential of natural substances (essential oils and hydrolates), active metabolites of bacteria of the genus *Bacillus* and selected synthesized photodynamically active compounds against resistant bacteria that colonize part of the water distribution system.

16.1.C. PROFESSIONAL PROJECTS

PROJECT	CONTRACTOR	LEADER
Service provider: Environmental Hygiene Unit		
Monitoring air pollution in the City of Zagreb (from 1963)	City of Zagreb, City Office for Energy, Environmental Protection and Sustainable Development	V. Vađić (1963–2014), G. Pehneć (from 2015)
Monitoring of the Total Effects of CPS Molve on the Ecosystem (from 1998)	INA-Naftaplin and Institute for Public Health of the Koprivnica-Križevci County	V. Vađić (1998–2014), G. Pehneć (from 2015)
Monitoring Air Quality at the CWWTP Construction Site in Zagreb (from 2003)	Zagreb Wastewater Ltd.	V. Vađić (2003–2014), G. Pehneć (from 2015)
Monitoring Air Pollution at National Network Stations for the Purpose of Continued Air Quality Monitoring (from 2015)	Ministry of Environment and Energy and Meteorological and Hydrological Service of Croatia	G. Pehneć
Drafting Equivalency Studies at Measurement Stations of the National Network for Continued Air Pollution Monitoring (from 2015)	Ministry of Environment and Energy and Meteorological and Hydrological Service of Croatia	I. Bešlić
Monitoring Air Pollution at a Station at Military Training Polygon in Slunj (from 2009)	Meteorological and Hydrological Service of Croatia	V. Vađić (2009–2014), G. Pehneć (from 2015)
Service provider: Radiation Dosimetry and Radiobiology Unit		
Determination of the radiological status of the working environment in IPNP	INA Group	I. Prlić
Preparation of documentation for the approval of the Republic of Croatia Ministry of the Interior on the building permit for the construction of the space of the linear accelerator and associated services in the new building of the General Hospital Zadar (clinic) activity with sources of ionizing radiation	General Hospital Zadar Capital ing	I. Prlić
Service provider: Radiation Protection Unit		
Background Radioactivity Monitoring in the Republic of Croatia, IMI-CRZ-96 (since 1959)	Civil protection directorate of the Republic of Croatia Ministry of the Interior	G. Marović
Results of Monitoring of Environmental Radioactivity in Vicinity of Plomin Coal-Fired Power Plant, IMI-P-383	HEP proizvodnja Thermal power plant Plomin I, Plomin	G. Marović
Results of Radioactivity Measurements at Gas Field Molve, IMI-P-384	Koprivnica-Križevci County, Koprivnica	G. Marović
Development of field methods for environmental radioactivity monitoring in Republic of Croatia (PZ-12-18)	Civil protection directorate of the Republic of Croatia Ministry of the Interior	B. Petrinec



16.2. INTERNATIONAL PROJECTS

16.2.A. SCIENTIFIC RESEARCH PROJECTS

16.2.A.1. European Union programs EUROPEAN REGIONAL DEVELOPMENT FUND

Operational Program Competitiveness and Cohesion (3 projects)



Operativni program
KONKURENTNOST
I KOHEZIJA

INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (R. Fuchs)	Research and Educational Centre of Environmental Health and Radiation Protection – Reconstruction and Expansion of the IMROH	2017–2021

IMROH ASSOCIATES: A. Lucić Vrdoljak, Z. Franić, S. Stankić, B. Roić, S. Barbarić, M. Herman

SUMMARY

The grant of 232,602,280.72 HRK is intended for the implementation of the project over 52 months, during which the Institute will be expanded with a new building of 6,785.15 m², while our existing building of 2,067.41 m² will be renovated. The Institute will also acquire a significant amount of modern research and IT equipment, which together with the aforementioned construction makes this project one of the central development project crucial not only for Croatia but also for the wider region. The Centre itself is conceptualised as an administrative and organisation unit within the Institute and will function as its part, whereas its operation will rely on the Institute's researchers and professionals. The project will dramatically improve the Institute's infrastructure, which includes both the aspect of fundamental research and that of applied research in the fields of occupational medicine, environmental health, radiation and related disciplines, as well as those aimed at lifewide education and class within certain postgraduate study programmes. The project also plans the introduction of a "mini technology park" within which modular laboratories would enable the Institute's researchers to cooperate with guest researchers and conduct specific, in some cases market-oriented, research.

INSTITUTION (Leader)	PROJECT	DURATION
School of Medicine, Zagreb (D. Ježek)	Scientific Center of Excellence for Reproductive and Regenerative Medicine (CERRM, KK.01.1.1.01.0008)	2014–2019

IMROH ASSOCIATE: A. Fučić

SUMMARY

Fifty newborns of both sexes, whose mothers were not professionally exposed to any known carcinogen or drug, were analysed. All mothers completed a questionnaire on lifestyle, diet, and residence. Multivariate analyzes for the dependent variables were made using generalized linear/nonlinear regression analyzes with the construction of all-effects models. The results show that there are significantly higher levels of estradiol and the ratio of estradiol to testosterone in newborns of mothers from the agricultural area than in those born to mothers with urban residence. Similarly, a higher estradiol ratio and estradiol to testosterone ratio were measured in the infants of mothers who drank coffee, milk, ate fish more than once a week, and smoked. Testosterone was significantly higher in infants of mothers with an agricultural residence. The incidence of genome damage was significantly higher in the infants of mothers who dyed during pregnancy, drank alcohol, and used disinfectants. IL6 levels were higher in infants of mothers with agricultural residence, but also in those living less than 100 m from the motorway.

INSTITUTION (Leader)	PROJECT	DURATION
Meteorological and Hydrological Service of Croatia (C. Kosanović)	AIRQ – Project of extension and modernisation of the national network for continuous air quality monitoring (KK.06.2.1.02.0001.)	2017–2021

IMROH ASSOCIATES: G. Pehnac (leader), R. Godec, I. Bešlić, S. Žužul, S. Stankić, B. Roić, S. Barbarić, M. Herman

SUMMARY

The purpose of the project is to improve and optimize the system for managing and monitoring air quality in urban areas, zones and agglomerations. The project aims to support the implementation of the legislative framework for air quality and environmental protection. This entails developing integrated strategies and projects which enable the evaluation, planning and implementation of adequate procedures for controlling air quality by means of measuring relevant parameters. In the end, the project thus aims to improve the monitoring programme for short-lived climate forcers and introduce climate-sensitive measures against air pollution. Lead beneficiary is Croatian meteorological and Hydrological Service (DHMZ) and the partner institution is IMROH. The project will receive a grant in the amount of 125,123,500.00 HRK (85 % funded by the ERDF OP Competitiveness and Cohesion, 15 % by the Environmental Protection and Energy Efficiency Fund).

The project will result in 5 new and 19 modernized measuring stations of full functionality; developed and functional model for the assessment of ground level concentrations of pollutants; additional equipment of DHMZ and IMI chemical laboratories for measurements in accordance with the national Programme for measuring the level of air pollution in the national network for continuous air quality monitoring; with additional equipment for calibration laboratory for calibration of air quality measures and related measurement sizes. Through this project, the Environmental Hygiene Unit acquires equipment for the purpose of air quality monitoring at measuring stations of the State Network in the part related to sampling and physical and chemical analysis of PM₁₀ and PM_{2.5} particle fractions and equivalence testing of non-reference methods for the determination of PM₁₀ and PM_{2.5} mass concentrations, in accordance with legal obligations. In 2018 public procurement procedures were carried out, for procurement of the IMROH chemical laboratory equipment and for an off-road vehicle. In 2019 the vehicle and all chemical laboratory equipment, laboratory furniture, and accessories were delivered. All equipment was put in operation. Trainings and method developments are in progress.

Operational Program INTERREG V-A Slovenia-Croatia



INSTITUTION (Leader)	PROJECT	DURATION
Jožef Stefan Institute, Ljubljana, Slovenia	ENsuring RAdiation Safety (ENRAS)	2018–2020

IMROH ASSOCIATES: B. Petrinec (leader), T. Meštrovic, T. Bituh, D. Babić, Z. Franić, M. Kovačić, M. Avdić
 PARTNERS: Slovenian Fire Association, Croatian Fire Association, Civil protection directorate of the Republic of Croatia Ministry of the Interior, Slovenian Nuclear Safety Administration, Administration of the Republic of Slovenia for Protection and Rescue

SUMMARY

The ENRAS project will help develop cross-border services in the field of ensuring safety (civil protection) in cases of nuclear or radiological accidents. The shared challenge within the project is meant to enable harmonised and safe joint interventions in cases of such accidents. The main goal is to strengthen cross-border cooperation among subjects participating in the area of protection for the purpose of more effective rescue and intervention, increasing training and skills, and establishing the first system for joint interventions in cross-border areas.

EUROPEAN RESEARCH AND INNOVATION PROGRAMME



HORIZON 2020 (3 projects)

INSTITUTION (Leader)	PROJECT	DURATION
Bundesamt für Strahlenschutz, Salzgitter, Germany (T. Jung)	European Concerted Programme on Radiation Protection Research (CONCERT, 662287 COFOUND EJP-Topic: NFRP-2014-2015), within the framework of Euroatom Horizon 2020	2015–2020

IMROH ASSOCIATES: I. Prlić (leader for Croatia and POM Contact point, Program Manager, member of the project consortium management), I. Brčić Karačonji, A. Lucić Vrdoljak, R. Fuchs, D. Željezić, J. Macan, M. Surić Mihić

Consortium: 36 national PoM Institutions from 23 EU Member States and Norway and Switzerland

SUMMARY

The CONCERT, European Joint Programme for the Integration of Radiation Protection Research under Horizon 2020 operates as an umbrella structure for the research initiatives jointly launched by the radiation protection research platforms MELODI (for low dose risk research), ALLIANCE (for radioecology), NERIS (for nuclear emergency preparedness), and EURADOS (for dosimetry). CONCERT as a co-fund action (70% EC and 30% national funding) is aimed at integrating national and European research programmes. Next to research, education and training activities closely linked to research will be carried out by CONCERT to build and maintain the high level of competence in radiation sciences and radiation protection in Europe. In addition, CONCERT will make the best use of the available research infrastructure in Europe, mainly by enhancing the visibility of infrastructures and facilitating access to them. CONCERT has the mission to further reduce uncertainties in the assessment and management of radiation risks to the environment and to humans by targeted science. To achieve this, CONCERT will initiate an open exchange of knowledge and information between science, regulation, and society.

The aim of CONCERT is to set in motion the convergence of three focusing forces: the scientific community, national agencies and research institutions, and EURATOM policies in order to achieve new breakthroughs in radiation protection research. CONCERT strives for a better integration of the radiation protection scientific community at EU level, leading to a better coordination of research efforts and the provision of more consolidated and robust science-based policy recommendations to decision makers in this area. In the long-term, these efforts will translate into additional or improved practical measures in view of the effective protection of people and the environment.

CONCERT is an open project within two transnational tenders for research projects have been launched (in spring 2016 with fund of 10,000,000 € and in spring 2017 with a fund of 7,000,000 €). In total, 9 funding projects were selected for these international tenders. All project results achieved so far can be found on the project's web site (<http://www.concert-h2020.eu/en/Publications>).

INSTITUTION (Leader)	PROJECT	DURATION
German Environmental Agency (M. Gehring-Kolossa)	European Human Biomonitoring Initiative (HBM4EU, Grant Agreement No 733032)	2017–2021

IMROH ASSOCIATE: A. Fučić

Consortium: 24 EU Member States and Norway, Island, Israel, Switzerland, European Environment Agency and European Commission

SUMMARY

Within the project, an analysis of the genome damage of persons with occupational chromium exposure has been completed, a review article on occupational exposure to phthalates is in print, and a review article on the topic of occupational exposure to pesticides is under preparation.

INSTITUTION (Leader)	PROJECT	DURATION
Norwegian Institute for Air Research, Kjeller, Norway (M. Dusinska)	Science-Based Risk Governance of Nanotechnology (RiskGONE, Gran Agreement No 814425)	2019–2023
IMROH ASSOCIATES: I. Vinković Vrček (leader), I. Pavičić, Z. Franić, B. Pem Consortium: 15 EU Member States and USA, and Iran		
SUMMARY		
<p>During the first 12-month period, IMROH was involved in the kick-off meeting, M6 meeting held in Cyprus, Face-to-face meeting of the WP4 held in Luxembourg and teleconference meetings related to the WP2, WP4, WP5, and WP7.</p> <p>IMI participated in:</p> <ul style="list-style-type: none"> the Round Robin from the Malta Initiative analysing 4 different nanoparticles by means of dynamic light scattering (DLS) (within WP4) the analysis and discussion on dispersion protocols, and standard operational procedures (SOPs) on the particle size determination and effective density to be used within WP4 and WP5 the SOPs review and preparation for Round Robin within Task 5.1 "Evaluation and adaptation of <i>in vitro</i> safety testing OECD TGs to enable engineered nanomaterials (ENMs) risk governance" the analysis on nano-related Adverse Outcome Pathways (AOPs). 		

EUROPEAN SOCIAL FUND

Operational Programme Efficient Human Resources Croatian Science Foundation – Scientific Cooperation Programme (2 projects)



INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (I. Vinković Vrček)	Safe-by-Design Approach for Development of Nano-Enabled-Delivery Systems to Target the Brain (SENDER, HrZZ-PZS-2019-02-4323)	2019–2023
IMROH ASSOCIATES: I. Pavičić, B. Pem, K. Ilić PARTNER: University of Melbourne, Victoria, Australia		
SUMMARY		
<p>Nanotechnology provides innovative and effective therapeutic and diagnostic tools and tools. However, treatment of neurodegenerative disorders is still a major challenge due to the existence of a blood-brain barrier (BBB) that impedes effective drug delivery to the brain. Multifunctional nanoparticles (NPs) represent a new and improved platform for greater efficacy, bioavailability and targeted drug delivery via BBB. The main objective of the proposed project is to develop a multifunctional nanosystem that will enable drug delivery to the brain (BRaiND) for the effective and safe treatment of brain abnormalities associated with aging and degeneration. Specific activities will be carried out:</p> <ul style="list-style-type: none"> design, preparation, and characterization of BRaiND assessment of the stability and fate of BRaiND in biological media mechanical and quantitative assessment of the interaction of BRaiND with BBB profiling the efficacy and safety of BRaiND with a combined <i>in vitro</i> and <i>in vivo</i> approach. <p>BRaiND will be based on selenium or gold nanoparticles, stabilized by polyethylene glycol and functionalized proteins that target brain receptors. Such multifunctional system will be coupled with model neuroactive drugs to demonstrate the effectiveness, quality and safety of the BRaiND system. Careful <i>in vitro</i> and <i>in vivo</i> studies will be conducted including the stability and interactions of BRaiND in various biological media, BBB permeability, targeting efficacy at specific brain sites, neuroprotective activity, and evaluation of the safety of their administration. The project work plan is based on validated and standardized methodologies as well as innovative experimental techniques. Given the major challenges of translational research into neurodegenerative diseases, SENDER's strategy is based on the Safe-by-Design approach, enabled by nanotechnology tools that analyze and manipulate biological processes at the nanoscale, where diseases originate and thrive. The project activities in the first quarter focused on:</p> <ul style="list-style-type: none"> organizing and getting to know the research team implementation of the selection process and recruitment of candidates for the post of doctoral candidate organize and carry out procurement of the instrument provided for in the project financial plan preparatory phase of strategy development for the preparation of defined drug-conjugated AuNPs and SeNP-BraiNDs. 		

INSTITUTION (Leader)	PROJECT	DURATION
Department of Physics, Faculty of science, Zagreb (M. Makek)	Single layer gamma-ray polarimeter for medical imaging applications and fundamental physics research (SiLGaP, HrZZ-PZS-2019-02-5829)	2019–2023

IMROH ASSOCIATES: L. Pavelić, M. Surić Mihić
PARTNER: University of Sydney, New South Wales, Australia

SUMMARY

Gamma-ray polarization information is valuable in many areas of contemporary physics research. An example in fundamental sector is the phenomenon of quantum entanglement, which may be investigated by analyzing relative polarizations of three gammas originating from ortho-positronium decay. In applications, an important case is the biomedical imaging with Positron Emission Tomography (PET), where it has been shown by simulated model studies, that the polarization information, which is not exploited in existing PET systems, has the potential to improve the image quality. The polarization of a gamma photon can be determined from its Compton scattering, where it produces a recoil electron and a scattered photon. For reconstruction of Compton events, one needs position and energy-sensitive detectors, usually encompassing two layers, for detection of the electron and the scattered photon, respectively. However, in many applications where detectors are highly granular and contain many channels, such as PET, a system based on two-layer readout would be costly. In this project we will construct a new modular detector system for gamma polarization measurements, based on single-layer Compton scattering detectors. The module will contain an array of scintillators, read-out by silicon photomultipliers. Compared to two-layer detectors, the single-layer concept offers a possibility to construct more cost-efficient, compact and versatile devices. We will assemble a sixteen-module system, which will be used in two applications: first, to evaluate experimentally for the first time the feasibility of using the information about gamma-ray polarization in PET, as an important step towards the next generation of more efficient medical imaging devices, and second, to analyze the azimuthal correlations of three gammas from ortho-positronium decay in order to investigate entanglement as a fundamental concept of quantum physics.

DANUBE REGION STRATEGY



LEADER	PROJECT	DURATION
Institut für Soziale Ökologie, Alpen-Adria-Universität Klagenfurt, Austria (V. Winiwarter)	A sustainable future for the Danube river basin as a challenge for the interdisciplinary humanities (Danube: Future)	2013–2020

IMROH ASSOCIATE: G. Gajski

SUMMARY

Danube: Future aims at developing interdisciplinary research and education in the Danube River Basin (DRB) simultaneously as a basis for the solution of pressing environmental issues and a sustainable future of the region. Danube: Future is a multi-year program that consists of three modules: core, capacity building, and sustainability related research with a long-term socio-ecological component. Danube: Future is a unique combination of regional, national, and supra-national initiatives in interdisciplinary sustainability research with training and capacity building. It contributes to the sustainable development of the DRB with a particular focus on the contribution of humanities (149).

**EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY
COST ACTION Programme (10 projects)**


INSTITUTION (Leader)	PROJECT	DURATION
University Medical Center Hamburg – Eppendorf, Germany (L. T. Budnik)	Diagnosis, Monitoring and Prevention of Exposure-Related Noncommunicable Diseases (DiMoPEX, CA15129)	2016–2019

IMROH ASSOCIATES: J. Macan (Management Committee member), Ž. Babić, Zr. Franić, J. Kovačić, R. Turk, V. M. Varnai

SUMMARY

DiMoPEX presents the opportunity for interdisciplinary collaboration between scientists in the field of chronic non-communicable diseases caused by environmental factors. Furthermore, the project is dedicated to increasing the interest of young scientists for this research field, especially for the different aspects of exposition to environmental factors. During 2019, associates of the Occupational and Environmental Medicine Unit took part in a course with the topic on risk assessment and communication.

INSTITUTION (Leader)	PROJECT	DURATION
Institute of Basic Medical Sciences, University of Oslo, Norway (A. Collins)	The comet assay as a human biomonitoring tool (hCOMET, CA 15132)	2016–2020

IMROH ASSOCIATES: G. Gajski (member of the Management Committee), M. Milić (member of the Management Committee, member of Core Group, WG1 leader, responsible for the website of the network)

SUMMARY

Many human biomonitoring studies have used the comet assay to measure DNA damage. In most cases, the assay is applied to peripheral blood mononuclear cells. Results from relatively small individual studies are often inconsistent and it is advantageous to carry out a pooled analysis of the combined data from all available studies. hCOMET will be a network comprising researchers who are active in human biomonitoring with this assay. Results supplied by these researchers will be compiled as a single database representing a large number of individual DNA damage measurements. The pooled analysis will allow us to determine which factors affect DNA damage, and to what extent. In addition, hCOMET will address the issue of interlaboratory reproducibility of the assay by devising standard protocols so that in future comparison of results from different studies will be facilitated (3, 12, 24, 25, 48, 69).

INSTITUTION (Leader)	PROJECT	DURATION
Zuyd University of Applied Sciences, Heerlen, Netherlands (F. Crijns)	Anti-Microbial Coating Innovations to prevent infectious diseases (AMICI, CA15114)	2016–2020

IMROH ASSOCIATE: I. Vinković Vrček (Management Committee replacement member)

SUMMARY

A workshop for young researchers was held on 7 Mar 2019 in Riga, Latvia. At this workshop, PhD student K. Ilic presented the results obtained during his short term scientific mission (STSM) stay in the group of prof A. Kahru in Tallinn, Estonia. At the same workshop, I. Vinković Vrček gave a lecture entitled "Obstacles and opportunities on development for antimicrobial coatings as a scientist".

INSTITUTION (Leader)	PROJECT	RAZDOBLJE
School of Biochemistry & Immunology, Trinity Biomedical Sciences Institute, Dublin, Ireland (J. Murray)	European Network of Multidisciplinary Research and Translation of Autophagy knowledge (TransAutophagy, CA 15138)	2016–2022

IMROH ASSOCIATE: M. Ljubojević

SUMMARY

M. Ljubojević participated in the work meeting that took place 23-25 Apr 2019 (Sofia, Bulgaria), where she was elected member of the Management Committee. A wide range of activities and planned operation actions related to the actions will enhance the knowledge and link the studies of sex and age differences conducted in the Molecular Toxicology Unit with those of autophagocytosis processes conducted in EU countries.

INSTITUTION (Leader)	PROJECT	DURATION
Universite Dijon Bourgogne, Dijon, France (M. Cherkaoui Malki)	Personalized nutrition in aging society: redox control of major age-related diseases (NutRedOx, CA16112)	2017–2021

IMROH ASSOCIATE: M. Gerić (Management Committee member)

SUMMARY

The importance of a healthy ageing process becomes apparent when considering that (a) the Generation 50+ (G50+) already has a share in population of around one third across Europe, with obvious regional variations, (b) this share is likely to increase further in the future, and (c) vitality at older age is not only an important measure of quality of life but also key to participation and productivity. The theme "nutrition and ageing" has many different aspects and poses numerous challenges, which provide a fertile ground for many research themes and networks. Among them, the NutRedOx network will focus on the impact of redox active compounds in food on healthy ageing, chemoprevention and redox control in the context of major age-related diseases. The main aim of the NutRedOx network is the gathering of experts from across Europe, including other Mediterranean countries, and from different disciplines that are involved in the study of biological redox active food components and are relevant to the ageing organism, its health, function and vulnerability to disease. Together, these experts will form a major and sustainable EU-wide cluster in form of the "NutRedOx Centre of Excellence" able to address the topic from different perspectives, with the long-term aim to provide a scientific basis for (improved) nutritional and lifestyle habits, to train the next generation of multidisciplinary researches in this field, to raise awareness of such habits among the wider population, and also to engage with Industry to develop age-adequate foods and medicines (304).

INSTITUTION (Leader)	PROJECT	DURATION
Erasmus Universitair Medisch Centrum Rotterdam, Rotterdam, the Netherlands (T. M. Luider)	"Good biomarker practice" to increase the number of clinically validated biomarkers (CliniMARK, CA16113)	2017–2021

IMROH ASSOCIATE: G. Gajski (Management Committee member)

SUMMARY

Thousands of circulating proteins have been shown to be hallmarks of emerging disease, response to treatment, or a patients' prognosis. The identification of these small molecule biomarkers holds a great promise for significant improvement of personalized medicine based on simple blood tests. For instance, diagnosis and prognosis with biomarkers [e.g. carcinoembryonic antigen (CEA)] has significantly improved patient survival and decreased healthcare costs in colorectal cancer patients. Unfortunately, despite significant investments to increase the number of biomarker studies, only ~150 out of thousands of identified biomarkers have currently been implemented in clinical practice. This is mainly caused by the time-consuming process of reliably detecting biomarkers, the irreproducibility of studies that determine a biomarkers' clinical value, and by a mismatch in studies that are performed by academia and what is required for regulatory and market approval. To increase the number of clinically validated biomarkers, rather than further increasing the number of biomarker discovery studies, CliniMARK will improve the quality and reproducibility of studies and establish a coherent biomarker development pipeline from discovery to market introduction.

INSTITUTION (Leader)	PROJECT	DURATION
National Institute of Occupational Health, Oslo, Norway (I. Sivesind Mehlum)	Network on the coordination and harmonisation of european occupational cohorts (OMEGA-NET, CA16216)	2017–2021

IMROH ASSOCIATES: J. Macan and V. M. Varnai (Management Committee members), Zr. Franić, (Management Committee substitute), A. Bjelajac

SUMMARY

The main aim is to establish a network to optimize the usage of cohort from the working and general population in Europe. The aims of the OMEGA-NET projects are promotion of collaboration between existing cohort researches, gathering the information on employment and occupational exposure, coordination and harmonization researches on exposure assessment in working population, and the promotion of integrative strategies for the researches of workers health in Europe. The promotion of evidence-based preventive strategies directed to health at work are expected. Associates of this Unit are involved in working groups focused on prevention of occupational skin diseases and mental disorders related to work. Institute was a host of the Working groups and Management Committee meeting held in Zagreb in October 2019. J. Macan presented at the meeting a lecture about the research performed in the Unit.

INSTITUTION (Leader)	PROJECT	DURATION
University of Lodz, Poland (B. Klajnert-Maculewicz)	Cancer Nanomedicine – from the bench to the bedside (Nano2Clinic, CA17140)	2018–2022

IMROH ASSOCIATE: I. Vinković Vrček (Management Committee member, WP2 leader)

SUMMARY

PhD student R. Barbir was awarded a scholarship for a short-term research residency at the Instituto de Ciencia de Materiales de Aragon in Zaragoza, Spain. Under the mentorship of prof. J. Martinez de la Fuente, R. Barbir conducted physicochemical studies of the interaction of silver nanoparticles with model proteins. The research residency plan is in line with the workplan of the NanoFaceS project and will form part of Barbir's doctoral thesis. The stay was held from 18 Feb to 14 Apr 2019.

PhD student B. Pem was awarded a fellowship for a short-term research residency at the University of the West of England in Bristol, UK (18 Feb-14 Apr 2019). Under the mentorship of prof A. Adanatzki, she developed computer models to describe and predict the behavior of nanoparticles coated with functional molecules. The developed models will be used to test the interactions of functionalized nanoparticles with biological systems, as part of the NanoFaceS project.

WP2 leader I. Vinković Vrček and R. Barbir attended the first Nano2Clinic Spring School, held in Trieste, Italy (8-11 Apr 2019). During the school, many interesting and instructive lectures were held in all areas of nanomedicine. I. Vinković Vrček had a lecture entitled "Safe-by-design approach to foster clinical translation of nano-enabled medical products", in which she invited members of the scientific community to reflect on material safety and move away from the usual focus on efficiency. R. Barbir presented the poster "Biocompatibility evaluation of selenium nanoparticles as promoting delivery nanosystems". Dr A. Selmani presented a poster "Stability of selenium nanoparticles as a novel anticancer delivery vehicle in relevant biological media" in collaboration with I. Vinković Vrček.

PhD student R. R. Jiménez from Instituto de Ciencia de Materiales de Aragón, Zaragoza, Spain, visited the IMROH in STSM (Short Term Scientific Mission) of the COST Action Program Nano2Clinic (14 Sep-14 Oct 2019). His STSM project focused on understanding the mechanism of action of nanomedicine preparations and improving their biocompatibility and safety. At the Institute, he taught the Safe-by-Design approach to the development of nanosystems for targeted drug delivery for antitumor therapy. The NanoFaceS group also benefited greatly from his experience in the synthesis of nanopharmaceuticals. The study visit resulted in an exchange of knowledge and a deepening of knowledge about specific aspects of the medical application of nanomaterials and the use of more effective and safer preparations.

The First COST Action Conference CA17140 Nano2Clinic (Cancer Nanomedicine: From the Bench to the Bedside) was held on 15-17 Oct 2019 in Riga, Latvia. The conference brought together leading European and world experts in the field of nanomedicine to present the latest developments in the development of nanomaterials for cancer therapy. I. Vinković Vrček, as a leader of Task Force 2 of COST Action, moderated one of the lecture groups. B. Pem had a short lecture "Effect of particle shape and size on interactions of gold nanoparticles with proteins of different glycosylation status".

INSTITUTION (Leader)	PROJECT	DURATION
Vienna Biocenter Core Facilities, Austria (A. Walter)	Correlated Multimodal Imaging in Life Sciences (COMULIS, CA 17121)	2018–2022

IMROH ASSOCIATES: D. Karaica, I. Vrhovac Madunić

SUMMARY

The first meeting of the Steering Committee was held 12 Oct 2018 in Bruxelles (Belgium), where the heads of working groups as well leaders of ITC (Inclusiveness Target Countries) and STSM (Short-term scientific missions) committees were appointed/selected. I. Vrhovac Madunić was elected as ITC Board Manager, while D. Karaica was elected as ITC Board member. Also, the proposed action plan was approved and the location of the next coming COST action meeting in Porto (Portugal) was agreed.

INSTITUTION (Leader)	PROJECT	DURATION
Erasmus University Medical Center, Rotterdam, Netherlands (F. Rivadeneira)	Genomics of MusculoSkeletal traits Translational Network (GEMSTONE, CA18139)	2019–2023

IMROH ASSOCIATE: S. Cvijetić Avdagić

SUMMARY

The project brings together a wide range of researchers active in musculoskeletal biology and focuses primarily on pharmacogenetics. The goal is to translate new discoveries in the field of musculoskeletal genetics into meaningful clinical applications. One of the working groups is focused on population-based research on epigenetic factors in the etiology of bone diseases.

OTHER EUROPEAN PROJECTS

European Agency for Safety and Health at Work



INSTITUTION (Leader)	PROJECT	DURATION
National Public Health Institute, Budapest, Hungary (F. Kudász)	Good practice case study on dangerous substances	2017–2019

IMROH ASSOCIATES: J. Macan, Ž. Babić, Zr. Franić, F. Šakić, M. Deranja

SUMMARY

In collaboration with the Hungarian National Public Health Institute, a project financed by the European Occupational Safety and Health Agency (EU OSHA) was implemented. Information about the available guidelines and other materials in Croatian and Slovenian supporting the prevention of exposure to dangerous substances at the workplace were collected. The list of websites with available material was published on the website of the EU OSHA (<https://osha.europa.eu/>).

Polytechnic Institute of Lisbon, Portugal



INSTITUTION (Leader)	PROJECT	DURATION
Lisbon School of Health Technology, Polytechnic Institute of Lisbon, Lisbon, Portugal (S. Viegas)	Occupational exposure to cytotoxic agents in veterinary hospitals and clinics (CytoVet)	2017–2019

IMROH ASSOCIATE: G. Gajski

SUMMARY

CytoVet project will provide experimental data that could enable the prediction of adverse effects and risk assessment for exposed workers in veterinary hospitals and clinics. The project will answer whether exposure to cytotoxic agents might pose a risk to human health in occupational settings (309).

16.2.A.2. United Nations Environment Programme (UNEP) International Atomic Energy Agency (IAEA)



INSTITUTION (Leader)	PROJECT	DURATION
Department of Nuclear Sciences and Applications, IAEA Laboratories Seibersdorf, Austria (R. Padilla Alvarez)	Enhancing the Inventory of Aerosol Source Profiles Characterized by Nuclear Analytic Techniques in Support of Air Quality Management (RER/7/011)	2017–2019

IMROH ASSOCIATES: I. Bešlić, S. Davila, R. Godec

SUMMARY

The project was initially planned for a period of two years and was subsequently extended to 2019. The reason is the completion of the planned activities related to the procurement of equipment and supplies as well as the evaluation of the results obtained. At the 'TC Final Coordination Meeting, EVT (1901605), held from 25 to 29 Nov 2019 in Lisbon, Portugal, representatives of participating countries presented the scopes of the sample collection and performed analysis. Representatives from 19 participating countries attended the meeting. The framework program and planned activities for the next RER 7012 project were agreed, which would be a continuation of the RER7011 project. It was decided to ensure the purchase of more reference particulate matter samplers and MABI aethelometers for the determination of black carbon. It was also decided to continue the sampling campaign started during the last RER project with sampling dynamics every third day. Sampling will be carried out on Teflon filters, and the distribution of the filters has been taken over by IMROH associates, as it was in a previous project. It was decided that during the project the following will be organized: one workshop for working with large databases in Cyprus, one coordination meeting to evaluate the results of the last project in Vienna and a final coordination meeting to be organized in Moldova. At the meeting associates were informed about the status of the scientific paper submitted for review, which includes the results and data analysis of the previous project.

For the new project IMROH has requested 28-element multi-element reference material whose concentrations are at least three times higher than the X-ray fluorescence (XRF) detection limit. One-element certified reference materials for XRF have been ordered for IMROH as well as certified reference materials for elemental carbon (EC) and organic carbon (OC) analysis.

16.2.A.3. Government Ministry projects

Ministry of Environmental Protection of Mexico Federal Attorney for Environmental Protection (PROFEPA)



INSTITUTION (Leader)	PROJECT	DURATION
Autonomous University of Tlaxcala, Autonomous National University of Mexico, Meksiko (R. Valencia)	The general project of evaluation of the genotoxic risk from exposure to environmental pollutants	2016–2020

IMROH ASSOCIATE: M. Milić

SUMMARY

Within the project, studies on the toxicity of aflatoxins and mycotoxins (2) and DNA damage in agricultural workers were continued (332).

**US Department of Defense
US Defense Threat Reduction Agency (DTRA)**



INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (Z. Kovarik)	CNS-active, Orally Bioavailable, Zwitterionic Oximes for Organophosphate	2019–2022

IMROH ASSOCIATES: S. Žunec, V. Micek
PARTNERS: P. Taylor and Z. Radić (University of California at San Diego, La Jolla, SAD), K. Barry Sharpless (The Scripps Institute of Science) and others.

SUMMARY

Our research is focused on the detailed pharmacokinetics and pharmacodynamics of zwitterionic aldoximes designed in collaboration with Nobel laureate K. Barry Sharpless. These aldoximes promptly cross the blood-brain barrier and therefore could act as centrally-active antidotes in nerve agent poisonings (83).

**Ministry of Science and Education, Republic of Croatia
Scientific and Research Bilateral Cooperation in Science and Technology
(7 projects)**



INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (G. Gajski) National Institute of Biology, Ljubljana, Slovenia (B. Žegura)	Assessment of Toxicological Safety of Foodborne Toxins (SafeFood, Bilateral project CRO-SI)	2018–2019

IMROH ASSOCIATES: M. Gerić, I. Vrhovac Madunić, J. Madunić

SUMMARY

The aim of the project is to evaluate the toxic effect of toxins present in food in *in vitro* conditions on primary human peripheral blood lymphocytes used as sensitive indicators of individual exposure and human liver cancer cells (HepG2) that contain enzymes involved in the metabolism of toxinates. β -methylamino-L-alanine (BMAA) possesses clastogenic potential for human blood cells therefore further studies are needed to evaluate its chronic effects (26, 288).

INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (I. Vinković Vrček) Institute of Pharmaceutical Sciences, University of Graz, Austria (E. Roblegg)	The pharmacokinetic profile of silver nanoparticles: the role of biological barriers (NanoPasS, Bilateral project CRO-AT)	2018–2019

IMROH ASSOCIATES: A. M. Marjanović Čermak, I. Pavičić, K. Ilić

SUMMARY

Collaborator of the NanoFaceS project K. Ilic visited the Leibniz Institute for Photonic Technology (Leibniz-IPHT) in Jena, Germany from 1 to 26 Jul 2019. Under the guidance of prof W. Frizsche, he worked on the study of protein adsorption to the surface of nanoparticles by the localized surface plasmon resonance (LSPR) method, continuing and developing previous experiments as part of the Croatian-German collaboration. PhD students S. Hartl and C. Tetyczka, from the Department of Pharmaceutical Technology and Biopharmaceuticals of the University of Graz, visited IMROH from 18 to 22 Feb 2019. During the visit they conducted cellular experiments to determine the toxic effect of silver and selenium nanoparticles. Members of the NanoFaceS Group (I. Vinković Vrček, I. Pavičić, and K. Ilić) participated at the 10th BioNanoMed Conference, held in Graz, Austria (15-17 Apr 2019). I. Vinković Vrček held a lecture entitled "Sex-related *in vivo* Response to Metallic Nanoparticles", while I. Pavičić and K. Ilić presented two posters: "Biocompatibility assessment of selenium nanoparticles as novel biocidal nanomaterial" and "Interaction of silver nanoparticles with biological barriers". The 12th International Particle Toxicology Conference was held from 11 to 13 Sep 2019 in Salzburg, Austria.

The mission of the conference was to bring together toxicologists from all over the world to discuss issues of safety, application, and research approaches to particle toxicology. Collaborator of the project R. Barbir participated with a poster theme "Sex-related *in vivo* response to silver nanoparticles after subacute oral exposure". She presented the latest results of animal experiments on the effect of sex differences on the organism's response to subcutaneous exposure to silver nanoparticles. PhD student E. Galić also presented his research on the genotoxicity of silver and selenium nanoparticles with a poster: "Genotoxicity of silver and selenium nanoparticles on human epithelial cells". The research was carried out in collaboration with the NanoFaceS Group with the research groups of the Universities of Osijek and Graz. Work on the project resulted in the preparation of 2 scientific publications, which were prepared for submission to scientific journals.

INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (I. Vinković Vrček) Leibniz Institute of Photonic Technology (IPHT), Jena, Germany (W. Fritzsche)	Multiplex characterization platform for nanobio interfaces (Bilateral project CRO-DE)	2018–2019

IMROH ASSOCIATES: R. Barbir, G. Šinko, B. Pem, K. Ilić

SUMMARY

During the two-year period, all planned experiments were completed, and the preparation of the first joint publication is under way. In addition, new forms of collaboration have been opened – in the field of application of a multiplex characterization platform for the detection of nanoplastics in biological samples.

PhD student B. Pem visited the Leibniz Institute for Photonic Technology in Jena, Germany (11 Nov–7 Dec 2019). She studied the localised surface plasmon resonance (LSPR) technique and performed fibrinogen binding experiments on the surface of gold nanoparticles, which builds directly on the previous work of the NanoFaceS Group PhD students. Also, during the stay, preliminary measurements of protein interactions with nanoparticles were performed using the surface-enhanced Raman spectroscopy (SERS) technique. Ms Pem will be able to apply her newly acquired knowledge to the continuation of the experiment upon her return to Zagreb. On 2 Nov 2019 at the Fraunhofer Institute of Immunology and Cellular Therapy in Leipzig, Germany, The Mitteldeutschland DNA gathering was held, bringing together experts in the field of DNA research and nanoparticle application in the development of sensors and diagnostic devices. The event was organized in collaboration with the Leibniz Institute for Photonic Technology in Jena and the University of Potsdam. PhD student B. Pem had an oral presentation of the NanoFaceS project: "Interaction of metallic nanoparticles with biomolecules: the implications for nano-bio interface". The NanoFaceS Group hosted a young scientist from the Leibniz Institute of Photonic Technology in Jena, Germany E. Podlesnaia (9–16 Dec 2019). Ms Podlesnaia is developing methods for the synthesis of anisotropic gold nanoparticles and intends to extend her field of work to other types of nanomaterials. The aim of her visit was to observe and learn the methods of synthesis of silver and selenium nanoparticles of different sizes and shapes. The NanoFaces team also benefited greatly from her knowledge and experience. This visit resulted in the strengthening of Croatian-German cooperation through a bilateral project, and the exchange of knowledge was to the benefit of both partner institutions.

INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (Z. Kovarik) Research Center for Eco-environmental Sciences, Chinese Academy of Sciences, Beijing, China (Q. Xie)	Effects of selected pesticides on neuronal acetylcholinesterase expression (Bilateral project CRO-CN)	2019–2021

IMROH ASSOCIATES: T. Čadež, M. Katalinić, A. Zandona

SUMMARY

The aim of this project is to study the effects of pesticides on acetylcholinesterase (AChE) activity and expression to explain the mechanism of AChE regulation at cellular level. So far, we have selected several organophosphate pesticides for testing, described the reversible inhibition of AChE, and identified key interactions in the enzyme's active site by molecular modelling (334).

INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (S. Herceg Romanić) Institute of Physics, University of Belgrade, Serbia (G. Jovanović)	Persistent organochlorine compounds in human milk and their potential effect on the level of primary DNA damage in human cells (Bilateral project CRO-RS)	2019–2021

IMROH ASSOCIATES: D. Želježić, V. Mužinić, D. Klinčić, G. Mendaš Starčević

SUMMARY

The application of advanced statistical methods to evaluate exposure of the general population to persistent organochlorine compounds is studied. Future research will include examining the application of statistical machine learning methods (artificial neural networks, support vector methods, and decision trees) to R and Week programs with respect to factors affecting levels of organochlorine compounds in breast milk.

INSTITUTION (Leader)	PROJECT	DURATION
IMROH, Zagreb (G. Gajski) Vinča Institute of Nuclear Science, University of Belgrade, Serbia (M. Čolović)	Acetylcholinesterase Inhibitors as Potential Anti-Alzheimer Drugs: Prooxidative and Cytogenotoxic Properties (SafeAChE, Bilateral project CRO-RS)	2019–2021

IMROH ASSOCIATES: M. Gerić, M. Milić

SUMMARY

SafeAChE will evaluate the prooxidative and toxic effect of newly synthesized polyoxometalate compounds exhibiting an inhibitory effect on AChE; a targeted enzyme of drugs used as symptomatic therapy in patients with Alzheimer's disease.

INSTITUTION (Leader)	PROJECT	DURATION
Ruđer Bošković Institute, Zagreb (S. Orlić) Chinese Academy of Sciences (A. Hu)	Distribution of antibiotic resistance genes in waste water treatment plants and receiving environments of China and Croatia (Bilateral project CRO-CN)	2019–2021

IMROH ASSOCIATES: G. Gajski

SUMMARY

The project goal is to evaluate the types and concentrations of typical new organic pollutants in coastal cities and the receiving environment and their temporal and spatial distribution characteristics, migration patterns and country differences. The abundance and community composition of typical antibiotic resistance genes in sewage plants and receiving environments in the two countries and their temporal and spatial distribution characteristics, migration patterns and country differences. Furthermore, the project will clarify the coupling relationship between new organic pollutants and antibiotic resistance genes, and assess ecological risks.

16.2.B. PROFESSIONAL PROJECTS

PROJECT	CONTRACTOR	LEADER
Service provider: Radiation Dosimetry and Radiobiology Unit		
EAN NORM; European ALARA Network for Naturally Occurring Radioactive Materials	Project Coordinator IAF	I. Prlić
Contract no. TREN/H4/51/2005 of the European Commission (EC) (since 2005)	Radioökologie GmbH, Dresden, Germany	I. Prlić
HRPE Development of a training curriculum for radiation protection experts in Croatia	SCK·CEN Academy for Nuclear Science and Technology, Belgium	M. Surić Mihić (IMROH) and T. Clarijs (SCK·CEN Belgium)

17. PROFESSIONAL UNITS



17.1. Laboratory Animal Breeding Unit

EMPLOYEES

HEAD

Vedran Micek, DVM, professional associate

ASSOCIATE

Mirjana Mataušić Pišl, DVM, PhD, scientific associate until 31 Dec 2019

TECHNICAL STAFF

Kata Šmaguc, technician

PROFESSIONAL WORK

The Laboratory Animal Unit of the Institute breeds laboratory rats, strain HsdBrlHan: Wistar, in accordance with the Animal Welfare Act (OG 102/17) and other applicable laws, guidelines and policies. Animals are bred under strictly controlled conditions, under surveillance of authorised personnel (DVM), and then used as a model in scientific and experimental research. The Unit has facilities that are consistent with legislation and guidelines concerning the breeding and housing of laboratory animals. From 2016, the Laboratory Animal unit is authorized for performing *in vivo* experiments for a ten-year period. The living conditions of animals are appropriate and contribute to their health and welfare. The housing, feeding, animal care and experimental procedures are managed by a veterinarian in accordance with contemporary veterinary practices. The animals are kept in steady-state micro environmental conditions and fed with standard GLP certified laboratory food and water *ad libitum* with altering 12 h light and dark cycles. Sanitation of facilities is performed on a weekly basis in order to reduce the possibility of any external contamination. In the context of projects contracted with the Croatian Science Foundation, scheduled *in vivo* experiments were performed for two projects: "Aging-related expression of membrane transporters in rat" (AGEMETAR, IP-11-2013-1481, IMROH) and "Dietary lipids, sex and age in pathogenesis of metabolic syndrome" (DietMetSyn, IP-2016-06-3163, Faculty of Veterinary Medicine, University of Zagreb).



17.2. Poison Control Centre

EMPLOYEES

HEAD

Rajka Turk, MSc, professional advisor in science

ASSOCIATES

Researchers of the Occupational and Environmental Health Unit (Chapter 15.5.)

PROFESSIONAL WORK

The information service of the PCC received 2401 calls from health institutions and professionals in Croatia regarding acute poisoning incidents. Following requests from the industry, 97 toxicological evaluations were prepared as well as 4 reports for the registration of pesticides according to the Plant Protection Products Act and Regulation (EU) No. 1107/2009 on placing of plant protection products on the market. Following enquiries from the industry, 37 evaluations for the purpose of biocidal products authorization according to the Biocidal products Act and Regulation (EU) No. 528/2012 concerning the placement on the market and use of biocidal products. Collaboration with the Agency for Medicinal Products and Medical Devices of Croatia in monitoring of drug poisonings (pharmacovigilance) continued. Further work on the revision of the National Action Plan for sustainable use of pesticides as well as accompanying ordinances was continued with the Ministry of Agriculture. Collaboration with the Ministry of Work and Pension System on the amendments of the Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work also continued. Further work on the compilation of new Guidelines for the use of Antidotes in emergency medicine was initiated, in collaboration with the Croatian Institute for Emergency Medicine and Croatian Institute for Public Health Department for Toxicology.

Annual reports of the PCC continued to be published in the journal *Archives of Industrial Hygiene and Toxicology* in English and Croatian (177). A professional paper on occupational poisonings recorded at the PCC in 2018 was also published (117). Publication of short communications for the general public on recent poisoning incidents and their prevention was continued through the Institute's website (180).

The PCC continued to participate in the prospective epidemiological study entitled "Study on Viperidae Family Snakebites in Central and Eastern European Countries (CEE-VIPER)" (leader: M. Brvar, MD, PhD, Slovenian Poison control centre, Ljubljana, Slovenia) with data about incidence and characteristics the European viper envenomations for which the PCC was consulted in 2019.

The PCC also started to participate in the epidemiological study on poisonings by refillable electronic cigarettes entitled "PRECISE Project: Potential Risks from Electronic Cigarettes & their technical Specifications in Europe" (leader: A. Vardavas, MD, PhD, Medical School, University of Crete, Heraclion, Greece). Results of the pilot phase of the PCC project "Preventing child poisonings by educational intervention aimed at parents of preschool children" were presented at the 39th International Congress of the European Association of Poisons Centres and Clinical Toxicologists (Naples, Italy) (264).

Evaluation of the proposal for harmonised classification and labelling at EU level of 4-vinylcyclohexene diepoxide, prepared for the European Chemicals Agency (ECHA), as the Committee for Risk Assessment's rapporteur (361).

18. RESEARCH AREA "ŠUMBAR"

● HEAD

Josip Tončić, MSc, DVM, professional associate in science

● PROFESSIONAL WORK

The Research Area "Šumbar" is located east of the city of Karlovac (GPS coordinates: 45.5297, 15.6322) with a zone of 2,153 ha mainly covered by an English oak (*Quercus robur*) and hornbeam (*Carpinus betulus*) forest. "Šumbar" is a unique ecosystem in which the activities of safeguarding, control, and improvement of the habitat's stability are undertaken. Within the scope of these activities, a very important activity is the environmental study of water, soil, air, and biological material, which is related to natural and anthropogenic environmental pollution and the main goal is to preserve a healthy habitat.

A background ionising radiation monitoring RS 131 HP Ionization Chamber: Reuter Stokes type was performed continuously. The entire measuring system is connected to the telecommunication system, which allows real-time online data monitoring. Measurements were performed with mobile ALARA devices at various microlocations. All collected data were later processed, evaluated, and correlated in the Radiation Dosimetry and Radiobiology Unit. Part of the proposed activities in the scope of the Horizon 2020 EUROATOM (Integrating Radiation Protection Research in the European Union) call ref: NFRP-07-2015 programme was also carried out at "Šumbar".

Measurements with HORIBA APNA-360 (Ambient NO_x Monitor), HORIBA APOA-360 (Ambient O₃ Monitor) and Sven Leckel Sequential Sampler SEQ47/50, which measure NO, NO₂, NO_x, O₃ and PM_{2.5} were continued within the scope of the programme of monitoring air pollution and quality.

19. COMPANY OWNED BY THE INSTITUTE

Occupational Health Polyclinic of the Institute for Medical Research and Occupational Health Ltd., Ksaverska cesta 2, Zagreb

DIRECTOR

Prim Jelena Macan, PhD, MD, permanent scientific advisor (90 % of working hours at the Institute, 10 % at the Polyclinic)

ASSOCIATE

Franka Šakić, senior technician (90 % of working hours at the Institute, 10 % at the Polyclinic)

BUSINESS RESULTS

The professional activity of the Occupational Health Polyclinic of the Institute for Medical Research and Occupational Health Ltd. continued operating in 2019 providing services in the domain of occupational and sports medicine, and internal medicine. The outpatient clinic provided a total of 441 medical services for 322 customers. An occupational medicine specialist delivered 10 judicial-medical expertises for the Administrative Court in Zagreb, Municipal Courts in Rijeka, Bjelovar, Velika Gorica, Commercial Court in Zagreb, and Municipal Civil Court in Zagreb). J. Macan was appointed as main supervisor by the Croatian Ministry of Health for 7 residents in occupational and sports medicine. The Psychotherapy Office led by A. Bjelajac, PhD, psychologist and psychotherapist, continued working within the company. Twelve clinical psychological examinations were performed on the request of the occupational medicine specialist. The company operated positively in 2019.

20. PUBLISHING

The Institute is the publisher of the scientific journal *Arhiv za higijenu rada i toksikologiju – Archives of Industrial Hygiene and Toxicology*, print: ISSN 0004-1254, online: ISSN 1848-6312.

<p>HONORARY EDITOR Prof Dr Marko Šarić, F.C.A.</p> <p>EDITOR IN CHIEF Nevenka Kopjar</p> <p>ASSISTANT EDITORS Irena Brčić Karačonji, Jelena Macan</p> <p>REGIONAL EDITOR FOR SLOVENIA Marija Sollner Dolenc</p> <p>MANUSCRIPT EDITOR & EDITORIAL ASSISTANT Dado Čakalo</p> <p>COPY EDITORS Dado Čakalo, Makso Herman</p> <p>TECHNICAL EDITING & LAYOUT Nevenka Kopjar, Makso Herman</p> <p>STATISTICS EDITOR Jelena Kovačić</p> <p>CROATIAN LANGUAGE REVISION Ivanka Šenda</p> <p>SUBSCRIPTIONS Vesna Lazanin</p> <p>PRINT Đenona, Zagreb</p> <p>Financially supported by the Ministry of Science and Education</p>	<p>THE OFFICIAL JOURNAL OF Croatian Medical Association – Croatian Society on Occupational Health Croatian Society of Toxicology Slovenian Society of Toxicology Croatian Radiation Protection Association Croatian Air Pollution Prevention Association</p> <p>EXECUTIVE EDITORIAL BOARD Ivan Bešlić (Croatia) Tomislav Bituh (Croatia) Adrijana Bjelajac (Croatia) Irena Brčić Karačonji (Croatia) Selma Cvijetić Avdagić (Croatia) Domagoj Đikić (Croatia) Azra Huršidić Radulović (Croatia) Ivan Kosalec (Croatia) Jelena Kovačić (Croatia) Zrinka Kovarik (Croatia) Jernej Kužner (Slovenia) Ana Lucić Vrdoljak (Croatia) Jelena Macan (Croatia) Marin Mladinić (Croatia) Mirjana Pavlica (Croatia) Branko Petrincec (Croatia) Alica Pizent (Croatia) Marija Sollner Dolenc (Slovenia) Maja Šegvić Klarić (Croatia)</p>
<p>ADVISORY EDITORIAL BOARD Mohammad Abdollahi (Iran); Biljana Antonijević (Serbia); Michael Aschner (USA); Stephen W. Borron (USA); Vlasta Bradamante (Croatia); Petar Bulat (Serbia); Marija Elena Calderón Segura (Mexico); P. Jorge Chedrese (Canada); Jagoda Doko Jelinić (Croatia); Vita Dolžan (Slovenia); Damjana Drobne (Slovenia); Hugh L. Evans (USA); Zdenko Franić (Croatia); Radovan Fuchs (Croatia); Corrado Lodovico Galli (Italy); Lars Gerhardsson (Sweden); Milica Gomzi (Croatia); Andrew Wallace Hayes (USA); Michael C. Henson (USA); Jasminka Illich-Ernst (USA); Mumtaz İşcan (Turkey); Ljiljana Kaliterna Lipovčan (Croatia); Vladimir Kendrovski (Macedonia); Sanja Kežić (Netherlands); Lisbeth E. Knudsen (Denmark); Samo Kreft (Slovenia); Dirk W. Lachenmeier (Germany); Andreas L. Lopata (Australia); Marcello Lotti (Italy); Ester Lovšin Barle (Slovenia); Richard A. Manderville (Canada); Velimir Matković (USA); Sačeta Miljanić (Croatia); Kenneth A. Mundt (USA); Michael Nasterlack (Germany); Krešimir Pavelić (Croatia); Maja Peraica (Croatia); Martina Plasek (Croatia); Mirjana Radenković (Serbia); Zoran Radić (USA); Miloš B. Rajković (Serbia); Peter Raspor (Slovenia); Biserka Ross (UK); Zvonko Rumboldt (Croatia); Yusuf Sevgiler (Turkey); Nikolajs Sjakste (Latvia); Krešimir Šega (Croatia); Horst Thiemann (Germany); Andreas Thrasymoulou (Greece); Christopher M. Timperley (UK); Alain Verstraete (Belgium); Carla Viegas (Portugal); Slavica Vučinić (Serbia); Robert Winker (Austria)</p>	

General information about the journal

Articles from the fields of occupational health, toxicology, ecology, chemistry, biochemistry, biology, pharmacology, and psychology are edited in line with modern standards. The journal's publication is financially supported by the Ministry of Science and Education and, to a smaller extent, subscriptions. The *Archives* is issued four times a year.

The *Archives* is indexed in SCI-Expanded, Medline/PubMed, Scopus, and many other databases. The Impact Factor (IF) for 2019 was 1.436, which is the highest IF value since the journal was listed in *InCites Journal Citation Reports* (Clarivate Analytics). The 5-year IF was 1.606, which is the highest value ever achieved in the journal's history. The *Archives* is currently ranked within the third Quartile (Q3) in the Public, Environmental & Occupational Health and the fourth Quartile (Q4) in the Toxicology area, based on the previous year's achievements. The *Archives* ranks fifth on the list of all Croatian journals by IF value (regardless of the area of publication).

IF values of the Arhives since its listing in InCites Journal Citation Reports (Clarivate Analytics)

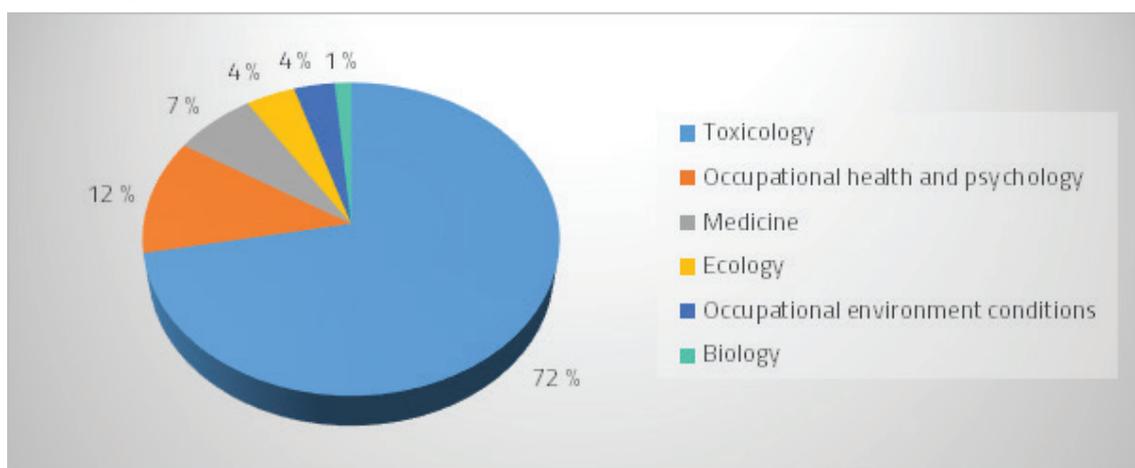
Year	IF	5-years IF
2018	1.436	1.606
2017	1.117	1.335
2016	1.395	1.320
2015	0.971	1.019
2014	0.932	1.120
2013	0.727	0.980
2012	0.674	–
2011	1.048	–
2010	0.826	–

Ranking of Croatian journals according to IF (Clarivate Analytics)

Select All	Full Journal Title	Total Cites	Journal Impact Factor	Eigenfactor Score
1	Croatian Journal of Forest Engineering	567	2.258	0.00069
2	Biochemia Medica	1,810	2.202	0.00331
3	CROATIAN MEDICAL JOURNAL	1,675	1.624	0.00177
4	FOOD TECHNOLOGY AND BIOTECHNOLOGY	2,039	1.517	0.00129
5	Arhiv za Higijenu Rada i Toksikologiju-Archives of Industrial Hygiene and Toxicology	780	1.436	0.00097

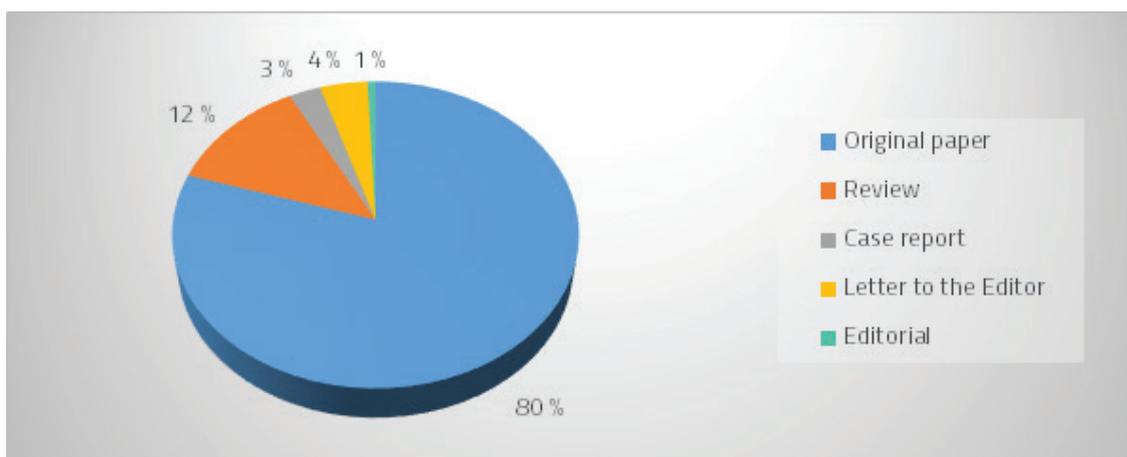
The citation of the *Archives* in 2019 was very good. As of 2 Jan 2020, the *Web of Science* database recorded 4,132 citations of articles published since 2008, when the journal was included in the database to date. The h-index of the *Archives* for the period 2008 - 2019 according to the *Web of Science* database is 27.

During 2019, the Editorial Office of the *Archives* received a total of 144 submissions, most of which were submitted through the journal's online system available at <https://arhiv.imi.hr> and the remainder by e-mail (arhiv@imi.hr). Most of the submissions covered topics from toxicology, while occupational health and psychology followed with a somewhat smaller number of submissions.



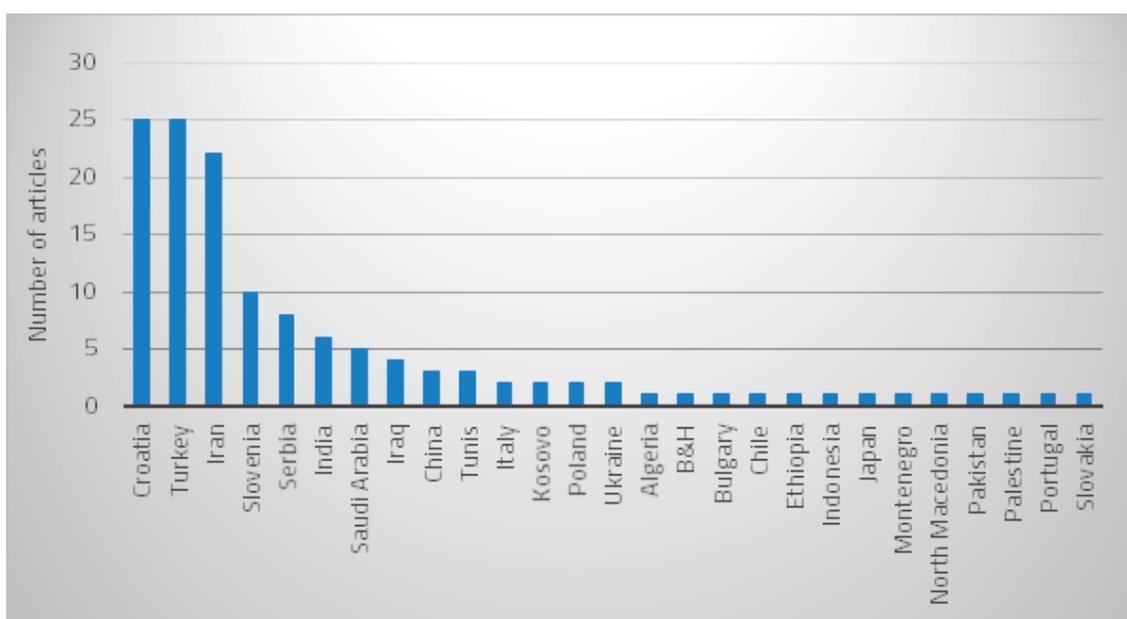
Distribution of articles submitted in 2019 according to research areas

Most of the manuscripts received (80 %) referred to original scientific papers and review papers (12 %), while other categories of manuscripts were less represented.



Distribution of manuscripts submitted in 2019 according to article type

The manuscripts were submitted by authors from 27 different countries. The largest number of manuscripts was submitted from Croatia (17%) and Turkey (17%), followed by authors from Iran (15%), Slovenia (7%), and Serbia (6%), while other countries were represented by less than 5%.



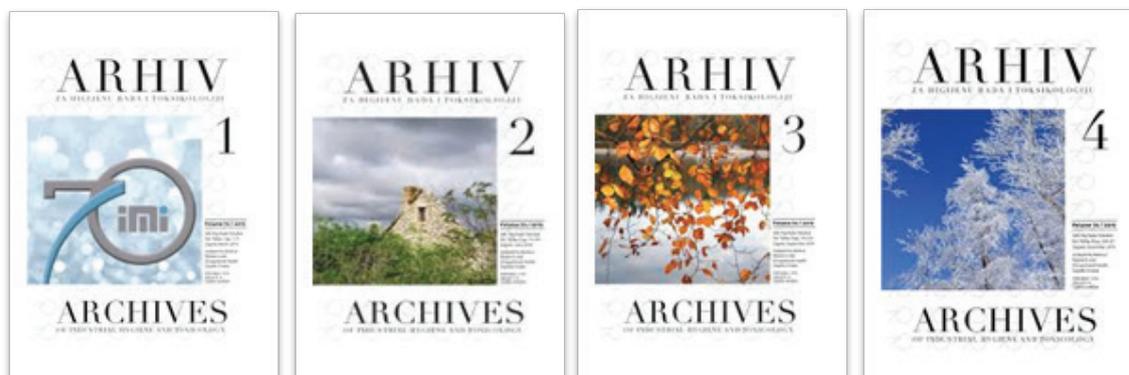
Distribution of articles submitted in 2019 according to origin country

The rejection rate was 60% (86 of 144 manuscripts received were rejected). Most of them (67%) were rejected by the Editor-in-Chief or an Editorial Board decision because of poor quality or failure to meet the minimum criteria for review, while others were rejected due to negative reviews.

Each submission is screened for plagiarism by the iThenticate Plagiarism Detection Software. The contained Crossref Similarity Check is used to check the authenticity of a submission against a vast database of scientific literature published worldwide. Access to the aforementioned software system is enabled through the journal's cooperation with its online publisher Sciendo.

In 2019, four regular issues of Volume no. 70 were published, containing articles published in six categories: Original article (29), Review/Mini-Review (9), Letter to the Editor (2), Note (1), Technical Paper (1) and Editorial (1). In addition to regular manuscripts, articles in the *In memoriam* and *Reports* categories were also published. According to the attendance on the Portal of Scientific Journals of the Republic of Croatia (HRČAK) during 2019, the *Archives* holds a high position in relation to other journals in the fields

of biomedicine and health and the natural sciences. The total number of visits to the *Archives* through the HRČAK website was 2,114,339 on 2 Jan 2020.



Cover pages of all Archives' issues published in 2019 (Volume 70)

Throughout 2019, the journal continued to operate in accordance with high standards of editorial work comparable to foreign journals. The *Archives* is a regular member of the Committee on Publication Ethics (COPE) and the Editors are members of the Mediterranean Editors and Translators and European Association of Science Editors (EASE).

The journal's editors work continuously to promote the reputation of the journal domestically and internationally, which includes contacts with researchers and professional associations. For participants of the Specialisation in Occupational Health and Sports, which takes place at the Institute under the mentorship of Dr J. Macan, on 29 Nov 2019, a workshop entitled *How to write and publish a good case report or case series* was held by D. Čakalo, I. Brčić Karačonji, and N. Kopjar. The regular publication of the journal and its successful operation during 2019 was achieved by the enthusiasm of the Editorial Office and due to their large number of working hours spent in daily activities such as language and technical editing, print layout preparation, maintenance of the online submission system and manuscript management, digitalization of old volumes, and other administrative affairs within the journal.

The journal is available free of charge to the foreign and domestic scientific public through the link <https://hrcak.srce.hr/aiht> (all regular issues published from 1946 to the present and the most important supplements are available). Full text articles in PDF format are also available through Sciendo's service (<https://content.sciendo.com/view/journals/aiht/aiht-overview.xml>).

21. PRILOZI**A. OVLAŠTENJA INSTITUTA**

- Ministarstvo zdravstva RH – ovlaštenje za provođenje Programa specijalističkog usavršavanja doktora medicine u području medicine rada i sporta, u dijelu programa Profesionalne bolesti, bolesti u svezi s radom i profesionalna toksikologija. Ovlaštenje od prosinca 2018. vrijedi do izdavanja novog rješenja.

- Ministarstvo zaštite okoliša i energetike RH – dozvola za obavljanje djelatnosti praćenja kvalitete zraka. Ovlaštenje vrijedi do 20. prosinca 2020.

- Ministarstvo zaštite okoliša i energetike RH – dozvola za obavljanje djelatnosti osiguranja kvalitete mjerenja i podataka kvalitete zraka (referentni laboratorij) za metode:
 - HRN EN 12341:2014 (EN 12341:2014): Određivanje masene koncentracije PM_{10} i $PM_{2,5}$ frakcije lebdećih čestica
 - HRN EN 14902:2007 (EN 14902:2005), HRN EN 14902/AC:2007 (EN 14902:2005/AC:2006): Određivanje koncentracije Pb, Cd, As i Ni u PM_{10} frakciji lebdećih čestica
 - SIS-TP CENT/TR 16243:2011 (CEN/TR 16243:2011): Određivanje masenih koncentracija elementnog i organskog ugljika u lebdećim česticama u vanjskome zraku
 - HRN EN 15549:2008 (EN 15549:2008): Određivanje koncentracija benzo(a)pirena u vanjskome zraku
 - SIS-TP CENT/TR 16269:2011 (CEN/TR 16269:2011): Određivanje masenih koncentracija aniona i kationa u lebdećim česticama
 - HRS CEN/TS 16645:2016 (CEN/TS 16645:2014): Određivanje koncentracija benzo(a) antracena, benzo(b)fluorantena, benzo(j)fluorantena, benzo(k)fluorantena, dibenzo(a,h) antracena, indeno(1,2,3-cd)pirena i benzo(ghi)perilena u vanjskom zraku.Ovlaštenje vrijedi do 20. prosinca 2020.

- Državni zavod za radiološku i nuklearnu sigurnost – ovlaštenje za obavljanje stručnih poslova zaštite od ionizirajućeg zračenja:
 - mjerenje osobnog vanjskog ozračenja izloženih radnika ili osoba koje se obučavaju ili obrazuju za rad s izvorima ionizirajućeg zračenja
 - ispitivanje rendgenskih uređaja, akceleratora i drugih uređaja koji proizvode ionizirajuće zračenje te davanje mišljenja s procjenom opasnosti na osnovi mjerenja i proračuna
 - ispitivanje zatvorenih radioaktivnih izvora i uređaja sa zatvorenim radioaktivnim izvorima te davanje mišljenja s procjenom opasnosti na osnovi mjerenja i proračuna
 - ispitivanje prostorija u kojima se radi s izvorima ionizirajućeg zračenja te izrada dokumenata iz kojih je vidljivo udovoljava li prostorija propisanim uvjetima zaštite od ionizirajućeg zračenja
 - ispitivanje i praćenje vrste i aktivnosti radioaktivnih tvari u zraku, tlu, moru, rijekama, jezerima, podzemnim vodama, oborinama, vodi za piće, hrani i predmetima opće uporabe
 - ispitivanje koncentracije radona i potomaka radona u zraku.Ovlaštenje vrijedi do 10. prosinca 2020.

- Ministarstvo poljoprivrede RH - ovlaštenje za obavljanje analiza: hrana, hrana za životinje, prirodna mineralna, prirodna izvorska i stolna voda.
Ovlaštenje od 26. travnja 2016. vrijedi do izdavanja novog rješenja.

B. SURADNE USTANOVE

Sporazumi o suradnji

RED. BR.	NAZIV USTANOVE	GODINA POTPISIVANJA
1.	Institut za istraživanje i razvoj održivih eko sustava	2005.
2.	Medicinski fakultet Sveučilišta J. J. Strossmayera u Osijeku	2013.
3.	Sveučilište u Rijeci	2013.
4.	Sveučilište u Zagrebu	2013.
5.	Grad Zagreb	2014.
6.	Institut „Jožef Stefan“	2014.
7.	Nastavni zavod za javno zdravstvo „Dr. Andrija Štampar“	2014.
8.	Sveučilište u Mostaru	2014.
9.	Sveučilište u Zadru	2014.
10.	Veterinarski fakultet Univerziteta u Sarajevu	2014.
11.	Hemijski fakultet Univerziteta u Beogradu	2015.
12.	Hrvatski zavod za javno zdravstvo	2015.
13.	Institut za fiziku	2015.
14.	Ministarstvo unutarnjih poslova RH	2015.
15.	Agencija za lijekove i medicinske proizvode RH	2016.
16.	Ericsson Nikola Tesla d.d.	2016.
17.	Klinički bolnički centar Zagreb	2016.
18.	Rudarsko-geološko-naftni fakultet Sveučilišta u Zagrebu	2016.
19.	Sveučilište Sjever	2016.
20.	Grad Kaštela	2017.
21.	Nuklearna elektrana Krško	2017.
22.	Institut za hemiju, tehnologiju i metalurgiju, Beograd, Srbija	2018.
23.	Metalurški fakultet Sveučilišta u Zagrebu, Sisak	2018.
24.	Prirodno-matematički fakultet Univerziteta u Novom Sadu, Srbija	2018.
25.	Prirodno-matematički fakultet Univerziteta u Sarajevu, BiH	2018.
26.	AVANCO d. o. o.	2019.

Ostale znanstvenoistraživačke i stručne suradnje

USTANOVE U REPUBLICI HRVATSKOJ

1. Agencija za zaštitu okoliša, Zagreb
2. Agronomski fakultet Sveučilišta u Zagrebu
3. CARNet, Zagreb
4. Državni hidrometeorološki zavod, Zagreb
5. Ekoneg d. o. o., Zagreb
6. Fakultet elektrotehnike i računarstva Sveučilišta u Zagrebu
7. Fakultet kemijskog inženjerstva i tehnologije Sveučilišta u Zagrebu
8. Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu
9. Fond za zaštitu okoliša i energetske učinkovitost, Zagreb
10. Gekom d. o. o., Zagreb
11. Hrvatski institut za istraživanje mozga, Zagreb
12. Hrvatski sindikat male privrede, obrtništva, uslužnih djelatnosti i stranih predstavništava, Zagreb
13. Hrvatski veterinarski institut, Zagreb
14. Institut „Ruđer Bošković“, Zagreb
15. Kaznionica u Lepoglavi

16. Klinička bolnica Merkur, Zagreb
17. Klinički bolnički centar Osijek
18. Klinički bolnički centar „Sestre milosrdnice“, Zagreb
19. Klinički bolnički centar Zagreb (KBC Zagreb)
20. Klinika za dječje bolesti, Zagreb
21. Klinika za ženske bolesti i porode, KBC Zagreb
22. Medicinski fakultet Sveučilišta u Rijeci
23. Medicinski fakultet Sveučilišta u Zagrebu
24. Ministarstvo unutarnjih poslova RH, Ravnateljstvo civilne zaštite,
25. Sektor za radiološku i nuklearnu sigurnost
26. Ministarstvo zaštite okoliša i energetike RH, Zagreb
27. Nastavni zavod za javno zdravstvo „Dr. Andrija Štampar“, Zagreb
28. Nastavni zavod za javno zdravstvo Primorsko-goranske županije, Rijeka
29. Nezavisni sindikat znanosti i visokog obrazovanja, Zagreb
30. Odgojni zavod Turopolje, Velika Gorica
31. Odjel za biotehnologiju Sveučilišta u Rijeci
32. Petrokemija d. d., Kutina
33. Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu
34. Prehrambeno-tehnološki fakultet, Sveučilište J. J. Strossmayera u Osijeku
35. Prirodoslovno-matematički fakultet Sveučilišta u Splitu
36. Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu
37. Sabor RH, Zagreb
38. Stomatološki fakultet Sveučilišta u Zagrebu
39. Sveučilište J. J. Strossmayera u Osijeku, Odjel za kemiju
40. Veterinarski fakultet Sveučilišta u Zagrebu
41. Zavod za javno zdravstvo Brodsko-posavske županije, Slavonski Brod
42. Zavod za javno zdravstvo Istarske županije, Pula
43. Zavod za javno zdravstvo Koprivničko-križevačke županije, Koprivnica
44. Zavod za javno zdravstvo Osječko-baranjske županije, Osijek
45. Zavod za javno zdravstvo Zadarske županije, Zadar

USTANOVE U INOZEMSTVU

1. Academic Medical Centre, Amsterdam, Nizozemska
2. Bundesamt für Strahlenschutz, Salzgitter, Njemačka
3. Fakulteta za kemiju in kemijsko tehnologiju Univerza v Ljubljani, Slovenija
4. Florida State University, Tallahassee, FL, SAD
5. Helmholtz Zentrum München Deutsches Forschungszentrum für Gesundheit und Umwelt, München, Njemačka
6. Hungarian Institute for Public Health, Budimpešta, Mađarska
7. Institut für Chemie, Universität Graz, Austrija
8. Institut für Physikalische und Theoretische Chemie, Technische Universität Graz, Graz, Austrija
9. Institut für Soziale Ökologie, Alpen-Adria-Universität Klagenfurt, Austrija
10. Inštitut za biokemiju, Medicinska fakulteta, Univerza v Ljubljani, Ljubljana, Slovenija
11. Inštitut za patološko fiziologiju, Medicinska fakulteta, Univerza v Ljubljani, Ljubljana, Slovenija
12. Institute for Nuclear Research, Hungarian Academy of Sciences, Debrecen, Mađarska
13. Institute of Basic Medical Sciences, University of Oslo, Oslo, Norveška
14. Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prag, Češka
15. Institute of Nature Conservation of Polish Academy of Sciences, Krakow, Poljska

16. International Atomic Energy Agency, Beč, Austrija
17. Joint Research Centre of the European Commission, Bruxelles, Belgija
18. Malopolski Voivodeship Inspectorate of Environmental Protection, Krakow, Poljska
19. Mazovian Voivodeship Inspectorate of Environmental Protection, Varšava, Poljska
20. Nacionalni inštitut za biologijo, Ljubljana, Slovenija
21. National Reference Laboratory of CIEP, Krakow, Poljska.
22. NMR laboratórium, Pannon Egyetem, Veszprém, Mađarska
23. Polish Chamber of Commerce for Sustainable Development (PIGE), Varšava, Poljska
24. Prirodno-matematički fakultet, Univerzitet u Kragujevcu, Srbija
25. Umweltbundesamt (UBA), Langen, Njemačka
26. UHasselt University Belgium, Campus Diepenbeek, Agoralaan Gebouw H, Diepenbeek, Belgija
27. Universidad Autónoma de Tlaxcala, Universidad Nacional Autónoma de México, Meksiko
28. Universität Osnabrück, Osnabrück, Njemačka
29. Universitätsklinikum Hamburg-Eppendorf (UKE), Hamburg, Njemačka
30. University of California at San Diego, La Jolla, CA, SAD
31. University of Rouen, Mont-Saint-Aignan, Francuska
32. Univerzita Hradec Králové, Hradec Králové, Češka
33. VITO- Vlaamse Instelling voor Technologisch Onderzoek, Mol, Belgija

C. PRIHODI INSTITUTA

RED.BR.	VRSTA PRIHODA	IZNOS (HRK)	%
A	PRIHODI IZ DRŽAVNOG PRORAČUNA	42.030.966	75,68
1.	Plaće i prijevoz na posao za zaposlenike	25.314.386	45,58
2.	Plaće, prijevoz i naknade za znanstvene novake	411.174	0,74
3.	Programsko financiranje Instituta	3.617.568	6,51
4.	Jubilarne nagrade, otpremnine, potpore za opremanje doktorata	164.936	0,30
5.	Regres za godišnji odmor, božićnica i dar djeci za Dan svetog Nikole	411.750	0,74
6.	Pomoći zaposlenicima za rođenje djeteta, bolovanje i smrtne slučajeve	45.518	0,08
7.	Povrat naknade zbog nezapošljavanja osoba s invaliditetom	37.125	0,07
8.	Nacionalno sufinanciranje Projekta ReC-IMI	83.253	0,15
9.	Bilateralni projekti	106.398	0,19
10.	Potpore za prijavu projekata i za popularizaciju znanosti	25.631	0,05
11.	Ministarstvo zaštite okoliša i energetike RH - financiranje projekta AIRQ	9.147.287	16,47
12.	Projekti Hrvatske zaklade za znanost	2.665.940	4,80
B	PRIHODI OD PRUŽENIH USLUGA NA TRŽIŠTU	5.702.144	10,27
1.	Gradski ured za gospodarstvo, energetiku i zaštitu okoliša, Zagreb	804.214	1,45
2.	Klinički bolnički centar Zagreb	491.067	0,88
3.	Državni zavod za radiološku i nuklearnu sigurnost, Zagreb	48.521	0,09
4.	Klinički bolnički centar „Sestre milosrdnice“, Zagreb	396.198	0,71
5.	Zagrebačke otpadne vode d. o. o., Zagreb	257.652	0,46
6.	Klinička bolnica Dubrava, Zagreb	283.890	0,51
7.	Zavod za javno zdravstvo Koprivničko-križevačke županije, Koprivnica	212.064	0,38
8.	Ekonerg - Institut za energetiku i zaštitu okoliša d. o. o., Zagreb	143.120	0,26
9.	Hrvatski zavod za zdravstveno osiguranje, Zagreb	170.733	0,31
10.	Ministarstvo unutarnjih poslova RH, Zagreb	496.750	0,89
11.	Zavod za javno zdravstvo Brodsko-posavske županije, Slavonski Brod	64.000	0,12
12.	Grad Vinkovci	73.227	0,13
13.	Međunarodna zračna luka Zagreb d. d.	107.520	0,19
14.	Syngenta Agro d. o. o. Zagreb	48.125	0,09
15.	Nastavni zavod za javno zdravstvo „Dr. Andrija Štampar“	41.097	0,07
16.	Dom zdravlja Splitsko-dalmatinske županije, Split	78.050	0,14
17.	Cesta d. o. o. Pula	91.250	0,16
18.	HEP Proizvodnja d. o. o., Zagreb	69.400	0,12
19.	Opća bolnica Varaždin	67.450	0,12
20.	Opća bolnica Šibensko-kninske županije, Šibenik	83.960	0,15
21.	Bayer d. o. o. Zagreb	110.000	0,20
22.	Crosco naftni servisi d. o. o.	45.467	0,08
23.	Ispitivanje i mjerenje radioaktivnosti uzoraka	83.452	0,15
24.	Ocjena ekološke prikladnosti objekata	189.781	0,34
25.	Dozimetrija izvora zračenja	712.225	1,28
26.	Laboratorijske usluge - pacijenti	133.991	0,24
27.	Laboratorijske analize i toksikološke ocjene uzoraka	368.693	0,66
28.	Arhiv – pretplata	5.787	0,01
29.	Izbori u zvanja, etičko povjerenstvo, konzultantske usluge	24.460	0,04

C	PRIHODI OSTVARENI IZ OSTALIH IZVORA	7.804.483	14,05
1.	DHMZ - Program mjerenja razine onečišćenosti u Državnoj mreži	3.939.626	7,09
2.	Međunarodni projekti	620.688	1,12
3.	Prihodi iz EFRR-a za financiranje Projekta REC-IMI	471.764	0,85
4.	Fond za zaštitu okoliša - sufinanciranje projekta AIRQ	1.588.393	2,86
5.	Prihodi od dividendi, kamata i pozitivnih tečajnih razlika	54.698	0,10
6.	Refundacije troškova	146.011	0,26
7.	Prihodi od prodaje stanova i automobila	22.978	0,04
8.	Donacije i pomoći	780.000	1,40
9.	Ostali prihodi i sufinanciranje troškova	180.325	0,32
A+B+C	UKUPNI PRIHOD	55.537.593	100,00

D. PUBLIKACIJE DJELATNIKA INSTITUTA

KATEGORIJA PUBLIKACIJE	BROJ RADOVA
D.1. Znanstveni, pregledni i stručni radovi (+ prihvaćeni za objavu u 2020.)	130 (+26)
Radovi u časopisima indeksiranim u bazi WoS	89
Radovi u časopisima indeksiranim u bazi WoS prihvaćeni za objavu u 2020.	26
Radovi u časopisima indeksiranim u ostalim bazama	5
Radovi u neindeksiranim časopisima	3
Radovi u zbornicima skupova održanih u RH	25
Radovi u zbornicima skupova održanih u inozemstvu	8
D.2. Knjige, časopisi, zbornici	20
Autor ili urednik knjige	1
Rad ili poglavlje u knjizi	16
Urednik časopisa ili zbornika	3
D.3. Ostale publikacije	4
Tiskana izdanja	3
Elektronička izdanja	1
D.4. Kvalifikacijski radovi	18
Radovi djelatnika Instituta	2
Radovi pristupnika s mentorom/komentorom na Institutu	16
D.5. Kongresna priopćenja na skupovima održanim u RH	65
Sažetci u časopisima indeksiranim u bazi WoS	0
Sažetci u ostalim časopisima i knjigama sažetaka	65
Sažetci u elektroničkom izdanju	0
D.6. Kongresna priopćenja na skupovima održanim u inozemstvu	76
Sažetci u časopisima indeksiranim u bazi WoS	12
Sažetci u ostalim časopisima i knjigama sažetaka	62
Sažetci u elektroničkom izdanju	2
D.7. Izvještaji stručne djelatnosti	23
Nacionalni projekti, ugovori i suradnje	21
Međunarodni projekti, ugovori i suradnje	2
UKUPNO PUBLIKACIJA OBJAVLJENIH U 2019. (+ prihvaćenih za objavu u 2020.)	336 (+26)

D.1. ZNANSTVENI, PREGLEDNI I STRUČNI RADOVI**Radovi u časopisima indeksiranim u bazi WoS**

- AGHAJANYAN A, FUCIC A, TSKHOVREBOVA L, GIGANI O, KONJEVODA P. Genome damage in children with classical Ehlers-Danlos syndrome - An *in vivo* and *in vitro* study. *Eur J Med Genet* 2019;62(11):103546. (znanstveni rad, Q3)
- ARENAS-HUERTERO F, ZARAGOZA-OJEDA M, SÁNCHEZ-ALARCÓN J, MILIĆ M, ŠEGVIĆ KLARIĆ M, MONTIEL-GONZÁLEZ JM, VALENCIA-QUINTANA R. Involvement of AhR pathway in toxicity of Aflatoxins and other mycotoxins. *Front Microbiol* 2019;10:2347. (pregledni rad, Q1)
- AZQUETA A, MURUZABAL D, BOUTET-ROBINET E, MILIC M, DUSINSKA M, BRUNBORG G, MØLLER P, COLLINS AR. Technical recommendations to perform the alkaline standard and enzyme-modified comet assay in human biomonitoring studies. *Mutat Res Gen Tox En* 2019;843:24-32. (pregledni rad, Q3)
- BABIĆ Ž, FRANIĆ Zr, MACAN J. Keeping children safe from harmful household products: a survey on safety practices in Croatia. *Arh Hig Rada Toksikol* 2019;70:60-1. (pismo uredniku, Q3)
- BABIĆ Ž, KEŽIĆ S, MACAN J. Individual susceptibility to contact sensitization: the role of TNF alpha 308G>A polymorphism and atopy. *Eur J Dermatol* 2019;29:75-80. (znanstveni rad, Q1)
- BAČANI M, NOVAK M, KOKANOVIĆ I, BABIĆ D. Composites of multiwall carbon nanotubes and conducting polyaniline: Bulk samples and films produced from a solution in chloroform. *Curr Appl Phys* 2019;19:775-9. (znanstveni rad, Q2)

7. BARBIR R, GOESSLER W, ĆURLIN M, MICEK V, MILIĆ Mi, VUKOVIĆ B, MILIĆ Ma, LJUBOJEVIĆ M, DOMAZET JURAŠIN D, VINKOVIĆ VRČEK I. Protein corona modulates distribution and toxicological effects of silver nanoparticles *in vivo*. Part Part Syst Charact 2019;36:1900174. (znanstveni rad, Q1)
8. BAŠICA B, MIHALJEVIĆ I, MARAKOVIĆ N, KOVAČEVIĆ R, SMITAL T. Molecular characterization of zebrafish Gstr1, the only member of teleost-specific glutathione S- transferase class. Aquat Toxicol 2019;208:196-207. (znanstveni rad, Q1)
9. BAUMANN K, KORDIĆ L, MOČIBOB M, ŠINKO G, TOMIĆ S. Synthesis and *in vitro* screening of novel heterocyclic β -D-gluco- and β -D-galactoconjugates as butyrylcholinesterase inhibitors. Molecules 2019;24:2833-47. (znanstveni rad, Q2)
10. BOSAK A, OPSENICA DM, ŠINKO G, ZLATAR M, KOVARIK Z. Structural aspects of 4-aminoquinolines as reversible inhibitors of human acetylcholinesterase and butyrylcholinesterase. Chem Biol Interact 2019;308:101-9. (znanstveni rad, Q2)
11. CEDILAK M, BANJANAC M, BELAMARIC D, RADICEVIC AP, FARAHO I, ILIC K, CUZIC S, GLOJNARIC I, HABER VE, BOSNAR M. Precision-cut lung slices from bleomycin treated animals as a model for testing potential therapies for idiopathic pulmonary fibrosis. Pulm Pharmacol Ther 2019;55:75-83. (znanstveni rad, Q2)
12. COLLINS A, MILIĆ M, BONASSI S, DUSINSKA M. The comet assay in human biomonitoring: Technical and epidemiological perspectives. Mutat Res 2019;843:1-2. (uvodnik, Q3)
13. CVIJETIĆ AVDAGIĆ S, KOVAČIĆ J. Association between quantitative bone ultrasound and self-reported physical activity in nursing homes residents. Eur Geriatric Med 2019;10:659-66. (znanstveni rad, Q3)
14. DOMIJAN A-M, MARJANOVIĆ ČERMAK AM, VULIĆ A, TARTARO BUJAK I, PAVIČIĆ I, PLEADIN J, MARKOV K, MIHALJEVIĆ B. Cytotoxicity of gamma irradiated aflatoxin B₁ and ochratoxin A. J Environ Sci Health B 2019;54:155-62. (znanstveni rad, Q3)
15. DVORŠČAK M, FINGLER S, MENDAŠ G, STIPIČEVIĆ S, VASILIĆ Ž, DREVENKAR V. Distribution of organochlorine pesticide and polychlorinated biphenyl residues in lake sediment cores from the Plitvice Lakes National Park (Croatia). Arch Environ Contam Toxicol 2019;77:537-48. (znanstveni rad, Q3)
16. DVORŠČAK M, STIPIČEVIĆ S, MENDAŠ G, DREVENKAR V, MEDUNIĆ G, STANČIĆ Z, VUJEVIĆ D. Soil burden by persistent organochlorine compounds in the vicinity of a coal-fired power plant in Croatia: A comparison study with an urban-industrialized area. Environ Sci Pollut Res 2019;26:23707-16. (znanstveni rad, Q2)
17. FEITOU MATT LH, KARAICA D, DYC C, OULD B, ABDALLAHI S, MOULAYE M, BA OY, MULLIE W, FRETEY J. Sea turtle stranding events along the Mauritanian coast. Salamandra 2019;55:199-201. (znanstveni rad, Q2)
18. FRANIĆ Z. Apišumarstvo - pčelarstvo i šumarstvo. Šumarski list 2019;143:279-90. (pregledni rad, Q4)
19. FRANIĆ Zr, BABIĆ Ž, BJELAJAC A, MACAN J. Factors related to skin health in hairdressing apprentices from two Croatian regions. Contact Dermatitis 2019;81:266-73. (znanstveni rad, Q1)
20. FRANIĆ Z, BRANIĆ G. Long-term investigations of ¹³⁴Cs and ¹³⁷Cs activity concentrations in honey from Croatia. Bull Environ Contam Toxicol 2019;102:462-7. (znanstveni rad, Q3)
21. FUCHS N, MILJANIĆ A, JURIĆ A, KATIĆ A, BRAJENOVIĆ N, MICEK V, FUCHS R, BRČIĆ KARAČONJI I. Optimisation of a gas chromatography-mass spectrometry method for the simultaneous determination of tetrahydrocannabinol and its metabolites in rat urine. Arh Hig Rada Toksikol 2019;70:325-31. (znanstveni rad, Q3)
22. FUCIC A, AGHAJANYAN A, CULIG Z, LE NOVERE N. Systems oncology: Bridging pancreatic and castrate resistant prostate cancer. Pathol Oncol Res 2019;25:1269-77. (znanstveni rad, Q2)
23. GAJSKI G, GERIĆ M, DOMIJAN A-M, GOLUBOVIĆ I, GARAJ-VRHOVAC V. Evaluation of oxidative stress responses in human circulating blood cells after imatinib mesylate treatment – Implications to its mechanism of action. Saudi Pharm J 2019;27:1216-21. (znanstveni rad, Q1)
24. GAJSKI G, ŽEGURA B, LADEIRA C, POURRUT B, DEL BO' C, NOVAK M, SRAMKOVA M, MILIĆ M, GUTZKOW KB, COSTA S, DUSINSKA M, BRUNBORG G, COLLINS A. The comet assay in animal models: From bugs to whales – (Part 1 Invertebrates). Mutat Res Rev 2019;779:82-113. (pregledni rad, Q1)
25. GAJSKI G, ŽEGURA B, LADEIRA C, POURRUT B, DEL BO' C, NOVAK M, SRAMKOVA M, MILIĆ M, GUTZKOW KB, COSTA S, DUSINSKA M, BRUNBORG G, COLLINS A. The comet assay in animal models: From bugs to whales – (Part 2 Vertebrates). Mutat Res Rev 2019;781:130-64. (pregledni rad, Q1)
26. GERIĆ M, GAJSKI G, DOMIJAN A-M, GARAJ-VRHOVAC V, FILIPIĆ M, ŽEGURA B. Genotoxic effects of neurotoxin β -N-methylamino-L-alanine in human peripheral blood cells. Chemosphere 2019;214:623-32. (znanstveni rad, Q1)
27. GERIĆ M, GAJSKI G, MIHALJEVIĆ B, MILJANIĆ S, DOMIJAN A-M, GARAJ-VRHOVAC V. Radioprotective properties of food colorant sodium copper chlorophyllin on human peripheral blood cells *in vitro*. Mutat Res 2019;845:403027. (znanstveni rad, Q3)

28. GERIĆ M, POPIĆ J, GAJSKI G, GARAJ-VRHOVAC V. Cytogenetic status of interventional radiology unit workers occupationally exposed to low-dose ionising radiation: A pilot study. *Mutat Res* 2019;843:46-51. (znanstveni rad, Q3)
29. IVANIĆ M, FIKET Ž, MEDUNIĆ G, FURDEK TURK M, MAROVIĆ G, SENČAR J, KNIEWALD G. Multi-element composition of soil, mosses and mushrooms and assessment of natural and artificial radioactivity of a pristine temperate rainforest system (Slavonia, Croatia). *Chemosphere* 2019;215:668-77. (znanstveni rad, Q1)
30. JAKŠIĆ D, KOCSUBÉ S, BENCSIK O, KECSKEMÉTI A, SZEKERES A, JELIĆ D, KOPJAR N, VÁGVÖLGYI C, VARGA, ŠEGVIĆ KLARIĆ M. Aflatoxin production and *in vitro* toxicity of *Aspergilli* section *Flavi* isolated from air samples collected from different environments. *Mycotoxin Res* 2019;35:217-30. (znanstveni rad, Q2)
31. JOVANOVIĆ G, HERCEG ROMANIĆ S, STOJIĆ A, KLINČIĆ D, MATEK SARIĆ M, GRZUNOV LETINIĆ J, POPOVIĆ A. Introducing of modeling techniques in the research of POPs in breast milk – A pilot study. *Ecotoxicol Environ Saf* 2019;172:341-7. (znanstveni rad, Q1)
32. JURICA K, VRDOLJAK J, BRČIĆ KARAČONJI I. Food defence systems as an answer to food terrorism. *Arhiv Hig Rada Toksikol* 2019;70:232-55. (pregledni rad, Q3)
33. JURKIN D, ZGORELEC Ž, RINKOVEC J. Koncentracije Pt, Pd i Rh u tlu i vegetaciji / Concentrations of Pt, Pd and Rh in soil and vegetation: A review. *J Cent Eur Agric* 2019;20:686-99. (pregledni rad, nema Q)
34. KOPJAR N, FUCHS N, ŽUNEC S, MIKOLIĆ A, MICEK V, KOZINA G, LUCIĆ VRDOLJAK A, BRČIĆ KARAČONJI I. DNA damaging effects, oxidative stress responses and cholinesterase activity in blood and brain of Wistar rats exposed to Δ^9 -tetrahydrocannabinol. *Molecules* 2019;24:1560. (znanstveni rad, Q2)
35. KOŠČEC BJELAJAC A, BOBIĆ J, KOVAČIĆ J, VARNAI VM, MACAN J, SMOLIĆ Š. Employment status and other predictors of mental health and cognitive functions in older Croatian workers. *Arh Hig Rada Toksikol* 2019;70:109-16. (znanstveni rad, Q3)
36. KOŠČEC BJELAJAC A, DESPOT LUČANIN J, LUČANIN D, DELALE EA. Psychosocial predictors of sleep quality in residents of nursing homes. *GeroPsych* 2019;32:93-105. (znanstveni rad, Q4)
37. KOVARIK Z, KALISIAK J, MAČEK HRVAT N, KATALINIĆ M, ZORBAZ T, ŽUNEC S, GREEN C, RADIĆ Z, FOKIN VV, SHARPLESS KB, TAYLOR P. Reversal of tabun toxicity, enabled by a triazole annulated oxime library-reactivators of acetylcholinesterase. *Chem Eur J* 2019;25:4100-14. (znanstveni rad, Q1)
38. KOVARIK Z, MAČEK HRVAT N, KALISIAK J, KATALINIĆ M, SIT RK, ZORBAZ T, RADIĆ Z, FOKIN VV, SHARPLESS KB, TAYLOR P. Counteracting tabun inhibition by reactivation by pyridinium aldoximes that interact with active center gorge mutants of acetylcholinesterase. *Toxicol Appl Pharmacol* 2019;372:40-6. (znanstveni rad, Q1)
39. LAZARUS M, GANČEVIĆ P, ORCT T, BARIŠIĆ D, JERINA K, ŠPREM N. Barbary sheep tissues as bioindicators of radionuclide and stabile element contamination in Croatia: exposure assessment for consumers. *Environ Sci Pollut Res* 2019;26:14521-33. (znanstveni rad, Q2)
40. LJUBOJEVIĆ M, ORCT T, MICEK V, KARAICA D, JURASOVIĆ J, BRELJAK D, VRHOVAC MADUNIĆ I, RAŠIĆ D, NOVAK JOVANOVIĆ I, PERAICA M, GERIĆ M, GAJSKI G, KRALIK OGUIĆ S, ROGIĆ D, NANIĆ L, RUBELJ I, SABOLIĆ I. Sex-dependent expression of metallothioneins MT1 and MT2 and concentrations of trace elements in rat liver and kidney tissues: Effect of gonadectomy. *J Trace Elem Med Biol* 2019;53:98-108. (znanstveni rad, Q2)
41. MAKEK M, BOSNAR D, PAVELIĆ L. Scintillator pixel detectors for measurement of Compton scattering. *Condens Matter* 2019;4:24. (znanstveni rad, nema Q)
42. MAKSIMOVIĆ A, FILIPOVIĆ S, LUTVIKADIĆ I, BRAJENOVIĆ N, BRČIĆ KARAČONJI I. Effect of morphine and tramadol on serum levels of lidocaine after epidural administration in dogs. *Jpn J Vet Res* 2019;67:275-9. (znanstveni rad, Q3)
43. MARGUÍ E, JABLAN J, GERIĆ M, INIĆ S, DOMIJAN A-M, JANUŠIĆ R, ŠARČEVIĆ B, QUERALT I, GARAJ-VRHOVAC V. Critical evaluation of the use of total reflection X-ray fluorescence spectrometry for the analysis of whole blood samples: application to patients with thyroid gland diseases. *Anal Bioanal Chem* 2019;411:1659-70. (znanstveni rad, Q1)
44. MASSON O, STEINHAUSER G, ZOK D, SAUNIER O, ANGELOV H, BABIĆ D, BEČKOVÁ V, BIERINGER J, BRUGGEMAN M, BURBIDGE CI, CONIL S, DALHEIMER A, DE GEER LE, DE VISMES OTT A, ELEFTHERIADIS K, ESTIER S, FISCHER H, GARAVAGLIA MG, GASCO LEONARTE C, GORZKIEWICZ K, HAINZ D, HOFFMAN I, HÝŽA M, ISAJENKO K, KARHUNEN T, KASTLANDER J, KATZLBERGER C, KIÉREPKO R, KNETSCH GJ, KÖVENDINÉ KÓNYI J, LECOMTE M, MIETELSKI JW, MIN P, MØLLER B, NIELSEN SP, NIKOLIC J, NIKOLOVSKA L, PENEV I, PETRINEC B, POVINEC PP, QUERFELD R, RAIMONDI O, RANSBY D, RINGER W, ROMANENKO O, RUSCONI R, SAEY PRJ, SAMSONOV V, ŠILOBRITIENÉ B, SIMION E, SÖDERSTRÖM C, ŠOŠTARIĆ M,

- STEINKOPFF T, STEINMANN P, SÝKORA I, TABACHNYI L, TODOROVIC D, TOMANKIEWICZ E, TSCHIERSCH J, TSIBRANSKI R, TZORTZIS M, UNGAR K, VIDIC A, WELLER A, WERSHOFEN H, ZAGYVAI P, ZALEWSKA T, ZAPATA GARCÍA D, ZORKO B. Airborne concentrations and chemical considerations of radioactive ruthenium from an undeclared major nuclear release in 2017. *Proc Natl Acad Sci U S A* 2019;116:16750-9. (znanstveni rad, Q1)
45. MILIČEVIĆ A. The relationship between antioxidant activity, first electrochemical oxidation potential, and spin population of flavonoid radicals. *Arh Hig Rada Toksikol* 2019;70:134-9. (znanstveni rad, Q3)
46. MILIČEVIĆ A, MILETIĆ IG, NOVAK JOVANOVIĆ I. Electrochemical oxidation of flavonoids: PM6 and DFT for elucidating electronic changes and modelling oxidation potential. *J Mol Lyq* 2019;285:551-6. (znanstveni rad, Q1)
47. MILIČEVIĆ A, MILETIĆ IG, NOVAK JOVANOVIĆ I. Electrochemical oxidation of flavonoids: PM6 and DFT for elucidating electronic changes and modelling oxidation potential (part II). *J Mol Lyq* 2019;295:111730. (znanstveni rad, Q1)
48. MILIĆ M, OŽVALD I, VINKOVIĆ VRČEK I, VUČIĆ LOVRENČIĆ M, OREŠČANIN V, BONASSI S, DEL CASTILLO ER. Alkaline comet assay results on fresh and one-year frozen whole blood in small volume without cryo-protection in a group of people with different health status. *Mutat Res* 2019;843:3-10. (znanstveni rad, Q3)
49. MUNA M, BLINOVA I, KAHRU A, VINKOVIĆ VRČEK I, PEM B, ORUPÖLD K, HEINLAAN M. Combined effects of test media and dietary algae on the toxicity of CuO and ZnO nanoparticles to freshwater microcrustaceans *Daphnia magna* and *Heterocypris incongruens*: food for thought. *Nanomaterials* 2019;9:23-36. (znanstveni rad, Q1)
50. MUŽINIĆ V, RAMIĆ S, ŽELJEŽIĆ D. Chromosome missegregation and aneuploidy induction in human peripheral blood lymphocytes *in vitro* by low concentrations of chlorpyrifos, imidacloprid and alpha-cypermethrin. *Environ Mol Mutagen* 2019;62:72-84. (znanstveni rad, Q2)
51. NOVAK JOVANOVIĆ I, JADREŠKO D, MILIČEVIĆ A, HRANJEC M, PERIN N. An electrochemical study on the redox chemistry of cyclic benzimidazole derivatives with potent anticancer activity. *Electrochim Acta* 2019;297:452-62. (znanstveni rad, Q1)
52. OLIVEIRA H, BEDNARKIEWICZ A, FALK A, FRÖHLICH E, LISJAK D, PRINA-MELLO A, RESCH S, SCHIMPEL C, VINKOVIĆ VRČEK I, WYSOKINSKA E, GORRIS HH. Critical considerations on the clinical translation of upconversion nanoparticles (UCNPs): recommendations from the European Upconversion Network (COST Action CM1403). *Adv Healthcare Mater* 2019;8:1801233. (znanstveni rad, Q1)
53. OSMANOVIĆ A, SALIHOVIĆ M, KOPJAR N, ŽELJEŽIĆ D, ROCA S, ŠPIRTOVIĆ-HALILOVIĆ S, ŠAPČANIN A, ZAVRŠNIK D. Synthesis of new acyclic pyrimidine nucleoside analogues and preliminary of their cytotoxic and genotoxic effects *in vitro*. *Res J Pharm Biol Chem Sci* 2019;1:493-502. (znanstveni rad)
54. PAVIĆ M, TURČIĆ P, LJUBOJEVIĆ M. Forgotten partners and function regulators of inducible metallothioneins. *Arh Hig Rada Toksikol* 2019;70:256-64. (znanstveni rad, Q3)
55. PEM B, GONZÁLEZ-MANCEBO D, MOROS M, OCAÑA M, BECERRO AI, PAVIČIĆ I, SELMANI A, BABIĆ M, HORÁK D, VINKOVIĆ VRČEK I. Biocompatibility assessment of up- and down-converting nanoparticles: implications of interferences with *in vitro* assays. *Methods Appl Fluoresc* 2019;7:014001. (znanstveni rad, Q2)
56. PEM B, PONGRAC IM, ULM L, PAVIČIĆ I, VRČEK V, DOMAZET JURAŠIN D, LJUBOJEVIĆ M, KRIVOHLAVEK A, VINKOVIĆ VRČEK I. Toxicity and safety study of silver and gold nanoparticles functionalized with cysteine and glutathione. *Beilstein J Nanotechnol* 2019;10:1802-17. (znanstveni rad, Q2)
57. PERKO T, VAN OUDHEUSDEN M, TURCANU C, PÖLZL-VIOL C, OUGHTON D, SCHIEBER C, SCHNEIDER T, ZÖLZER F, MAYS C, MARTELL M, BAUDÉ S, CHOFFEL DE WITTE I, PRLIĆ I, CANTONE MC, SALOMAA S, DURANOVA T, ECONOMIDES S, MOLYNEUX-HODGSON S. Towards a strategic research agenda for social sciences and humanities in radiological protection. *J Radiol Prot* 2019;39:766-82. (znanstveni rad, Q2)
58. PETRINEC B, ŠOŠTARIĆ M, BABIĆ D. The role of physics in radioecology and radiotoxicology. *Arh Hig Rada Toksikol* 2019;70:3-13. (pregledni rad, Q3)
59. RADOLIĆ V, MIKLAČIĆ I, POJE SOVILJ M, STANIĆ D, PETRINEC B, VUKOVIĆ B. The natural radioactivity of Istria, Croatia. *Radiat Phys Chem* 2019;155:332-40. (znanstveni, Q1)
60. RAMEK M, MARKOVIĆ M, MUTAPČIĆ I, PEJIĆ J, KELTERER A-M, SABOLOVIĆ J. Conformational analyses of physiological binary and ternary copper(II) complexes with L-asparagine and L-histidine; Study of tridentate binding of copper(II) in aqueous solution. *ChemistryOpen* 2019;8:852-68. (znanstveni rad, Q3)
61. RAOS N. Elements and elementary substances. *Kem Ind* 2019;68:317-22. (znanstveni rad, nema Q)
62. RAOS N. Origin of life and chemical combinatorics. *Kem Ind* 2019;68:129-33. (znanstveni rad, nema Q)
63. RAŠIĆ D, MICEK V, ŠEGVIĆ KLARIĆ M, PERAIĆ M. Oxidative stress as a mechanism of combined OTA and

- CTN toxicity in rat plasma, liver and kidney. *Hum Exper Toxicol* 2019;38:434-45. (znanstveni rad, Q2)
64. RAŠIĆ D, ŽELJEŽIĆ D, KOPJAR N, KIFER D, ŠEGVIĆ KLARIĆ M, PERAIKA M. DNA damage in rat kidneys and liver upon subchronic exposure to single and combined ochratoxin A and citrinin. *World Mycotox J* 2019;12:163-72. (znanstveni rad, Q2)
 65. RINKOVEC J. Platinum, palladium, and rhodium in airborne particulate matter. *Arh Hig Rada Toksikol* 2019;70:224-31. (pregledni rad, Q3)
 66. ROD E, MATIĆ I, ANTUNOVIĆ M, VETMA V, PAVIČIĆ I, HUDETZ D, MARIJANOVIĆ I, PRIMORAC D, IVKOVIĆ A. Optimization of an *ex vivo* gene transfer to the hamstrings tendons muscle remnants: potential for genetic enhancement of bone healing. *Croat Med J* 2019;60:201-11. (znanstveni rad, Q2)
 67. ROJE Ž, ILIĆ K, GALIĆ E, PAVIČIĆ I, TURČIĆ P, STANEC Z, VINKOVIĆ VRČEK I. Synergistic effects of parabens and plastic nanoparticles on proliferation of human breast cancer cells. *Arh Hig Rada Toksikol* 2019;70:310-4. (znanstveni rad, Q3)
 68. ROSENBERG M, ILIĆ K, JUGANSON K, IVASK A, AHONEN M, VINKOVIĆ VRČEK I, KAHRU A. Potential ecotoxicological effects of antimicrobial surface coatings: a literature survey backed up by analysis of market reports. *Peer J* 2019;7:e6315. (znanstveni rad, Q2)
 69. RUSSO P, LAMONACA P, MILIC M, ROJAS E, PRINZI G, CARDACI V, VITIELLO L, PROIETTI S, SANTORO A, TOMINO C, FINI M, BONASSI S. Biomarkers of DNA damage in COPD patients undergoing pulmonary rehabilitation: Integrating clinical parameters with genomic profiling. *Mutat Res* 2019;843:111-7. (znanstveni rad, Q3)
 70. SILANO V, BAVIERA JMB, BOLOGNESI C, BRÜSCHWEILER JB, COCCONCELLI PS, CREBELLI R, GOT DM, GROB K, LAMPI E, MORTENSEN A, RIVIÈRE G, STEFFENSEN I-L, TLUSTOS C, VAN LOVEREN H, VERNIS L, HOLGER Z, JANY K-D, GLANDORF B, PENNINKS A, ŽELJEŽIĆ D, AGUILERA J, ANDRYSZKIEWICZ M, ARCELLA D, LIU Y, ENGEL K-H, CHESSON A. EFSA Panel on Food Contact Materials, Enzymes, Processing Aids (CEP). Safety evaluation of the food enzyme alpha-amylase from a genetically modified *Trichoderma reesei* (strain DP-Nzb48). *EFSA J* 2019;17:5553. (mišljenje, nema Q)
 71. SILANO V, BAVIERA JMB, BOLOGNESI C, BRÜSCHWEILER BJ, COCCONCELLI PS, CREBELLI R, GOTT DM, GROB K, LAMPI E, MORTENSEN A, RIVIÈRE G, STEFFENSEN I-L, TLUSTOS C, VAN LOVEREN H, VERNIS L, ZORN H, GLANDORF B, HERMAN L, JANY K-D, KÄRENLAMPI S, PENNINKS A, ŽELJEŽIĆ D, AGUILERIA GÓMEZ M, ARCELLA D, HORN C, KOVALKOVIČOVÁ N, LIU Y, MAIA JM, CHESSON A. EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP): Safety evaluation of the food enzyme glucose oxidase from *Aspergillus niger* (strain ZGL). *EFSA J* 2019;17:5629. (mišljenje, nema Q)
 72. SILANO V, BAVIERA JMB, BOLOGNESI C, BRÜSCHWEILER BJ, COCCONCELLI PS, CREBELLI R, GOTT DM, GROB K, LAMPI E, MORTENSEN A, RIVIERE G, STEFFENSEN I-L, TLUSTOS C, VAN LOVEREN H, VERNIS L, ZORN H, JANY K-D, GLANDORF B, PENNINKS A, ŽELJEŽIĆ D, ANDRYSZKIEWICZ M, ARCELLA D, LIU Y, ROSSI A, ENGEL K-H, CHESSON A. EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP): Safety evaluation of the food enzyme alpha-amylase from non-genetically modified *Aspergillus niger* strain (strain DP-Azb60). *EFSA J* 2019;17:5680. (mišljenje, nema Q)
 73. SILANO V, BAVIERA JMB, BOLOGNESI C, BRÜSCHWEILER BJ, COCCONCELLI PS, CREBELLI R, GOTT DM, GROB K, LAMPI E, MORTENSEN A, RIVIÈRE G, STEFFENSEN I-L, TLUSTOS C, VAN LOVEREN H, VERNIS L, ZORN H, HERMAN L, PENNINKS A, ŽELJEŽIĆ D, ANDRYSZKIEWICZ M, ARCELLA D, LIU Y, ENGEL K-H, CHESSON A. EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP): Safety evaluation of the food enzyme alpha-amylase from a genetically modified *Bacillus subtilis* (strain NBA). *EFSA J* 2019;17:5681. (mišljenje, nema Q)
 74. SILANO V, BAVIERA JMB, BOLOGNESI C, BRÜSCHWEILER BJ, COCCONCELLI PS, CREBELLI R, GOTT DM, GROB K, LAMPI E, MORTENSEN A, RIVIÈRE G, STEFFENSEN I-L, TLUSTOS C, VAN LOVEREN H, VERNIS L, ZORN H, GLANDORF B, PENNINKS A, ŽELJEŽIĆ D, GOMES A, ENGEL K-H, CHESSON A. EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP): Safety evaluation of the food enzyme alpha-amylase from *Bacillus licheniformis* (strain DP-Dzb44). *EFSA J* 2019;17:5738. (mišljenje, nema Q)
 75. SILANO V, BAVIERA JMB, BOLOGNESI C, BRÜSCHWEILER BJ, COCCONCELLI PS, CREBELLI R, GOTT DM, GROB K, LAMPI E, MORTENSEN A, RIVIÈRE G, STEFFENSEN I-L, TLUSTOS C, VAN LOVEREN H, VERNIS L, ZORN H, GLANDORF G, PENNINKS A, ŽELJEŽIĆ D, AGUILERA J, LIU Y, CHESSON A. EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP): Safety evaluation of the food enzyme glucan 1,4-alpha-maltotetraohydrolase from *Bacillus licheniformis* (strain DP-Dzf24). *EFSA J* 2019;17:5739. (mišljenje, nema Q)
 76. SKOKO B, BABIĆ D, MAROVIĆ G, PAPIĆ S. Environmental radiological risk assessment of a coal ash and slag disposal site with the use of the ERICA Tool. *J Environ Radioactivity* 2019;208-209:106018. (znanstveni

- rad, Q3)
77. SMREČKI N, RONČEVIĆ T, JOVIĆ O, KUKOVEC B-M, MARAVIĆ A, GAJSKI G, ČIKEŠ-ČULIĆ V. Copper(II) complexes with N'-methylsarcosinamide selective for human bladder cancer cells. *Inorg Chim Acta* 2019;488:312-20. (znanstveni rad, Q2)
 78. ŠINKO G. Assessment of scoring functions and *in silico* parameters for AChE-ligand interactions as a tool for predicting inhibition potency. *Chem Biol Interact* 2019;308:216-23. (znanstveni rad, Q2)
 79. ŠTAF A, ŽUNAR B, PRANKLIN A, ZANDONA A, SVETEC MIKLENIĆ M, ŠANTEK B, SVETEC I-K. Novel approach in the construction of bioethanol-producing *Saccharomyces cerevisiae* hybrid. *Food Technol Biotechnol* 2019;57:5-16. (znanstveni rad, Q3)
 80. TADIN A, GAVIC L, GOVIC T, GALIC N, VLADISLAVIC NZ, ZELJEZIC D. *In vivo* evaluation of fluoride and sodium lauryl sulfate in toothpaste on buccal epithelial cells toxicity. *Acta Odontol Scand* 2019;77:38693. (znanstveni rad, Q3)
 81. TADIN A, GAVIC L, JURKOVIC I, VIDOVIC N, JERKOVIC D, ZELJEZIC D. Cytogenetic biomonitoring of dental technicians: a cross-sectional study. *J Prosthodont* 2019;28:106-12. (znanstveni rad, Q2)
 82. TADIN A, GAVIC L, ROGULJIC M, JERKOVIC D, ZELJEZIC D. Nuclear morphological changes in gingival epithelial cells of patients with periodontitis. *Clin Oral Investig* 2019;23:3749-57. (znanstveni rad, Q1)
 83. TAYLOR P, YAN-JYE S, MOMPERS J, HOU W, CAMACHO-HERNANDEZ GA, RADIĆ Z, ROSENBERG Y, KOVARIK Z, SIT RK, SHARPLESS BK. Assessment of ionizable, zwitterionic oximes as reactivating antidotal agents for organophosphate exposure. *Chem Biol Interact* 2019;308:194-7. (pregledni rad, Q2)
 84. TIMPERLEY CM, ABDOLLAHI M, AL-AMRI AS, BAULIG A, BENACHOUR D, BORRETT V, CARIÑO FA, GEIST M, GONZALEZ D, KANE W, KOVARIK Z, MARTÍNEZ-ÁLVAREZ R, FUSARO MOURÃO NM, NEFFE S, RAZA SK, RUBAYLO V, SUÁREZ AG, TAKEUCHI K, TANG C, TRIFIRÒ F, VAN STRATEN FM, VANNINEN PS, VUČINIĆ S, ZAITSEV V, ZAFAR-UZ-ZAMAN M, ZINA MS, HOLEN S, FORMAN JE, ALWAN WS, SURI V. Advice on assistance and protection from the Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons: Part 2. On preventing and treating health effects from acute, prolonged, and repeated nerve agent exposure, and the identification of medical countermeasures able to reduce or eliminate the longer term health effects of nerve agents. *Toxicology* 2019;413:13-23. (pregledni rad, Q1)
 85. TIMPERLEY CM, FORMAN JE, ABDOLLAHI M, AL-AMRI AS, BAULIG A, BENACHOUR D, BORRETT V, CARIÑO FA, GEIST M, GONZALEZ D, KANE W, KOVARIK Z, MARTÍNEZ-ÁLVAREZ R, MOURÃO NMF, NEFFE S, RAZA SK, RUBAYLO V, SUÁREZ AG, TAKEUCHI K, TANG C, TRIFIRÒ F, VAN STRATEN FM, VANNINEN PS, VUČINIĆ S, ZAITSEV V, ZAFAR-UZ-ZAMAN M, ZINA MS, HOLEN S. Advice on assistance and protection provided by the Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons: Part 1. On medical care and treatment of injuries from blister and nerve agents. *Toxicology* 2019;415:56-69. (pregledni rad, Q1)
 86. TOMASOVIC-LONCARIC C, FUCIC A, ANDABAK A, ANDABAK M, CEPPI M, BRUZZONE M, VRDOLJAK D, VUCICEVIC-BORAS V. Androgen receptor as a biomarker of oral Squamous cell carcinoma progression risk. *Anticancer Res* 2019;39:4285-9. (znanstveni rad, Q4)
 87. VUČIČEVIĆ BORAS V, FUČIĆ A, BARANOVIĆ S, BLIVAJŠ I, MILENOVIĆ M, BIŠOF V, RAKUŠIĆ Z, CEPPI M, BRUZZONE M. Environmental and behavioural head and neck cancer risk factors. *Cent Eur J Public Health* 2019;27:106-10. (znanstveni rad, Q4)
 88. WANG Q, ŠARKANJ B, JURASOVIĆ J, CHISTI Y, SULYOK M, GONG J, SIRISANSANEYAKUL S, KOMES D. Evaluation of microbial toxins, trace elements and sensory properties of a high-theabrownins instant Pu-erh tea produced using *Aspergillus tubingensis* via submerged fermentation. *Int J Food Sci Technol* 2019;54:1541-9. (znanstveni rad, Q2)
 89. ZORBAZ T, MALINAK M, KUČA K, MUSILEK K, KOVARIK Z. Butyrylcholinesterase inhibited by nerve agents is efficiently reactivated with chlorinated pyridinium oximes. *Chem Biol Interact* 2019;307:16-20. (znanstveni rad, Q2)

Radovi u časopisima indeksiranim u bazi WoS prihvaćeni za objavu u 2020.

90. ANČIĆ M, HUĐEK A, RIHTARIĆ I, CAZAR M, BAČUN-DRUŽINA V, KOPJAR N, DURGO K. Physico chemical properties and toxicological effect of landfill groundwaters and leachates. *Chemosphere* 2020;238:124574. (znanstveni rad, Q1)
91. AZQUETA A, LADEIRA C, GIOVANNELLI L, BOUTET-ROBINET E, BONASSI S, NERI M, GAJSKI G, DUTHIE S, DEL BO' C, RISO P, KOPPEN G, BASARAN N, COLLINS A, MØLLER P. Application of the comet assay in human biomonitoring: An hCOMET perspective. *Mutat Res – Rev Mutat Res* 2020;783:108288. (znanstveni rad, Q1)

92. BOSAK A, BAVEC A, KONTE T, ŠINKO G, KOVARIK Z, GOLIČNIK M. Interactions of paraoxonase-1 with pharmacologically relevant carbamates. *Molecules* 2020;25(1). pii: E211. (znanstveni rad, Q2)
93. CVIJETIĆ S, BASHOTA L, ŠATALIĆ Z. Characteristics of calcium intake in nursing home residents in Zagreb. *Mljekarstvo* 2020; prihvaćen za objavljivanje (znanstveni rad, Q3)
94. DUKA I, GERIĆ M, GAJSKI G, FRIŠČIĆ M, MALEŠ Ž, DOMIJAN A-M, TURČIĆ P. Optimization of a fast screening method for the assessment of low molecular weight thiols in human blood and plasma suitable for biomonitoring studies. *J Environ Sci Health A Tox Hazard Subst Environ Eng* 2020;55:275-80. (znanstveni rad, Q3)
95. FRANIĆ Z, BRANICA G, PETRINEC B, MAROVIĆ G. Long term investigation of ¹³⁷Cs in chicken meat and eggs from northwest Croatia. *J Environ Sci Health B* (znanstveni rad, Q3)
96. GAJSKI G, GERIĆ M, ŽIVKOVIĆ SEMREN T, TARIBA LOVAKOVIĆ B, OREŠČANIN V, PIZENT A. Application of the comet assay for the evaluation of DNA damage from frozen human whole blood samples: Implications for human biomonitoring. *Toxicol Lett* 2020;319:58-65. (znanstveni rad, Q2)
97. KAŠUBA V, MICEK V, PIZENT A, LOVAKOVIĆ BT, ŽELJEŽIĆ D, MILIĆ M, KOPJAR N. DNA damage in kidney and parenchymal and non-parenchymal liver cells of adult Wistar rats after subchronic oral treatment with tembotrione. *Environ Sci Pollut Res Int* 2020;27:1800-7. (znanstveni rad, Q2)
98. KLINČIĆ D, DVORŠČAK M, JAGIĆ K, MENDAŠ G, HERCEG ROMANIĆ S. Levels and distribution of polybrominated diphenyl ethers in humans and environmental compartments: a comprehensive review of the last five years of research. *Environ Sci Pollut Res* 2020;27:5744-58. (znanstveni rad, Q2)
99. KOŠČEC BJELAJAC A, BAKOTIĆ M, ROSS B. Weekly alternation of morning and afternoon school start times: Implications for sleep and daytime functioning of adolescents. *Sleep* 2020; prihvaćen za objavljivanje (znanstveni rad, Q1)
100. KOVAČIĆ J. Learning parameters of Bayesian networks from datasets with systematically missing data: a meta-analytic approach. *Expert Syst Appl* 2020;141:112956. (znanstveni rad, Q1)
101. LAZARUS M, ORCT T, SERGIEL A, VRANKOVIĆ L, MARIJIĆ VF, RAŠIĆ D, RELJIĆ S, ALADROVIĆ J, ZWIJACZ-KOZICA T, ZIĘBA F, JURASOVIĆ J, ERK M, MAŠLAK R, SELVA N, HUBER Đ. Metal(loid) exposure assessment and biomarker responses in captive and free-ranging European brown bear (*Ursus arctos*). *Environ Res* 2020;183:109166. (znanstveni rad, Q1)
102. MACAN J, BALENOVIĆ A, TURK R. Independent contact allergy to bisphenol F epoxy resin: a case report. *Contact Dermatitis* 2020;82:70-1. (stručni rad, Q1)
103. MAČEK HRVAT N, KALISIAK J, ŠINKO G, RADIĆ Z, SHARPLESS KB, TAYLOR P, KOVARIK Z. Evaluation of high-affinity phenyltetrahydroisoquinoline aldoximes, linked through anti-triazoles, as reactivators of phosphorylated cholinesterases. *Toxicol Lett* 2020;321:83-9. (znanstveni rad, Q2)
104. MAKEK M, BOSNAR D, PAVELIĆ L, ŠENJUG P, ŽUGEC P. Single-layer Compton detectors for measurement of polarization correlations of annihilation quanta. *Nucl Instrum Methods Phys Res A* 2020;958:2019.162835 (znanstveni rad, Q2)
105. MIHALJEVIĆ I, BAŠICA B, MARAKOVIĆ N, KOVAČEVIĆ R, SMITAL T. Interaction of organotin compounds with three major glutathione S-transferases in zebrafish. *Toxicol In Vitro* 2020;62:104713. (znanstveni rad, Q2)
106. PAVELIĆ L, LACKOVIĆ I, SURIĆ MIHIĆ M, PRLIĆ I. A technology overview of active ionizing radiation dosimeters for photon fields. *Rad Prot Dosim* 2020 (znanstveni rad, Q4)
107. PAVIČIĆ I, MILIĆ M, PONGRAČ IM, BRKIĆ AHMED L, MATIJEVIĆ GLAVAN T, ILIĆ K, ZAPLETAL E, ĆURLIN M, MITREČIĆ D, VINKOVIĆ VRČEK I. Neurotoxicity of silver nanoparticles stabilized with different coating agents: *In vitro* response of neuronal precursor cells. *Food Chem Toxicol* 2020;136:110935. (znanstveni rad, Q1)
108. PINTAR A, STIPIČEVIĆ S, LAKIĆ J, BARIĆ K. Phytotoxicity of mesotrione residues on sugar beet (*Beta vulgaris* L.) in agricultural soils differing in adsorption affinity. *Sugar Tech* 2020;22:137-42. (znanstveni rad, Q3)
109. RAŠIĆ D, JAKŠIĆ D, HULINA TOMAŠKOVIĆ A, KIFER D, KOPJAR N, RUMORA L, ŽELJEŽIĆ D, PERAIĆ M, ŠEGVIĆ KLARIĆ M. Sterigmatocystin moderately induces oxidative stress in male Wistar rats after short-term oral treatment. *Mycotoxin Res* 2019. (znanstveni rad, Q1)
110. SELMANI A, ULM LEA, KASEMETS K, KURVET I, ERCEG I, BARBIR R, PEM B, SANTINI P, DELAČ MARION I, VINKOVIĆ T, KRIVOHLAVEK A, DUTOUR SIKIRIĆ M, KAHRU A, VINKOVIĆ VRČEK I. Stability and toxicity of differently coated selenium nanoparticles under model environmental exposure settings. *Chemosphere* 2020;250:126265. (znanstveni rad, Q1)
111. ŠAGUD I, MAČEK HRVAT N, GRGIČEVIĆ A, ČADEŽ T, HODAK J, DRAGOJEVIĆ M, LASIĆ K, KOVARIK Z, ŠKORIĆ

- I. Design, synthesis and cholinesterase inhibitory properties of new oxazole benzylamine derivatives. *J Enzyme Inhib Med Chem* 2020;35:460-7. (znanstveni rad, Q1)
112. ŠIMIĆ I, JOVANOVIĆ G, HERCEG ROMANIĆ S, KLINČIĆ D, MATEK SARIĆ M, POPOVIĆ A. Optimization of gas chromatography-electron ionization-tandem mass spectrometry for determining toxic non-ortho polychlorinated biphenyls in breast milk. *Biomed Environ Sci* 2020;33:58-61. (pismo uredniku, Q3)
113. VEINOVIĆ Ž, PRLIĆ I, KUJUNDŽIĆ T, SURIĆ MIHIĆ M, PERKOVIĆ D, DOMITROVIĆ D, KORMAN T, MOSTEČAK A, UROIĆ G. Gospodarenje reziduima u okviru Nacionalnog programa provedbe Strategije zbrinjavanja radioaktivnog otpada, iskorištenih izvora i istrošenog nuklearnog goriva Republike Hrvatske (KUI-43/2019). *Kem Ind* (znanstveni rad, nema Q)
114. VRANDEČIĆ K, ČOSIĆ J, ILIĆ J, RAVNJAK B, SELMANI A, GALIĆ E, PEM B, BARBIR R, VINKOVIĆ VRČEK I, VINKOVIĆ T. Antifungal activities of silver and selenium nanoparticles stabilized with different surface coating agents. *Pest Manag Sci* 2020 (znanstveni rad, Q1)
115. WITTLICH M, JOHN SM, TIPLICA GS, ŠALJAVĀSTRU CM, BUTACU AI, MODENESE A, PAOLUCCI V, D'HAUW G, GOBBA F, SARTORELLI P, MACAN J, KOVAČIĆ J, GRANDAHL K, MOLDOVAN H. Personal solar ultraviolet radiation dosimetry in an occupational setting across Europe. *J Eur Acad Dermatol Venereol* 2020; prihvaćen za objavljivanje (znanstveni rad, Q1)

Radovi u časopisima indeksiranim u ostalim bazama

116. BELIS CA, PERNIGOTTI D, PIROVANO G, FAVEZ O, JAFFREZO JL, KUENEN J, DENIER VAN DER GON H, REIZER M, RIFFAULT V, ALLEMAN LY, ALMEIDA M, AMATO F, ANGYAL A, ARGYROPOULOS G, BANDE S, BESLIC I, BESOMBES-J-L, BOVE MC, BROTTTO P, CALORI G, CESARI D, COLOMBI C, CONTINI D, DE GENNARO G, DI GILIO A, DIAPOULI E, EL HADDAD I, ELBERN H, ELEFTHERIADIS K, FERREIRA J, GARCIIVIVANCO M, GILARDONI S, GOLLY B, HELLEBUST S, HOPKE PK, IZADMANESH Y, JORQUERA H, KRAJSEK K, KRANENBURG R, LAZZERI P, LENARTZ F, LUCARELLI F, MACIEJEWSKA K, MANDERS A, MANOUSAKAS M, MASIOL M, MIRCEA M, MOOIBROEK D, NAVA S, OLIVEIRA D, PAGLIONE M, PANDOLFI M, PERRONE M, PETRALIA E, PIETRODANGELO A, PILLON S, POKORNA P, PRATI P, SALAMEH D, SAMARA C, SAMEK L, SARAGA D, SAUVAGE S, SCHAAP M, SCOTTO F, SEGA K, SIOUR G, TAULER R, VALLI G, VECCHI R, VENTURINI E, VESTENIUS M, WAKED A, YUBERO E. Evaluation of receptor and chemical transport models for PM10 source apportionment. *Atmos Environ X* 2020;5:100053. (znanstveni rad)
117. FRANIĆ Zr, MACAN J, KUJUNDŽIĆ BRKULJ M. Profesionalna otrovanja zabilježena u Centru za kontrolu otrovanja tijekom 2018. godine. *Sigurnost* 2019;61:175-8. (stručni rad)
118. MILIĆ M, BOLANČA I, GJIRLIĆ D, BENKOVIĆ V. Assessment of Listerine Cool Mint mouthwash influence on possible DNA damage measured by buccal micronucleus cytome assay-preliminary results. *Genetics & Applications* 2019;3:24-35. (znanstveni rad)
119. ŠARIĆ V, ŠKEVA G, LJUBEK T, TURK R, MACAN J. Suradnja kao temelj za promicanje sustava sigurnosti i zdravlja zaposlenika. *Sigurnost* 2019;61:373-8. (stručni rad)
120. TARIBA LOVAKOVIĆ B. Cadmium, arsenic, and lead: elements affecting male reproductive health. *Curr Opin Toxicol* 2020;19:7-14. (znanstveni rad)

Radovi u neindeksiranim časopisima

121. FRANIĆ Z. Pčele Astronauti. *Hrvatska pčela* 2019;138:381-2.
122. FRANIĆ Z. Pčelinjak pustinje Blaca. *Hrvatska pčela* 2019;138:340-2.
123. KOVARIK Z, MAČEK HRVAT N, ŽUNEC S, KATALINIĆ M. Detoxification of tabun-exposed mice by an acetylcholinesterase mutant assisted with a novel pyridinium aldoxime. *Biol Serb* 2019;41:4-8.

Radovi u kongresnim zbornicima skupova održanih u RH

124. BENKOVIĆ V, MODRIĆ Ž, HORVAT KNEŽEVIĆ A, MARČINA N, BOROJEVIĆ N, ORŠOLIĆ N, KOPJAR N, MILIĆ M. Primary DNA damage in peripheral blood and kidney cells of Swiss albino mice after Isoflurane anesthesia and whole body γ -radiation exposure. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str.127-32. (znanstveni rad)
125. BITUH T, SKOKO B, PETRINEC B, MAROVIĆ G. Procjena radiološkog utjecaja fosfogipsa na biotu uporabom programa ERICA Tool / Assessment of the phosphogypsum deposition site impact on the environment using ERICA Tool. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian

- Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 263-8. (znanstveni rad)
126. BRANICA G, FRANIĆ Z, MAROVIĆ G. Istraživanje kontaminacije piletine radiocezijem u sjeverozapadnoj Hrvatskoj / Radiocaesium contamination in chicken meat from northwestern Croatia. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 217-20. (znanstveni rad)
127. DAVILA S, BEŠLIĆ I. Usporedba elementne analize triju frakcija lebdećih čestica ED-XRF spektrometrijom. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 350-4. (znanstveni rad)
128. FRANIĆ Z. Pčele i zračenje / Bees and radiation. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 20-5. (znanstveni rad)
129. FRANIĆ Zr. Komparacija biološke aktivnosti različitih vrsta meda. U: Hegić G, urednik. Zbornik izlaganja 4. hrvatskog simpozija o vrijednosti pčelinjih proizvoda u očuvanju zdravlja s međunarodnim sudjelovanjem „Apiterapija – očuvanje zdravlja pčelinjim proizvodima“; 7. prosinca 2019.; Zagreb, Hrvatska. Zagreb: Hrvatsko apiterapijsko društvo; 2019. str. 12-5. (znanstveni rad)
130. JAKOVLJEVIĆ I, GODEC R, SEVER ŠTRUKIL Z, ŠIMIĆ I, PEHNEC G. Masene koncentracije PAU, OC i EC u PM₁ frakciji lebdećih čestica. U: Tomas S, Ačkar Đ, urednici. 17. Ružičkini dani „Danas znanost – sutra industrija“; 19. – 21. rujna 2018.; Vukovar, Hrvatska. Zagreb: Sveučilište Josipa Jurja Strossmayera u Osijeku Prehrambeno-tehnološki fakultet Osijek i Hrvatsko društvo kemijskih inženjera i tehnologa; 2019. str. 134-41. (znanstveni rad)
131. JURIČ A, BRČIĆ KARAČONJI I, ŽUNEC S, MIKOLIĆ A, KOPJAR N. Cito/genoprotektivni i antioksidacijski učinci meda obične planike na oštećenja ljudskih limfocita izazvana UVB zračenjem u uvjetima *in vitro* / Assessment of cyto/genoprotective and antioxidative properties of strawberry tree honey against UVB radiation *in vitro*. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 121-6. (znanstveni rad)
132. JUSTIĆ M, PAVELIĆ L, SURIĆ MIHIĆ M, PRLIĆ I. Izrada fantoma za mamografiju / Construction of the mammography phantom. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 83-5. (znanstveni rad)
133. KOVAČIĆ M, PETROCI Lj, FRANULOVIĆ I, AVDIĆ M. ⁹⁰Sr u povrću u Zagrebu i Zadru / ⁹⁰Sr in vegetables in the city of Zagreb and Zadar. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 231-5. (znanstveni rad)
134. MACAN J. Grinje (*Acari*). U: Korunić J, urednik. DDD trajna edukacija: Suzbijanje ostalih sezonski napsnih člankonožaca, uzročnika alergijskih reakcija i repelentna zaštita od zmija. Zagreb: Korunić d. o. o.; 2019. str. 73-85. (stručni rad)
135. MAROVIĆ G, RELJIĆ S, KUSAK J, HUBE DJ, FRANIĆ Z, AVDIĆ M, SENČAR J. Cezij u vukovima kao mjerilo radiološke čistoće okoliša u Hrvatskoj / Cesium in wolves as an indicator of environmental radiological purity in Croatia. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 227-30. (znanstveni rad)
136. MEŠTROVIĆ T, PETRINEC B, ŠOŠTARIĆ M, HEDI A, MARJANOVIĆ K, MIKLAVČIĆ I, BABIĆ D. Određivanje brzine ambijentalnog ekvivalenta doze ($H^*(10)/t$) u Kopačkom ritu / Ambient dose equivalent rate ($H^*(10)/t$) in Kopački Rit Nature Park. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian

- Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 247-50. (znanstveni rad)
137. MIHALJEVIĆ A, ŽUŽUL S. Utjecaj vrste filtarskog medija na granice detekcije elemenata u analizi lebdećih čestica u zraku. U: Tomas S, Ačkar Đ, urednici. 17. Ružičkine dani „Danas znanost – sutra industrija“, 19. – 21. rujna 2018.; Vukovar, Hrvatska. Zagreb: Sveučilište Josipa Jurja Strossmayera u Osijeku Prehrambeno-tehnološki fakultet Osijek i Hrvatsko društvo kemijskih inženjera i tehnologa; 2019. str. 176-85. (znanstveni rad)
138. MILIĆ M, MILKOVIĆ Đ, GERIĆ M, NODILO M, RANOGAJEC-KOMOR M, GAJSKI G. Buccal micronucleus assay: an introductory study on X-ray exposed child population. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 116-20. (znanstveni rad)
139. MILIĆ M, ROZGAJ R, KAŠUBA V, KOPIJAR N, RAMIĆ S, HORVAT KNEŽEVIĆ A, BENKOVIĆ V. Cytogenetic status of workers exposed to low doses of ionizing radiation with dosimetry and importance of the distribution of DNA damage in different biodosimetry methods in the results estimation. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 110-5. (znanstveni rad)
140. PAVELIĆ L, SURIĆ MIHIĆ M, HAJDINJAK M, PRLIĆ I. Razvoj i simulacija dozimetrijske akvizicijske elektronike za scintilacijske detektore / Development and simulation of dosimetric acquisition electronics for scintillation detectors. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 331-5. (znanstveni rad)
141. PEHNEC G, RINKOVEC J, MAROVIĆ G, PETRINEC B, SENČAR J. Radioaktivnost i elementi platinske skupine u zraku Zagreba. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 236-41. (znanstveni rad)
142. PETRINEC B, ŠOŠTARIĆ M, BABIĆ D, AVDIĆ M. Razvoj terenskih metoda za nadzor radioaktivnosti okoliša / Development of *in-situ* methods for environmental radioactivity monitoring. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 309-13. (znanstveni rad)
143. SEVER ŠTRUKIL Z, JAKOVLJEVIĆ I, PEHNEC G. Procjena izvora onečišćenja zraka PAU u Zagrebu korištenjem dijagnostičkih omjera. U: Tomas S, Ačkar Đ, urednici. 17. Ružičkine dani „Danas znanost – sutra industrija“, 19. – 21. rujna 2018.; Vukovar, Hrvatska. Zagreb: Sveučilište Josipa Jurja Strossmayera u Osijeku Prehrambeno-tehnološki fakultet Osijek i Hrvatsko društvo kemijskih inženjera i tehnologa; 2019. str. 193-203. (znanstveni rad)
144. SURIĆ MIHIĆ M, PETRINEC B, MAROVIĆ G, SENČAR J. Procjena očekivane efektivne doze udisanjem ¹⁰⁶Ru početkom listopada 2017. godine / An estimate of the committed effective dose due to inhalation of ¹⁰⁶Ru at the beginning of October 2017. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 147-51. (znanstveni rad)
145. SURIĆ MIHIĆ M, ŠIŠKO J, PAVIĆ GREGO A. Ekvivalentna doza za kožu i šake izloženih radnika u nuklearnoj medicini / The equivalent dose for the skin and hands of exposed workers in nuclear medicine. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 92-6. (znanstveni rad)
146. ŠIŠKO J, SURIĆ MIHIĆ M, JUSTIĆ M. Procjena efektivne doze za servisera helikoptera / Effective dose estimation for helicopter repair workers. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium

- of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 152-5. (znanstveni rad)
147. ZAUNER B, JUSTIĆ M, SURIĆ MIHIĆ M, PRLIĆ I. Kalibracija indikatora doze u dentalnoj medicini / Calibration of dose indicators (KAP/DAP meters) in dental medicine. U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 97-9. (znanstveni rad)
148. ŽUŽUL S, DAVILA S, RINKOVEC J, BEŠLIĆ I. Upotreba ED-XRF metode u odabiru filtarskog medija za uzorkovanje lebdećih čestica u zraku U: Popić J, Coha I, Krajcar Bronić I, Knežević Medija Ž, urednice. Zbornik radova 12. simpozija Hrvatskog društva za zaštitu od zračenja / Proceedings of the 12th Symposium of the Croatian Radiation Protection Association; 10. – 12. travnja 2019.; Varaždin, Hrvatska. Zagreb: Hrvatsko društvo za zaštitu od zračenja; 2019. str. 346-9. (znanstveni rad)

Radovi u kongresnim zbornicima skupova održanih u inozemstvu

149. AGHAZADEH A, GAJSKI G, JURECSKA L, KIŠ M, TUMPA A. PlantPower – Phytoremediation of contaminated soils in former minefields of the Western Balkan Area. U: Hanus C, Steiner G, urednici. Danube: Future Interdisciplinary School Proceedings 2017: Cultural and Social Implications of Global Change on the Danube River Basin. Krems: Donau-Universität Krems; 2019. str. 78-89. (znanstveni rad)
150. DAVILA S, BEŠLIĆ I, MARIĆ M, HRGA I. Comparison of electro-chemical sensors for air quality monitoring with reference methods in Zagreb. U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23.-27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 112-22. (znanstveni rad)
151. GLUŠČIĆ V, ČAČKOVIĆ M, PEHNEC G, BEŠLIĆ I. Ionic composition of PM_{2.5} particle fraction at a coastal urban background site in Croatia. U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23. – 27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 123-8. (znanstveni rad)
152. GODEC R, ŠIMIĆ I, ŠILOVIĆ HUJIĆ M, BEŠLIĆ I, DAVILA S, MIHALJEVIĆ M. Carbon content in PM_{2.5} at a coastal measuring site in Croatia. U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23. – 27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 94-104. (znanstveni rad)
153. JAKOVLJEVIĆ I, SEVER ŠTRUKIL Z, GODEC R, PEHNEC G. PAHs in PM₁ particle fraction at an urban location in Croatia U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23. – 27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 105-11. (znanstveni rad)
154. PEHNEC G, JAKOVLJEVIĆ I, GODEC R, ŽERO S, HUREMOVIĆ J, DŽEPINA K. Carcinogenic organic content of particulate matter at urban locations with different pollution sources. U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23. – 27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 137-45. (znanstveni rad)
155. RINKOVEC J, PEHNEC G, ŽUŽUL S. Nickel, arsenic, cadmium, and lead in PM₁ fraction in Zagreb, Croatia. U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23. – 27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 76-83. (znanstveni rad)
156. ŠIMIĆ I, MENDAŠ STARČEVIĆ G, PEHNEC G. Atmospheric deposition of organic compounds. U: Kara M, Dumanoglu Y, Tuna Tuygun G, Bayram A, Elbir T, urednici. Proceedings of the 18th World Clean Air Congress 2019; 23. – 27. rujna 2019.; Istanbul, Turska. Izmir: Turkish National Committee for Air Pollution Research and Control (TUNCAP); 2019. str. 129-36. (znanstveni rad)

D.2. KNJIGE, ČASOPISI, ZBORNICI

Autor ili urednik knjige

157. STIPIČEVIĆ S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019.

Rad ili poglavlje u knjizi

158. BABIĆ Ž, TURK R. Spriječimo otrovanja djece. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 7-13.
159. DVORŠČAK M. Postojana organska zagađivala od primjene do nuspojava. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 27-35.
160. FRANIĆ Z, BRNARDIĆ N. Ekološko pčelarstvo. U: Hegić G, urednica. Pčelarstvo, apiterapija, apiturizam. Zagreb: Geromar d.o.o; 2019. str. 39-60.
161. FRANIĆ Z, FRANIĆ Zr. Povijest apiterapije u Hrvatskoj. U: Hegić G, urednica. Pčelarstvo, apiterapija, apiturizam. Zagreb: Geromar d.o.o; 2019. str. 231-44.
162. FRANIĆ Zr, HEGIĆ G. Prva pomoć nakon uboda pčela. U: Hegić G, urednica. Pčelarstvo, apiterapija, apiturizam. Zagreb: Geromar d.o.o; 2019. str. 223-8.
163. FRANIĆ Zr, TURK R. Najotrovnije gljive Hrvatske. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 36-42.
164. GERIĆ M, GAJSKI G, GARAJ-VRHOVAC V. Toxicity of antineoplastic drug mixtures. U: Heath E, Isidori M, Filipič M, Kosjek T, urednice. Fate and effects of anticancer drugs in the environment. Cham: Springer Nature Switzerland AG; 2020. str. 421-40.
165. JURICA K, BRČIĆ KARAČONJI I. Maginja – neotkriveno mediteransko blago. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 21-6.
166. KOŠČEC BJELAJAC A. Zdravo spavanje i zdrava budnost u adolescenciji. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 14-20.
167. KUJUNDŽIĆ BRKULJ M. Buka – zagađenje koje se čuje. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 43-8.
168. MILIĆ M, BONASSI S, NERI M. The effect of dust, asbestos and other fibers on DNA damage measured using the micronucleus assay. Chapter 33. U: Knasmüller S, Fenech M, urednici. Issues in toxicology No. 39. The micronucleus assay in toxicology. London: Royal Society of Chemistry; 2019. str. 547-650.
169. PERAICA M. Oralno zdravlje i trovanja. U: Mravak-Stipetić M, Sertić J, Jurišić Kvesić A, urednice. Opće zdravlje kroz oralno zdravlje: multidisciplinarni pristup. Zagreb: Hrvatska komora dentalne medicine; 2019. str. 45-9.
170. ŠAKIĆ F, MACAN J. Osnove zaštite kože na radu. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 49-55.
171. ZANDONA A, KATALINIĆ M. Putovanje po stanicama. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 56-62.
172. ŽIVKOVIĆ SEMREN T, SEMREN I. Pas u službi detekcije malignih oboljenja. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 63-8.
173. ŽUNEC S. Opojna znanost: lice i naličje kanabisa. U: Stipičević S, urednica. Znanstveni dalekozor, zbirka radova za popularizaciju znanosti. Zagreb: Institut za medicinska istraživanja i medicinu rada; 2019. str. 69-76.

Uredništvo zbornika ili časopisa

174. DOKO JELINIĆ J, BEŠLIĆ I, urednici. Zbornik sažetaka jedanaestog hrvatskog znanstveno-stručnog skupa „Zaštita zraka '19“.
175. KOPJAR N, glavna urednica. Arhiv za Higijenu Rada i Toksikologiju.
176. MILIĆ M, gostujuća urednica. Special issue of the Mutation Research – Genetic Toxicology and Environmental Mutagenesis (comet assay in human biomonitoring).

D.3. OSTALE PUBLIKACIJE**Tiskana izdanja**

177. BABIĆ Ž, KOVAČIĆ J, TURK R. Izvješće Centra za kontrolu otrovanja za razdoblje od 1. siječnja do 31. prosinca 2018 / Report of the Poison Control Centre for the period from 1 Jan to 31 Dec 2018. Arh Hig Rad Toksikol

2019;70:69-73.

178. BRAKIĆ A, BUKVIĆ F, GERJEVIĆ J, KARIN V, KLASIĆ P, KOŽARIĆ M, LULIĆ L, KOŠČEĆ BJELAJAC A. Jedini dug koji ćete sa zadovoljstvom vratiti, edukativni letak, 2019.
179. MACAN J, SITAR SREBOČAN V. Medicinsko vještačenje u ugovornom osiguranju i vještačenje privremene i trajne radne nesposobnosti. U: Vukić M, Petrovečki V, urednici. Tečaj trajnog usavršavanja kandidata za stalnog sudskog vještaka medicinske struke. Zagreb: Hrvatski liječnički zbor, Hrvatsko društvo za medicinska vještačenja, Hrvatsko društvo sudskih medicinarina i toksikologa; 2019.

Elektronička izdanja

180. BABIĆ Ž, MACAN J, TURK R. Opasno je miješati sredstva za čišćenje u kućanstvu. Dostupno na: <https://www.imi.hr/hr/opasno-je-mijesati-sredstva-za-ciscenje-u-kucanstvu/>

D.4. KVALIFIKACIJSKI RADOVI

Radovi djelatnika Instituta

181. SULIMANEC GRGEC A. Procjena unosa nutrijenata i toksičnih metala hranom morskoga podrijetla: usporedbe u zdravih roditelja iz kontinentalne i priobalne Hrvatske / Assessment of nutritional and toxic metal intake by seafood: comparisons in healthy postpartum women from continental and coastal Croatia [disertacija]. Zagreb: Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu; 2019. Mentorica: M. Piasek
182. ŽIVKOVIĆ SEMREN T. Hlapljivi spojevi i aminokiseline u urinu oboljelih od tumora testisa / Volatile compounds and amino acids in the urine of testicular tumour patients [disertacija]. Zagreb: Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu; 2019. Mentorica: A. Pizent

Radovi pristupnika s mentorom/komentorom na Institutu

183. ANTOLIĆ N. Utvrđivanje spolnih i starosnih razlika u ekspresiji obje podjedinice feritina imunokemijskim metodama nove generacije / Determination of sex and age differences in expression of both ferritin subunits by the new generation immunochemical methods [diplomski rad]. Zagreb: Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu; 2019. Mentori: P. Turčić i M. Ljubojević
184. BABIĆ A. Identifikacija hlapljivih organskih metabolita u urinu bolesnika s rakom testisa / Identification of volatile organic metabolites in urine of testicular cancer patients [diplomski rad]. Zagreb: Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu; 2019. Mentorica: A. Pizent. Neposredna voditeljica: T. Živković Semren
185. BASHOTA L. Povezanost unosa kalcija i tjelesne aktivnosti s koštanom gustoćom u štićenika domova za starije i nemoćne osobe grada Zagreba / Association of calcium intake and physical activity with bone density in nursing home residents in Zagreb [diplomski rad]. Zagreb: Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu; 2019. Mentorica: S. Cvijetić Avdagić
186. BEUK P. Tehnika prazne stolice iz perspektive psihoterapeuta i klijenta / Empty chair technique from psychotherapist's and client's perspective [diplomski rad]. Zagreb: Hrvatski studiji Sveučilišta u Zagrebu; 2019. Mentorica: A. Bjelajac
187. BOSANČIĆ K. Povezanost statusa veze i karakteristika spavanja odraslih osoba / The association between relationship status and sleep patterns in adults [diplomski rad]. Zagreb: Hrvatski studiji Sveučilišta u Zagrebu; 2019. Mentorica: A. Bjelajac
188. BOŠNJAKOVIĆ A. Određivanje toksičnih i esencijalnih elemenata u kosi roditelja iz kontinentalne i priobalne Hrvatske / Determination of toxic and essential elements in hair of postpartum women from continental and coastal Croatia [diplomski rad]. Zagreb: Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu; 2019. Mentorica: J. Jurasović. Neposredna voditeljica: A. Sekovanić
189. CAPJAK I. Utjecaj veličine, oblika i površinske strukture nanočestica srebra na njihovu interakciju s modelnim proteinima / Effect of size, shape and surface structure of silver nanoparticles on their interaction with model proteins [disertacija]. Zagreb: Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu; 2019. Mentorice: I. Vinković Vrček i S. Šupraha-Goreta
190. ĐURANEC A. Optimiziranje spektrofotometrijske metode za određivanje glutationa u punoj krvi / Optimizing of spectrophotometric method for the determination of glutathione in full blood [diplomski rad]. Zagreb: Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu; 2019. Mentorica: A.-M. Domijan. Neposredni voditelj: M. Gerić

191. GOLUBOVIĆ I. Uloga oksidacijskog stresa u mehanizmu toksičnosti imatinib mesilata na netumorskim humanim stanicama [studentski rad nagrađen dekanovom nagradom]. Zagreb: Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu; 2019. Mentori: A.-M. Domijan, G. Gajski
192. KOŠČAK M. Procjena godišnje efektivne doze u stambenom objektu u Donjem Miholjcu / Estimation of the annual effective dose in a residential building in Donji Miholjac [diplomski rad]. Osijek: Odjel za fiziku Sveučilišta J. J. Strossmayera u Osijeku; 2019. Mentori: M. Poje Sovilj i B. Petrincec
193. KRIZMANIĆ T. Protektivno djelovanje ekstrakta maslačka (*Taraxacum officinale*) na genetički materijal humanih stanica u kulturi / Protective effect of dandelion extract (*Taraxacum officinale*) on genetic material of human cells in culture [diplomski rad]. Zagreb: Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu; 2019. Mentorica: K. Durgo. Neposredna voditeljica: M. Milić
194. LEDENKO I. Utjecaj vodenog ekstrakta ružmarina (*Rosmarinus officinalis* L.) na genomsku stabilnost, vijabilnost i proliferaciju tumorskih stanica epitela jezika / The influence of water extract of rosemary (*Rosmarinus officinalis* L.) on genetical stability, viability and proliferation of the cell culture of the tongue epithelium [diplomski rad]. Zagreb: Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu; 2019. Mentorica: K. Durgo. Neposredna voditeljica: M. Milić
195. MARJANOVIĆ K. Mahovina kao bioindikator radioaktivnog onečišćenja u parku prirode Kopački Rit / Mosses as a bioindicator of radioactive contamination in nature park Kopački Rit [diplomski rad]. Osijek: Odjel za fiziku Sveučilišta J. J. Strossmayera u Osijeku; 2019. Mentor: B. Petrincec
196. NEMET M. Nuklearna magnetska rezonancija u medicini / Nuclear magnetic resonance in medicine [diplomski rad]. Osijek: Odjel za fiziku Sveučilišta J. J. Strossmayera u Osijeku; 2019. Mentor: B. Petrincec
197. ŠUNIĆ I. Utjecaj sterigmatocistina na oksidacijski stress u mužjaka soja Wistar / Effect of sterigmatocystin on oxidative stress in male Wistar strain rats [diplomski rad]. Zagreb: Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu; 2019. Mentori: D. Đikić i D. Rašić
198. VUJEVA V. Ispitivanje stabilnosti glutationa u uzorcima plazme i krvi / Testing of glutathione stability in serum and plasma samples [diplomski rad]. Zagreb: Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu; 2019. Mentorica: A.-M. Domijan. Neposredni voditelj: M. Gerić

D.5. KONGRESNA PRIOPĆENJA NA SKUPOVIMA ODRŽANIM U RH

Sažetci u ostalim časopisima i knjigama sažetaka

199. BABIĆ Ž, FRANIĆ Z, MACAN J, TURK R. Occupational poisonings reported to the Croatian Poison Control Centre in the ten-year period (2009–2018). 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020“; Pula, Hrvatska 2019. Knjiga sažetaka str. 116–7.
200. BEŠLIĆ I, DAVILA S, ŠEGA K. Pregled studija ekvivalencije automatskih mjernih sustava za određivanje masenih koncentracija lebdećih čestica / A review of equivalency studies on automatic measuring systems for atmospheric particulate matter mass concentration determination. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19“ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19“; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 70–1.
201. BEUK P, BJELAJAC A. Tehnika prazne stolice iz perspektive psihoterapeuta. 27. godišnja konferencija hrvatskih psihologa „Psihologija i digitalni svijet“; Osijek, Hrvatska 2019. Knjiga sažetaka str. 103.
202. BJELAJAC A, FRANIĆ Zr, MACAN J. Karakteristike spavanja, alergijski simptomi i kvaliteta života povezana sa zdravljem u učenika frizerskih škola u Hrvatskoj. 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020“; Pula, Hrvatska 2019. Knjiga sažetaka str. 38–9.
203. BJELAJAC A, KLASIĆ P, ŠAKIĆ F, DELALE EA, GOJSALIĆ K, MACAN J. Sukladnost dječjih i roditeljskih procjena karakteristika spavanja adolescenata - rezultati pilot istraživanja. 2. međunarodni znanstveno-stručni skup Odjela za psihologiju Hrvatskog katoličkog sveučilišta „Mozak i um: promicanje dobrobiti pojedinca i zajednice“; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 170.
204. CAPJAK I, BARBIR R, DOMAZET JURAŠIN D, DEBELJAK Ž, ŠINKO G, DUTOUR SIKIRIĆ M, VINKOVIĆ VRČEK I. Size, shape and surface structure affect interaction of metallic nanoparticles with transport proteins. 17th European Symposium on Organic Reactivity (ESOR 2019); Dubrovnik, Hrvatska 2019. Abstracts str. 79.
205. ČAČKOVIĆ M, ŠEGA K, GLUŠČIĆ V, VAĐIĆ V, PEHNEC G, BEŠLIĆ I. Razine masenih koncentracija u vodi topljivih komponenti u PM_{2,5} frakciji lebdećih čestica u zraku za razdoblje 2014. – 2018. / Levels of mass concentrations of water-soluble components in PM_{2,5} particle fraction in air for the period 2014 – 2018. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19“ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19“; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 50–1.
206. DAVILA S, BEŠLIĆ I. Senzori – budućnost mjerenja kvalitete zraka? / Air quality sensors – the future of air

- quality measurement? Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 66-7.
207. DELALE EA, MALINA S, JURIĆ A, BJELAJAC A, DESPOT LUČANIN J. Doživljaj roditeljske kompetentnosti majki djece u programu Mala škola i majki djece socijalizirane u vrtiću. 2. međunarodni znanstveno-stručni skup Odjela za psihologiju Hrvatskog katoličkog sveučilišta „Mozak i um: promicanje dobrobiti pojedinca i zajednice"; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 156.
208. DESPOT LUČANIN J, DELALE EA, KOŠČEC BJELAJAC A, LUČANIN D. The wellbeing and competence of mothers in relation to the grandparents' help. 33rd Annual Conference of the European Health Psychology Society; Dubrovnik, Hrvatska 2019. Book of Abstracts str. 731.
209. DUBROVIĆ I, VUČENOVIĆ M, SALAČ N, MIČOVIĆ V, MRAKOVČIĆ ŠUTIĆ I, BRČIĆ KARAČONJI I, ŠUTIĆ I, BULOG A. Analiza BTEX-a GC/MS tehnikom u urinu. International Days of Public and Environmental Health Profession 2019; Zagreb, Hrvatska 2019. Book of Abstracts str. 49.
210. DUKA I, GERIĆ M, GAJSKI G, FRIŠČIĆ M, MALEŠ Ž, TURČIĆ P, DOMIJAN A-M. Utjecaj pohranjivanja na razinu glutationa u plazmi. 6. hrvatski kongres farmacije s međunarodnim sudjelovanjem; Dubrovnik, Hrvatska 2019. Knjiga sažetaka str. 251.
211. FILIPOVIĆ V, STIPIČEVIĆ S, FINGLER S, FILIPOVIĆ L, BUBALO KOVAČIĆ M, KRANJČEC F, ONDRAŠEK G. Modeliranje transporta glifosata pri različitim agroekološkim uvjetima upotrebom lizimetara i kolona s tlom / Modeling glyphosate transport in soils under different agricultural conditions using lysimeter and soil column data. 54. hrvatski i 14. međunarodni simpozij agronoma; Vodice, Hrvatska 2019. Zbornik sažetaka str. 22-3.
212. FRANIĆ Zr, BABIĆ Ž, MACAN J. Skin changes in Croatian hairdressing apprentices in a screening phase of a prospective cohort study. 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020"; Pula, Hrvatska 2019. Knjiga sažetaka str. 27-8.
213. GLUŠČIĆ V, PEHNEC G, ČAČKOVIĆ M, ŽUŽUL S. Trend kiselih komponenti u UTT u zagrebačkom zraku / Trend of acidic compounds in total deposited matter in Zagreb air. 26. hrvatski skup kemičara i kemijskih inženjera / 26th Croatian Meeting of Chemists and Chemical Engineers; Šibenik, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 231.
214. GLUŠČIĆ V, PEHNEC G, ŽUŽUL S, ŠILOVIĆ HUJIĆ M, MIHALJEVIĆ A, ČAČKOVIĆ M. Razine klorida, nitrata i sulfata u ukupnoj taložnoj tvari na dvije mjerne postaje u Zagrebu za razdoblje 2014. – 2018. / Levels of chloride, nitrate and sulphate in total deposited matter at two sampling sites in Zagreb for the period 2014 – 2018. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 120-1.
215. GODEC R, BAKIJA ALEMPIJEVIĆ S, BEŠLIĆ I, FRKA S, MILINKOVIĆ A, PENEZIĆ A, ŠIMIĆ I. Atmosfersko taloženje onečišćujućih tvari na šibenskom području jadranskog mora / Atmospheric deposition of pollutants in the sea surrounding Šibenik, Croatia. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 98-9.
216. GOJSALIĆ K, BJELAJAC A. Povezanost statusa veza i karakteristika spavanja odraslih osoba. 2. međunarodni znanstveno-stručni skup Odjela za psihologiju Hrvatskog katoličkog sveučilišta „Mozak i um: promicanje dobrobiti pojedinca i zajednice"; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 120.
217. GOLUBOVIĆ I, GERIĆ M, DOMIJAN A-M, GAJSKI G. Oxidative stress as an underlying mechanism of toxicity of imatinibe mesylate on noncancerous human cells. 8. simpozij studenata Farmacije i medicinske biokemije (FARMEBS 2019); Zagreb, Hrvatska 2019. Knjiga sažetaka str. 28.
218. HERCEG ROMANIĆ S, KLINČIĆ D. Hrvatska u okviru MONET projekta u razdoblju 2009.-2013. / Croatia within the MONET project for the period 2009-2013. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19"; Bol, Hrvatska. Zbornik sažetaka str. 122-3.
219. JAKOVLJEVIĆ I, SEVER ŠTRUKIL Z, GODEC R, PEHNEC G. Sezonske varijacije policikličkih aromatskih ugljikovodika u PM₁ frakciji lebdećih čestica / Seasonal variations of polycyclic aromatic hydrocarbons in PM₁ particle fraction. 26. hrvatski skup kemičara i kemijskih inženjera / 26th Croatian Meeting of Chemists and Chemical Engineers; Šibenik, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 41.
220. JAKOVLJEVIĆ I, SEVER ŠTRUKIL Z, PEHNEC G. Optimiziranje postupka pripreme uzoraka pri određivanju policikličkih aromatskih ugljikovodika vezanih na lebdeće čestice u zraku / Optimization of different sample preparation procedures for the determination of polycyclic aromatic hydrocarbons bounded on particle fractions in the air. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts

- str. 74-5.
221. JURASOVIĆ J, PAŠALIĆ D, SEKOVANIĆ A, ORCT T, DOROTIĆ A, STASENKO S, MIOČ T, MIŠKULIN I, ŠKRGATIĆ L, PIASEK M. Study of preamplification as a method for improvement of quantitative RT-PCR analysis of circulating miRNAs in maternal and cord blood plasma. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 92.
222. JURKOVIĆ M, VUŠAK D, PRUGOVEČKI B, MATKOVIĆ-ČALOGOVIĆ D, SABOLOVIĆ J. Sinteza i strukturna karakterizacija trans-(D-leucinato)(L-leucinato)bakra(II) / Synthesis and structural characterization of trans-(D-leucinato)(L-leucinato)copper(II). Šesti simpozij studenata kemičara; Zagreb, Hrvatska 2019. Knjiga sažetaka, str. 60.
223. KATALINIĆ M, ZANDONA A, MARAKOVIĆ N, MADUNIĆ J, VRHOVAC MADUNIĆ I, MIŠ K, PIRKMAJER S. Cytotoxicity of oxime antidotes driven by changes in their structure. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 34.
224. KOVAČIĆ J, MACAN J. Occupational exposure to solar ultraviolet radiation in Croatian construction workers. 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020“; Pula, Hrvatska 2019. Knjiga sažetaka str. 147-8.
225. KOŠČEC BJELAJAC A, BOBIĆ J, KOVAČIĆ J, VARNAI VM, MACAN J, SMOLIĆ Š. Predictors of mental health and cognitive functions in older Croatian workers. 33rd Annual Conference of the European Health Psychology Society; Dubrovnik, Hrvatska 2019. Book of Abstracts str. 290.
226. KOŠČEC BJELAJAC A, DESPOT LUČANIN J, LUČANIN D, DELALE EA, ŠTAMBUK M. Kvaliteta spavanja starijih osoba u različitim uvjetima stanovanja. 24. dani Ramira i Zorana Bujasa; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 100.
227. LIHTAR G, ZANDONA, A, GAŠO SOKAČ, D, BUŠIĆ, V, KATALINIĆ, M. The impact of structure changes of nicotinamide derivates on cholinesterase inhibition and cytotoxicity. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 133.
228. MACAN J, KERNER I, POPLAŠEN D, ROGINA T, STRIKIĆ N, VUKŠIĆ M, MATULIĆ M, PALADIN ŠUŠNJARA LJ, KANCELIR MILETIĆ V, DEČKOVIĆ VUKRES V, TROŠELJ M, HURŠIDIĆ RADULOVIĆ A. Medicina rada u Republici Hrvatskoj: sadašnje stanje i prioriteti. 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020“; Pula, Hrvatska 2019. Knjiga sažetaka str. 42-3.
229. MARAKOVIĆ N, KATALINIĆ M. Pharmacophore models to predict oxime antidote interactions with specific cell targets. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 100.
230. MATASOVIĆ B, PEHNEC G, BEŠLIĆ I, DAVILA S, BABIĆ D. Analiza koncentracije troposferskog ozona u sjevernom dijelu Zagreba od 2003 do 2016. / Assessment of tropospheric ozone concentration data from the northern Zagreb area for the period from 2003 to 2016. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 126-7.
231. MATOŠEVIĆ A, KNEŽEVIĆ A, KOVARIK Z, BOSAK A. Selectivity of biscarbantes in interaction with human cholinesterases. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 101.
232. MIJAKOSKI D, MACAN J, TURNER MC, SIVESIND MEHLUM I. Network on the coordination and harmonisation of European occupational cohorts (OMEGA-NET). 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020“; Pula, Hrvatska 2019. Knjiga sažetaka str. 23-4.
233. MIKOLIĆ A. Hormonski otrovi i zdravlje ljudi – postoji li problem? 3. dani strukovnih nastavnika; Šibenik, Hrvatska 2019. Zbornik sažetaka str. 61.
234. MIKOLIĆ A. Pesticidi kao hormonski otrovi – učinci na zdravlje ljudi. 2. studentski kongres zaštite zdravlja Sanitas 2019; Rijeka, Hrvatska 2019. Knjiga sažetaka str. 16.
235. MILINKOVIĆ A, BAKIJA ALEMPIJEVIĆ S, PENEZIĆ A, ŠANTIĆ D, SKEJIĆ S, ŠIMIĆ I, ŽUŽUL S, BEŠLIĆ I, GODEC R, FRKA S. Utjecaj atmosferskog taloženja na biokemiju površinskih slojeva oligotrofnih područja Jadranskog mora. Susret znanstvenika, stručnih djelatnika i studenata na temu zaštite okoliša u Hrvatskoj (2. ZORH Susret); Split, Hrvatska 2019. Knjiga sažetaka / Abstracts str. 10.
236. MUŽINIĆ V, ŽELJEŽIĆ D. Učinak terbutilazina na indukciju aneuploidije *in vitro* u limfocitima periferne krvi čovjeka. Treći simpozij studenata doktorskih studija PMF-a 2018./2019.; Zagreb, Hrvatska 2019. Postersko izlaganje.

237. ONDRAŠEK G, ZOVKO M, FILIPOVIĆ V, FILIPOVIĆ L, KRANJČEC F, BUBALO KOVAČIĆ M, MAUROVIĆ N, BARIĆ K, FINGLER S, ROMIĆ D, STIPIČEVIĆ S. Dynamics of surface runoff and agrochemicals concentration from sloped vine growing position under different precipitation intensity. 8th International Conference WATER FOR ALL; Osijek 2019. Book of Abstracts str. 67.
238. PAVIČIĆ I, MARJANOVIĆ ČERMAK AM. Prisutnost azbestnih vlakana u zraku u gradovima Republike Hrvatske / The presence of asbestos fibres in the air at the cities of Croatia Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19’”; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 94-5.
239. PEHNEC G, DAVILA S, BEŠLIĆ I. Koncentracije dušikovog dioksida u zraku Zagreba u razdoblju od 2009. do 2018. godine / Concentrations of nitrogen dioxide in Zagreb air for the period 2009 – 2018. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19’ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19’”; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 62-3.
240. PEM B, BARBIR R, ILIĆ K, PAVIČIĆ I, VINKOVIĆ VRČEK I. Challenges and obstacles to study nano-bio interface. Humboldt College: Science and educational challenges facing Europe in the next decade, On the occasion of the 250th anniversary of the birth of Alexander von Humboldt (1769 – 1859); Zagreb, Hrvatska 2019. Abstracts str. 52.
241. PETRINEC B, POJE SOVIJ M, MEŠTROVIĆ T, STANIĆ D, RADOLIĆ V, BABIĆ D, MIKLAVČIĆ I, VUKOVIĆ B, HEĐI A. Brzina ambijentalnog doznog ekvivalenta u Kopačkom ritu i okolici. 8. simpozij s međunarodnim sudjelovanjem Kopački rit: jučer, danas, sutra, 2019.; Kopački rit, Hrvatska. Zbornik sažetaka str. 112.
242. RAMIĆ A, MATOŠEVIĆ A, BOSAKA, KOVARIK Z, HRENART, PRIMOŽIĆ I. Design, synthesis and characterisation of Cinchona alkaloid carbamates. 26.HSKIKI, Hrvatski skup kemičara i kemijskih inženjera s međunarodnim sudjelovanjem i 4. simpozij „Vladimir Prelog”; Šibenik, Hrvatska 2019. Knjiga sažetaka str. 61.
243. RINKOVEC J, PEHNEC G, ŽUŽUL S. Metali u PM₁₀ i PM₁ frakciji lebdećih čestica u zraku Zagreba / Metals in PM₁₀ and PM₁ fractions in Zagreb air. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19’ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19’”; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 58-9.
244. SEKOVANIĆ A, ORCT T, JURASOVIĆ J, PIASEK M, SULIMANEC GRGEC A, BOŠNJAKOVIĆ A, MATEK SARIĆ M. Koncentracije žive u uzorcima majčine krvi i kose, posteljici i krvi iz pupčane vrpce u povezanosti s konzumacijom hrane morskoga podrijetla. 26. HSKIKI, Hrvatski skup kemičara i kemijskih inženjera s međunarodnim sudjelovanjem i 4. simpozij „Vladimir Prelog”; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 66.
245. SEVER ŠTRUKIL Z, JAKOVLJEVIĆ I, GODEC R, PEHNEC G. Karakterizacija policikličkih aromatskih ugljikovodika u PM₁₀ i PM_{2,5} frakciji u Zagrebu / Characterization of polycyclic aromatic hydrocarbons in PM₁₀ and PM_{2,5} fraction in Zagreb. 26. hrvatski skup kemičara i kemijskih inženjera / 26th Croatian Meeting of Chemists and Chemical Engineers; Šibenik, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 229.
246. SEVER ŠTRUKIL Z, JAKOVLJEVIĆ I, GODEC R, PEHNEC G. Sezonska ovisnost raspodjele policikličkih aromatskih ugljikovodika u PM₁₀ i PM_{2,5} frakciji u Zagrebu / Seasonal dependence of polycyclic aromatic hydrocarbons' distribution in PM₁₀ and PM_{2,5} fractions in Zagreb. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19’ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19’”; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 136-7.
247. SOPČIĆ S, ŠILOVIĆ HUJIĆ M, ČAČKOVIĆ M, GODEC R, VAĐIĆ V, PEHNEC G. Praćenje koncentracija merkaptana i sumporovodika u zraku na plinskom polju molve u razdoblju 2012. – 2016. / Mercaptans and hydrogen sulphide concentration monitoring in the air of Molve gas field during 2012 – 2016. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19’ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19’”; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 138-9.
248. SURIĆ MIHIĆ M, PAVELIĆ L, ŠIŠKO J, PRLIĆ I. Novi dozimetar za mjerenje izloženosti leće oka u intervencijskoj radiologiji i kardiologiji. Simpozij Medicinska fizika u Hrvatskoj; Zagreb, Hrvatska 2019. Zbornik sažetaka str. 9-11.
249. ŠAKIĆ F, TURK R, BABIĆ Ž, MACAN J. Postupak epikutanog testiranja materijalima donesenim s radnog mjesta - prikaz bolesnika. 7. hrvatski kongres medicine rada s međunarodnim sudjelovanjem „Medicina rada nakon 2020”; Pula, Hrvatska 2019. Knjiga sažetaka str. 84-5.
250. ŠEGA K, BEŠLIĆ I, GODEC R, DAVILA S. Prekoračenja dnevne granične vrijednosti koncentracija PM₁₀ na gradskoj pozadinskoj mjernoj postaji u Zagrebu tijekom razdoblja 2001. – 2018. / Exceedances of PM₁₀ daily limit value at an urban background station in Zagreb 2001 – 2018. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka ‘19’ / Eleventh Croatian Scientific and Professional Assembly “Air Protection ‘19’”; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 48-9.
251. ŠILOVIĆ HUJIĆ M, GODEC R, ŠIMIĆ I, BEŠLIĆ I. Organski i elementni ugljik u frakcijama lebdećih čestica PM_{2,5}

- i PM_{1,0} u zraku Zagreba / Organic and elemental carbon in the PM_{2,5} and PM_{1,0} particle fractions in Zagreb air. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 140-1.
252. ŠIMIĆ I, MENDAŠ STARČEVIĆ G, PEHNEC G. Atmosfersko taloženje organskih spojeva: usporedba različitih izvedbi uzorkivača / Atmospheric deposition of organic compounds: comparison between different performances of a bulk collector. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19"; Bol, Hrvatska. Zbornik sažetaka str. 142-3.
253. ŠIMIĆ I, MENDAŠ STARČEVIĆ G, PEHNEC G. Determination of the atmospheric deposition of polycyclic aromatic hydrocarbons and polychlorinated biphenyls. 26. HSKIKI, Hrvatski skup kemičara i kemijskih inženjera s međunarodnim sudjelovanjem i 4. simpozij „Vladimir Prelog"; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 230.
254. TARIBA LOVAKOVIĆ B, ŽIVKOVIĆ SEMREN T, SAFNER T, GAMULIN M, PIZENT A. Profil elemenata u krvi, serumu i urinu muškaraca s rakom testisa. Simpozij „Prvih 10 godina HDIR-a"; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 23.
255. TIČIĆ M, KOŠČEC BJELAJAC A. Stigma traženja pomoći i socijalna podrška kao prediktori kvalitete terapijskog saveza. 24. dani Ramira i Zorana Bujasa; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 185.
256. VAĐIĆ V, BABAČIĆ M, BEŠLIĆ I, HERCOG P, ABRAMOVIĆ B. Utjecaj EL-TO na kvalitetu zraka u sjevernom dijelu Zagreba u razdoblju veljača 2014. - veljača 2018. / Impact analysis of EL-TO on air quality in northern Zagreb from February 2014 to February 2018. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 60-1.
257. VUČENOVIĆ M, DUBROVIĆ I, SALAČ N, MIČOVIĆ V, MRAKOVČIĆ ŠUTIĆ I, BRČIĆ KARAČONJI I, ŠUTIĆ I, BULOG A. Analiza akrilamida UPLC MS/MS tehnikom. International Days of Public and Environmental Health Profession 2019; Zagreb, Hrvatska 2019. Book of Abstracts str. 48.
258. ZANDONA A, KATALINIĆ M. Dose and time-dependent effects of imidazolium oximes on human kidney cells. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 132.
259. ZORBAZ T, MIŠETIĆ P, ŽUNEC S, MENDAŠ STARČEVIĆ G, MICEK V, PAVOŠEVIĆ K, GABELICA MARKOVIĆ V, JEAN L, RENARD PY, KOVARIK Z. Pharmacodynamic and pharmacokinetic evaluation of morpholine-3-hydroxy-2-pyridine oxime, centrally active antidote for nerve agent poisoning. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 135.
260. ŽIVKOVIĆ SEMREN T, TARIBA LOVAKOVIĆ B, JOKIĆ S, ALADIĆ K, GAMULIN M, PIZENT A. Esencijalne i neesencijalne aminokiseline u ispitanika s tumorom testisa. 12. međunarodni znanstveno-stručni skup „Hranom do zdravlja"; Osijek, Hrvatska, 2019. Knjiga sažetaka str. 88.
261. ŽIVKOVIĆ SEMREN T, TARIBA LOVAKOVIĆ B, SAFNER T, JOKIĆ S, ALADIĆ K, GAMULIN M, PIZENT A. Rak testisa i promjene u ciklusu limunske kiseline. Simpozij „Prvih 10 godina HDIR-a"; Zagreb, Hrvatska 2019. Knjiga sažetaka str. 10.
262. ŽUNEC S, KATALINIĆ M. Evaluation of Δ^9 -tetrahydrocannabinol potency to inhibit cholinesterases. Congress of the Croatian Society of Biochemistry and Molecular Biology "Crossroads in Life Sciences", HDBMB2019; Lovran, Hrvatska 2019. Book of Abstracts str. 137.
263. ŽUŽUL S, ŽERO S, HUREMOVIĆ J, RINKOVEC J, GODEC R, DŽEPINA K, PEHNEC G. Masene koncentracije metala u PM₁₀ frakciji čestica na području Sarajeva / Mass concentrations of metals in PM₁₀ particulate matter in the Sarajevo region. Jedanaesti hrvatski znanstveno-stručni skup „Zaštita zraka '19" / Eleventh Croatian Scientific and Professional Assembly "Air Protection '19"; Bol, Hrvatska 2019. Zbornik sažetaka / Abstracts str. 56-7.

D.6. KONGRESNA PRIOPĆENJA NA SKUPOVIMA ODRŽANIM U INOZEMSTVU

Sažetci u časopisima indeksiranim u bazi WoS

264. BABIĆ Ž, KOVAČIĆ J, FRANIĆ Zr, BJELAJAC A, VARNAI VM, MACAN J, TURK R. Safekeeping of cleaning agents reported by parents of preschool children in Croatia. 39th International Congress of the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT); Naples, Italy 2019. Clin Toxicol 2019;57(6):128.
265. BABIĆ Ž, MACAN J. Associations of TNF alpha-308G>A genetic polymorphism with allergic diseases. 4th Meeting of Middle European Societies for Immunology and Allergology (MESIA); Samorin, Slovakia 2019.

- Eur J Immunol 2019;49(Suppl 4):7.
266. BARBIR R, MICHALKE B, LUCIO M, TARIBA B, VUČIĆ LOVRENČIĆ M, ŠERIĆ V, CANECKI-VARŽIĆ S, LJUBIĆ S, SMIRČIĆ DUJNJAK L, KRIVOHVALEK A, VINKOVIĆ VRČEK I. Incidence of diabetes mellitus type 2 in the European population chronically exposed to arsenic. EuroMedLab 2019; Barcelona, Spain 2019. Clin Chim Acta 2019;493(Suppl 1):S306-7.
267. DOBAJA BORAK M, BABIĆ Ž, BEKJAROVSKI N, CAGÁŇOVÁ B, GRENC D, GRUZDYTE L, KABATA PM, KASTANJE R, KOLPACH Z, KRAKOWIAK A, PAP C, RADENKOVA-SAEVA J, SEIN-ANAND J, VUČINIĆ S, ZACHAROV S, EDDLESTON M, BRVAR M. Epidemiology of *Viperidae* snake envenoming in central and southeastern Europe: CEE Viper Study. 39th International Congress of the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT); Naples, Italy 2019. Clin Toxicol 2019;57(6):48.
268. FRANIĆ Zr, BABIĆ Ž, MACAN J. Skin health in Croatian hairdressing apprentices at the beginning of vocational education: a new cohort study. 27th International Epidemiology in Occupational Health (EPICOH) conference; Wellington, New Zealand 2019. Occup Environ Med 2019;76(Suppl 1):A43-4.
269. FUCIC A, STARCEVIC M, DE SANTO N. BATINIC D, KRALIK S, PLAVEC D, KRASIC J, SINCIC N, LONCAREVIC D. Comparison of sex hormone levels, IL6 and micronucleus frequency between newborns of mothers with rural and urban residency. 55th Congress of the European Societies of Toxicology (EUROTOX 2019) Toxicology Science Providing Solutions; Helsinki, Finland 2019. Toxicol Lett 2019;314(Suppl 1):567.
270. GAJSKI G, GERIC M, ZEGURA B, NOVAK M, NUNIC J, BAJREKTAREVIC D, KOVACS R, CSENKI Z, URBANYI B, HORVATH A, NEGREIRA N, DE ALDA ML, BARCELO D, HEATH E, KOSJEK T, ZAJC I, BAEBLER S, ROTTER A, RAMSAK Z, FILIPIC M, GARAJ-VRHOVAC V. Toxicity of low environmentally relevant concentrations of cytostatic drug 5-fluorouracil in cultured human cells and zebrafish (*Danio rerio*). ACT's 39th Annual Meeting; West Palm Beach, FL, USA 2018. Int J Toxicol 2019;1:63-4.
271. KOSTELAC D, GERIC M, GAJSKI G, DOMIJAN A-M, MARKOV K, CANAK I, JAKOPOVIC Z, JEZEK D, FECE J. Extracellular metabolites of selected *Lactobacillus plantarum* strains decrease TNF-alpha in LPS stimulated peripheral blood mononuclear cells. European Biotechnology Congress; Valencia, Spain 2019. J Biotechnol 2019;305:S74-5.
272. KOVARIK Z, ČADEŽ T, MAČEK HRVAT N. Analysis of butyrylcholinesterase interactions with old inhibitors and new reactivators. 44th FEBS Congress "From molecules to living systems"; Krakow, Poland 2019. FEBS Open Bio 2019;9(Suppl 1):431.
273. MUŽINIĆ V, ŽELJEŽIĆ D. Effect of glyphosate at low concentrations on chromosome missegregation and aneuploidy induction in human peripheral blood lymphocytes *in vitro*. 55th Congress of the European Societies of Toxicology (EUROTOX 2019) Toxicology Science Providing Solutions; Helsinki, Finland 2019. Toxicol Lett 2019;314(Suppl 1):S162.
274. PAŠALIĆ D, PIASEK M, JURASOVIĆ J, ORCT T, SEKOVANIĆ A, STASENKO S, MIOČ T, PAIĆ F. Maternal cigarette smoking and expression of selected micro-RNAs in the plasma collected after spontaneous vaginal delivery. EuroMedLab 2019; Barcelona, Spain 2019. Clin Chim Acta 2019;493(Suppl 1):S572.
275. PERAICA M, RAŠIĆ D, HULINA A, MICEK V, JAKŠIĆ D, RUMORA L, ŠEGVIĆ KLARIĆ M. Effects of sterigmatocystin on antioxidative enzymes and expression of Hsp in male Wistar rats. 55th Congress of the European Societies of Toxicology (EUROTOX 2019) Toxicology Science Providing Solutions; Helsinki, Finland 2019. Toxicol Lett 2019;314(Suppl 1):71.

Sažetci u ostalim časopisima i knjigama sažetaka

276. BARBIR R, GOESSLER W, ČURLIN M, DABELIĆ S, MICEK V, PAVIČIĆ I, VINKOVIĆ VRČEK I. Sex-related *in vivo* response to silver nanoparticles after subacute oral exposure. 12th International Particle Toxicology Conference; Salzburg, Austria 2019. Book of Abstracts str. 112.
277. BOSAK A, MATOŠEVIĆ A, KNEŽEVIĆ A, ZANDONA A, KATALINIĆ M, KOVARIK Z. Design, synthesis and biological evaluation of bis carbamates as potent and selective butyrylcholinesterase inhibitors. 16th International Symposium on Cholinergic Mechanisms; Rehovot, Israel 2019. Book of Abstracts str. 62.
278. BRAIKI A, ZORBAZ T, MARAKOVIĆ N, BAATI R, KATALINIĆ M, GASTELLIER A-J, COURAGEUX C, JEGOUX J, DIAS J, CALAS G, NACHON F, WEIK M, DEHOUC M-P, JEAN L, KOVARIK Z, RENARD P-Y. 3-hydroxy-2-pyridine aldoxime reactivators of organophosphate-inhibited cholinesterases. 3rd International conference CBRNE Research and Innovation; Nantes, France 2019. Book of Abstracts str. 221.
279. BRČIĆ KARAČONJI I, MILJANIĆ A, JURIĆ A, BRAJENOVIĆ N, MICEK V, NEUBERG M, KOZINA G, LUCIĆ VRDOLJAK A, MIKOLIĆ A. Effect of irinotecan on urinary Δ^9 -tetrahydrocannabinol elimination in Wistar rats. The 2nd International Annual Congress on Controversies on Cannabis-Based Medicines (Med-Cannabis2019); Barcelona, Spain 2019. Book of Abstracts str. 3-4.

280. ČAČKOVIĆ M, ŠEGA K, VAĐIĆ V, PEHNEC G, GLUŠČIĆ V, BEŠLIĆ I. Mass concentrations of water-soluble ions in PM_{2.5} particle fraction measured at urban background site in Croatia. 7th International Symposium Ultrafine Particles – Air Quality and Climate; Bruxelles, Belgium 2019. Abstracts str. 34.
281. DAVILA S, BEŠLIĆ I, MARIĆ M, HRGA I. Comparison of electro-chemical sensors for air quality monitoring with reference methods in Zagreb. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 176.
282. DESPOT LUČANIN J, HANZEC MARKOVIĆ I, LUČANIN D, KOŠČEC BJELAJAC A, DELALE EA. Wellbeing and family engagement of older adults in families exposed to contemporary work conditions. XVI European Congress of Psychology; Moscow, Russia 2019. Book of Abstracts str. 523.
283. DJAKOVIĆ S, LAPIĆ J, TOMA M, ŠAKIĆ D, VINKOVIĆ VRČEK I, MARJANOVIĆ ČERMAK AM, ILIĆ K, PAVIČIĆ I. Synthesis of bioconjugates of ferrocene and pyrimidine nucleobases and chemosensitivity of human lung epithelial cells. JMMC 2019-11th Joint Meeting on Medicinal Chemistry; Prague, Czech Republic 2019. str. 62.
284. DOMIJAN A-M, GERIĆ M, JANUŠIĆ R, ŠARČEVIĆ B, DUKA I, MALEŠ Ž, GARAJ-VRHOVAC V, GAJSKI G. Lower glutathione levels in papillary thyroid cancer patients: method optimization and case-control study. 4th Congress of the Serbian Association for Cancer Research with International Participation; Belgrad, Serbia 2019. Book of Abstracts str. 23.
285. DUBOIS-GEOFFROY P, PROBST N, GASNOT J, RENARD PY, BRAIKI A, WARNAULT P, JEAN L, ZORBAZ T, MARAKOVIĆ N, KOVARIK Z, DIAS J, CALAS G, NACHON F, BAATI R. Uncharged reactivators of OP-inhibited cholinesterases. 17th Medical Chemical Defense Conference “Chemical Warfare Agents – old problems and new challenges”; Munich, Germany 2019. Book of Abstracts str. 134.
286. GAJSKI G, GERIĆ M, VUČIĆ LOVRENČIĆ M, BOŽIČEVIĆ S, RUBELJ I, NANIĆ L, ŠKROBOT VIDAČEK N, BENDIX L, PERAICA M, RAŠIĆ D, DOMIJAN A-M, GLUŠČIĆ V, JURASOVIĆ J, ORCT T, CVIJETIĆ AVDAGIĆ S, JURAK G, BOŠNIR J, GARAJ-VRHOVAC V. Green, or not to green, that is the question: health related biomarkers in vegetarians versus non-vegetarians. 47th Meeting of the European Environmental Mutagenesis and Genomics Society (EEMGS); Rennes, France 2019. Book of Abstracts str. 26.
287. GAJSKI G, GERIĆ M, VUČIĆ LOVRENČIĆ M, BOŽIČEVIĆ S, RUBELJ I, NANIĆ L, ŠKROBOT VIDAČEK N, BENDIX L, PERAICA M, RAŠIĆ D, DOMIJAN A-M, GLUŠČIĆ V, JURASOVIĆ J, ORCT T, CVIJETIĆ AVDAGIĆ S, JURAK G, BOŠNIR J, GARAJ-VRHOVAC V. Does a vegetarian diet influence genomic stability? Analysis of health-related biomarkers in vegetarians versus omnivores. 13th International Comet Assay Workshop; Pushchino, Moscow, Russia 2019. Book of Abstracts str. 20.
288. GAJSKI G, MADUNIĆ J, GERIĆ M, HERCOG K, DOMIJAN A-M, GOLUBOVIĆ I, ŽEGURA B. Evaluation of the cyto/genotoxic effects of marine toxin domoic acid in non-target human cells *in vitro*. 10th International Congress of the Turkish Society of Toxicology (TTD); Antalya, Turkey 2019. Book of Abstracts str. 53.
289. GALIĆ E, ILIĆ K, MILIĆ M, HARTL S, TETYCZKA C, VINKOVIĆ T, ROBLEGG E, VINKOVIĆ VRČEK I, PAVIČIĆ I. Genotoxicity of silver and selenium nanoparticles on human epithelial cells. 12th International Particle Toxicology Conference. Salzburg, Austria 2019. Book of Abstracts str. 97.
290. GERIĆ M, GAJSKI G, OREŠČANIN V, KOLLAR R, FRANEKIĆ J, GARAJ-VRHOVAC V. The impact of boat pressure-washing: Toxicology and solutions. 10th International Congress of the Turkish Society of Toxicology (TTD); Antalya, Turkey 2019. Book of Abstracts str. 49.
291. GLUŠČIĆ V, ČAČKOVIĆ M, PEHNEC G, BEŠLIĆ I. Ionic composition of PM_{2.5} particle fraction at a coastal urban background site in Croatia. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 63.
292. GODEC R, ŠEGA K. Comparison and trends of measured elemental carbon mass concentrations and estimated mass concentrations of black carbon in PM_{2.5} particle fraction. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 118.
293. GODEC R, ŠIMIĆ I, ŠILOVIĆ HUJIĆ M, BEŠLIĆ I. Carbon content in PM_{2.5} at a coastal measuring site in Croatia 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 62.
294. HAVERIĆ A, MILIĆ M. Analysis of DNA damage in peripheral blood cultures treated with curcumin or sunset yellow. 1st Congress of Geneticists in Bosnia and Herzegovina with International Participation; Sarajevo, Bosnia and Herzegovina 2019. Book of Abstracts str. 55.
295. HAVERIĆ A, MILIĆ M, HAVERIĆ S, MAKSIMOVIĆ M. Assessment of K2(B3O3F4OH) induced DNA damage in peripheral blood cultures. 13th International Comet Assay Workshop; Pushchino, Moscow, Russia 2019. Book of Abstracts str. 57.
296. HUĐEKA, JOUKHADAR L, JURIĆ A, BAČUN-DRUŽINA V, KOPJARN, DURGOK. Genotoxic effect of irinotecan on human liver and colon tumor cells. 1st Congress of Geneticists in Bosnia and Herzegovina with International

- Participation; Sarajevo, Bosnia and Herzegovina 2019. Book of Abstracts str. 90.
297. HUĐEK A, MARTINIĆ A, BAČUN-DRUŽINA V, KOMES D, DURGO K, MILIĆ M. Protective effect of *Rosmarinus officinalis* L. and *Taraxum officinale* L. extracts on genetic material on human squamous carcinoma cell line CAL 27. 13th International Comet Assay Workshop; Pushchino, Moscow, Russia 2019. Book of Abstracts str. 58.
298. ILIĆ K, HARTL S, GALIĆ E, SELMANI A, BARBIR R, PAVIČIĆ I, ROBLEGG E, VINKOVIĆ VRČEK I. Biocompatibility assessment of selenium nanoparticles as novel biocidal nanomaterial. 10th International Congress - Nanotechnology in Biology & Medicine; Graz, Austria 2019. str. 10.
299. ILIĆ K, HARTL S, GALIĆ E, TETYCZKA C, PEM B, BARBIR R, PAVIČIĆ I, ROBLEGG E, VINKOVIĆ VRČEK I. Interaction of silver nanoparticles with biological barriers. 10th International Congress – Nanotechnology in Biology & Medicine; Graz, Austria, 2019. str. 8.
300. JAKOVLJEVIĆ I, SEVER ŠTRUKIL Z, GODEC R, PEHNEC G. PAHs in PM₁ particle fraction at an urban location in Croatia. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 198.
301. JURIČ A, FUCHS N, BRČIĆ KARAČONJI I, LUCIĆ VRDOLJAK A, MICEK V, KOPJAR N. Application of the alkaline comet assay to assess DNA instability in different cell types of Wistar rats exposed to irinotecan. 13th International Comet Assay Workshop; Pushchino, Moscow, Russia 2019. Book of Abstracts
302. KATALINIĆ M, LONČAR J, MIŠ K, VRHOVAC MADUNIĆ I, SMITAL T, PIRKMAJER S. Human muscle cells as a model to study the expression and physiological role of the NRE enzyme. 44th FEBS Congress and 19th YSF FEBS 2019; Krakow, Poland 2019. Book of Abstracts str. 45.
303. KATALINIĆ M, ZANDONA A, MADUNIĆ J, VRHOVAC MADUNIĆ I, MIŠ K, PIRKMAJER S. Neural and muscle cells in organophosphorus compound antidote research. 3rd Symposium & Workshop “Skeletal muscle research – from cell to human 2019”; Ljubljana, Slovenia 2019. Book of Abstracts str. 37-8.
304. KOSTELAC D, GERIĆ M, GAJSKI G, MARKOV K, ČANAK I, JAKOPOVIĆ Ž, FRECE J. Antimicrobial activity and immunomodulating potential of *Lactobacillus plantarum* M2 isolated from donkey milk. 7th NutRedOx Meeting; Lisabon, Portugal 2019. Book of Abstracts str. 41.
305. KOVARIK Z. Nerve agent bioscavengers based on an efficient oxime-assisted reactivation of cholinesterases. 3rd International conference CBRNE Research and Innovation; Nantes, France 2019. Book of Abstracts str. 70.
306. KOVARIK Z. Novel oximes in counteracting organophosphates exposure. 17th Medical Chemical Defense Conference “Chemical Warfare Agents – old problems and new challenges”; Munich, Germany 2019. Book of Abstracts str. 134.
307. KOVARIK Z, MAČEK HRVAT N, ŽUNEC S, KATALINIĆ M. Detoxification of nerve agents by oxime-assisted reactivation of cholinesterases. 4th Congress of the Serbian Association for Cancer Research with Internatinal Participation; Belgrad, Serbia 2019. Book of Abstracts str. 39.
308. KOVARIK Z, ZORBAZ T, MAČEK HRVAT N, ŽUNEC S, ZANDONA A, KATALINIĆ M. Reversal of OP toxicity by the oxime-assisted reactivation of cholinesterase. 16th International Symposium on Cholinergic Mechanisms; Rehovot, Israel 2019. Book of Abstracts str. 25.
309. LADEIRA C, GAJSKI G, GERIĆ M, GARAJ-VRHOVAC V, VIEGAS S. Mixtures of chemicals in occupational real scenarios: from real exposure to *in vitro*. 47th Meeting of the European Environmental Mutagenesis and Genomics Society (EEMGS); Rennes, France 2019. Book of Abstracts str. 68.
310. LUDOVIC J, DUBOIS-GEOFFROY P, PROBST N, GASNOT J, BRAIKI A, WARNAULT P, GOMEZ C, RENOU J, VERDELET T, MERCEY G, DIAS J, CALAS G, KOVARIK Z, NACHON F, BAATI R, RENARD P-Y. 3-hydroxypyridine aldoximes as efficient uncharged reactivators against organophosphorus nerve agents poisoning. 17th Medical Chemical Defense Conference “Chemical Warfare Agents – old problems and new challenges”; Munich, Germany 2019. Book of Abstracts str. 124.
311. MAČEK HRVAT N, KALISIAK J, ŠINKO G, ZANDONA A, RADIĆ Z, SHARPLESS KB, TAYLOR P, KOVARIK Z. Design and evaluation of phenyltetrahydroisoquinoline pyridinium aldoximes as reactivators of nerve-agent-inhibited human cholinesterases. 17th Medical Chemical Defense Conference “Chemical Warfare Agents – old problems and new challenges”; Munich, Germany 2019. Book of Abstracts str. 138.
312. MIKOLIĆ A, ŽUNEC S, MICEK V, BRČIĆ KARAČONJI I, NEUBERG M, KOZINA G, LUCIĆ VRDOLJAK A. Oxidative stress responses and cholinesterase activity in blood and brain of Wistar rats exposed to Δ^9 -tetrahydrocannabinol. The 2nd International Annual Congress on Controversies on Cannabis-Based Medicines (Med-Cannabis2019); Barcelona, Spain 2019. Book of Abstracts str. 3.
313. MILIĆ M, BONASSI S, ROJAS E, BOLOGNESI C, SÁNCHEZ-ALARCÓN J, VALENCIA-QUINTANA R. The use of buccal cells in human biomonitoring and early disease detection. 77 International Scientific Conference of the University of Latvia; Satellite Symposium: DNA integrity in health and pathology; Riga, Latvia 2019.

- Medicina 2019;55(Supplement 1):214.
314. OŽVALD I, BOŽIČEVIĆ D, VINKOVIĆ VRČEK I, PAVIČIĆ I, DOMIJAN A-M, MILIĆ M. Differences between biochemical and DNA damage parameters (comet assay and micronucleus assay) before and after three weeks of interventional hypocaloric diet in obese patients monitored in the Special Hospital for extended treatment of Duga Resa, Croatia – preliminary results. 10th International Congress of the Turkish Society of Toxicology (TST); Antalya, Turkey 2019. Abstracts str. 150.
315. OŽVALD I, BOŽIČEVIĆ D, VINKOVIĆ VRČEK I, PAVIČIĆ I, DOMIJAN A-M, MILIĆ M. The influence of a three-week hypocaloric diet on dna damage parameters measured by alkaline comet assay and cytochalasin b-blocked micronucleus assay in obese patients from the special hospital for extended treatment of Duga Resa, Croatia – preliminary results. 1st Congress of Geneticists in Bosnia and Herzegovina with International Participation; Sarajevo, Bosnia and Herzegovina 2019. Genet Appl 2019;2(no.2, Special edition):31.
316. PAVELIĆ L, SURIĆ MIHIĆ M, LACKOVIĆ I, PRLIĆ I. Design of energy compensation filter for NaI(Tl) scintillation crystals: preliminary findings. 4th European Radiation Protection Week; Stockholm, Sweeden 2019. Book of Abstracts str. 17.
317. PAVIĆ M, BRZICA H, ŠPERANDA M, ĆURKOVIĆ S, LEINER D, LJUBOJEVIĆ M. Trials and errors in immunohistochemistry: Unmasking of SGLT1 in porcine small intestine. The 10th Meeting of the Young Generation of Veterinary Anatomists – YGVA 2019; Bucharest, Romania. Book of Abstracts str. 50-1.
318. PEHNEC G, JAKOVLJEVIĆ I, GODEC R, ŽERO S, HUREMOVIĆ J, DŽEPINA K. Carcinogenic organic content of particulate matter at urban locations with different pollution sources. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 10.
319. PEM B, BARBIR R, RAMÍREZ-JIMÉNEZ R, MARTÍN-RAPÚN R, MARTÍNEZ DE LA FUENTE J, VINKOVIĆ VRČEK I. Effect of particle shape and size on the interactions of gold nanoparticles with proteins of different glycosylation status. FIRST CA17140 COST CONFERENCE Cancer Nanomedicine – from the Bench to the Bedside. Riga, Latvia 2019. Book of Abstracts str. 27.
320. PEM B, VRČEK V, VINKOVIĆ VRČEK I. Thiol vs. disulphide: a DFT study of the nano-bio interface. ScotChem 2019. Edinburgh, United Kingdom 2019. Book of Abstracts str. 24.
321. PRIMOŽIĆ I, RADMAN KASTELIC A, MIKELIĆ A, HRENAR T, MATOŠEVIĆ A, BOSAK A, KOVARIK Z. Design, synthesis and characterisation of quinuclidine carbamates. 16th International Symposium on Cholinergic Mechanisms; Rehovot, Israel 2019. Book of Abstracts str. 88.
322. PRLIĆ I, VEINOVIĆ Ž, UROIĆ G, SURIĆ MIHIĆ M, HAJDINJAK M, CEROVAC Z. Modern practice regarding Residues (NORM) during the exploration drilling in Oil&Gas Industry in Republic of Croatia. 4th European Radiation Protection Week; Stockholm, Sweeden 2019. Book of Abstracts str. S83.
323. RAMIĆ A, HRENAR T, MATOŠEVIĆ A, BOSAK A, PRIMOŽIĆ I. Synthesis and evaluation of fluorinated Cinchona alkaloids as cholinesterases inhibitors. 16th International Symposium on Cholinergic Mechanisms; Rehovot, Israel 2019. Book of Abstracts str. 89.
324. RINKOVEC J, PEHNEC G, ŽUŽUL S. Nickel, arsenic, cadmium and lead in PM₁ fraction in Zagreb, Croatia. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 108.
325. SABOLIĆ I, MICEK V, GERIĆ M, GAJSKI G, KRALIK OGUIĆ S, RAŠIĆ D, KARAICA D, VRHOVAC MADUNIĆ I, LJUBOJEVIĆ M, ORCT T, JURASOVIĆ J, NOVAK JOVANOVIĆ I, PERAICA M, NANIĆ L, RUBELJ I, BRELJAK D. In a rat model of ageing, long-term treatment with wine antioxidant, resveratrol, upregulates plasma levels of testosterone in males and downregulates plasma levels of progesterone in females. 1st Science & Wine World Congress; Porto, Portugal 2019. Book of Abstracts str. 28.
326. SABOLOVIĆ J, KELTERER A-M, RAMEK M. DFT-calculated magnetic parameters of physiological copper(II) complexes with L-asparagine and L-histidine: A Tool for verification of predicted lower-energy conformers in aqueous solution. 10th Triennial Congress of the International Society for Theoretical Chemical Physics ISTCP 2019; Tromsø, Norway 2019. Book of Abstracts, Poster: P1-95.
327. STIPIČEVIĆ S, FINGLER S, FILIPOVIĆ V, FILIPOVIĆ L, ZOVKO M, KRANJČEC F, BARIĆ K, ONDRAŠEK G. Glyphosate adsorption in continental and Mediterranean vineyard soils of Croatia. 17th International Conference on Chemistry and the Environment (ICCE); Thessaloniki, Greece 2019. Conference Proceedings str. 359.
328. SURIĆ MIHIĆ M, PAVELIĆ L, VOJNIĆ KORTMIŠ M, ŠIŠKO J, MALTAR-STRMEČKI N. 3D printed eye lens dosimeter holder for IR and IC. 4th European Radiation Protection Week; Stockholm, Sweeden 2019. Book of Abstracts str. P21.
329. SURIĆ MIHIĆ M, PRLIĆ I, VEINOVIĆ Ž, MOSTEČAK A. Radiation protection education and training in Croatia – current situation and needs. 8th EUTERP Workshop “Optimizing radiation protection training”; Qawra, Malta 2019. Book of Abstracts str. 46.

330. ŠIMIĆ I, GODEC R, BEŠLIĆ I, DAVILA S. Elemental and Organic Carbon in PM_{2,5} at a Coastal Urban Background Station in Croatia. 12th International Conference on Carbonaceous Particles in the Atmosphere; Vienna, Austria 2019. Abstract Book str. 119.
331. ŠIMIĆ I, MENDAŠ STARČEVIĆ G, PEHNEC G. Atmospheric deposition of organic compounds. 18th World Clean Air Congress 2019; Istanbul, Turkey 2019. Proceedings of Abstracts str. 199.
332. VALENCIA R, MILIĆ M. Evaluation of DNA damage in agricultural workers of Zamora-Jacona, Michoacán México. XXIV Congreso Nacional de Ciencias Ambientales; Mazatlán, Sinaloa, México 2019. Rev Int Contam Ambie 2019;36:57-8.
333. VINKOVIĆ VRČEK I, PEM B, ILIĆ K, PAVIČIĆ I, GONZÁLEZ-MANCEBO D, NUÑEZ NO, BECERRO AI, OCAÑA M. Biocompatibility assessment of up- and down-converting nanoparticles: implications of interferences with *in vitro* assays. 17th International Congress on Photobiology and 18th Congress of the European Society for Photobiology; Barcelona, Spain 2019. Book of Abstracts str. 679.
334. XIE HQ, KOVARIK Z, LIU Y, ČADEŽ T, MA Y, ZANDONA A, LUO Y, ŠINKO G, KATALINIĆ M. Interaction analyses of AChE and BChE with selected pesticides. 16th International Symposium on Cholinergic Mechanisms; Rehovot, Israel 2019. Book of Abstracts str. 78.
335. ZANDONA A, MADUNIĆ J, KATALINIĆ M. Time-dependent cytotoxicity of pyridinium antidotes. 44th FEBS Congress and 19th YSF FEBS 2019; Krakow, Poland 2019. Book of Abstracts str. 46.
336. ZORBAZ T, MIŠETIĆ P, ŽUNEC S, ZANDONA A, MICEK V, MENDAŠ G, PROBST N, BRAJKI A, MAČEK HRVAT N, KATALINIĆ M, GABELICA MARKOVIĆ V, JEAN L, RENARD PY, KOVARIK Z. Pharmacological analysis of centrally active oxime for nerve agent poisoning. 16th International Symposium on Cholinergic Mechanisms; Rehovot, Israel 2019. Book of Abstracts str. 63.
337. ŽUNEC S, MIKOLIĆ A, BRČIĆ KARAČONJI I, KOPJAR N, LUCIĆ VRDOLJAK A. Interactions between cannabinoids and anticancer drugs: an example of Δ^9 -tetrahydrocannabinol and irinotecan. Cannabis under scrutiny: their toxicity and medical utility; Ljubljana, Slovenia 2019. Book of Abstracts str. 36.

Sažetci u elektroničkom izdanju

338. FILIPOVIĆ V, STIPIČEVIĆ S, FINGLER S, FILIPOVIĆ L, BUBALO KOVAČIČ M, KRANJČEC F, ONDRAŠEK G. Glyphosate mobility assessment in vineyard soils under different agroecological conditions. SSSA International Soils Meeting: Soils Across Latitudes; San Diego, CA, USA 2019. Dostupno na: <https://scisoc.confex.com/scisoc/2019sssa/meetingapp.cgi/Paper/116207>
339. KESERI, CVIJETIĆ S, JURASOVIĆ J, COLIĆ BARIĆ I, KAUZLARIĆ M, ŠIMUNIĆ K, BOSCHIERO D, ILICH J. Association of chronic stress, inflammation, body composition and dietary intake in Croatian university students. 13th European Nutrition Conference; Dublin, Ireland 2019. Dostupno na: <https://app.oxfordabstracts.com/events/696/program-app/submission/124897>

D.7. IZVJEŠTAJI STRUČNE DJELATNOSTI

Nacionalni projekti, ugovori i suradnje

340. IMI-CRZ-99; 2019. Praćenje stanja radioaktivnosti u okolišu u Republici Hrvatskoj (Izveštaj za 2018. godinu). G. Marović i sur. Ugovarač: Državni zavod za radiološku i nuklearnu sigurnost, Zagreb.
341. IMI-EBV-15/19; 2019. Određivanje koncentracije metala u uzorcima tkiva – serum, kosa i urin. J. Jurasović, R. Turk, J. Macan. Ugovarač: Zavod za javno zdravstvo Brodsko-posavske županije, Slavonski Brod.
342. IMI-P-419; 2019. Izveštaj o mjerjenju ukupne taložne tvari na području pjeskokopa „Brezovi rebar“ (Izveštaj za 2018. godinu). G. Pehneć i sur. Ugovarač: Wienerberger Ilovac d. o. o. Donje Pokuplje 2, Karlovac.
343. IMI-P-420; 2019. Izveštaj o mjerjenju ukupne taložne tvari na području općine sv. Đurđ, Šljunčara „Jamičak“ (Izveštaj za 2018. godinu). G. Pehneć i sur. Ugovarač: Bagerkop Roberto d. o. o. Ključička 1a, Novi Marof.
344. IMI-P-421; 2019. Izveštaj o mjerjenjima posebne namjene onečišćenja zraka (PM₁₀ i PM_{2,5}) i mjerjenjima ukupne taložne tvari na jednoj lokaciji u Vinkovcima (Izveštaj za 2018. godinu). G. Pehneć i sur. Ugovarač: Grad Vinkovci.
345. IMI-P-422; 2019. Izveštaj o mjerjenju kvalitete zraka na imisijskoj mjernoj postaji za praćenje kvalitete zraka Jakuševac (2018. godina). G. Pehneć i sur. Ugovarač: Ekoneg d. o. o., Zagreb.
346. IMI-P-423; 2019. Izveštaj o mjerjenju kvalitete zraka na lokaciji međunarodne zračne luke Zagreb (Izveštaj za 2018. godinu). G. Pehneć i sur. Ugovarač: Međunarodna zračna luka Zagreb d. d., Velika Gorica.
347. IMI-P-424; 2019. Izveštaj o mjerjenju PM₁₀ frakcije lebdećih čestica za pogon EL-TO Zagreb (Izveštaj za 1.

- siječnja – 6. ožujka 2018.). G. Pehnc i sur. Ugovarač: HEP – Proizvodnja d. o. o., Zagreb.
348. IMI-P-425; 2019. Izvještaj o praćenju kvalitete zraka na mjernoj postaji vojni poligon „Eugen Kvaternik“ u Slunju (Izvještaj za 2018. godinu). G. Pehnc i sur. Ugovarač: Državni hidrometeorološki zavod, Zagreb.
349. IMI-P-426; 2019. Izvještaj o praćenju kvalitete zraka na postajama državne mreže (Izvještaj za 2018. godinu). G. Pehnc i sur. Ugovarač: Ministarstvo zaštite okoliša i energetike RH, Zagreb, Državni hidrometeorološki zavod, Zagreb.
350. IMI-P-427; 2019. Studija ekvivalencije za ne-referentnu metodu mjerenja frakcije lebdećih čestica $PM_{2,5}$ na mjernoj postaji Višnjani. I. Bešlić i sur. Ugovarač: Ministarstvo zaštite okoliša i energetike RH, Zagreb Državni hidrometeorološki zavod, Zagreb.
351. IMI-P-428; 2019. Izvještaj o mjerenju i praćenju kvalitete zraka na gradskim mjernim postajama u 2018. (Izvještaj za 2018. godinu) G. Pehnc i sur. Ugovarač: Grad Zagreb, Gradski ured za energetiku, zaštitu okoliša i održivi razvoj.
352. IMI-P-429; 2019. Izvještaj o kontroli kvalitete rezultata mjerenja zraka – usporedba rezultata dobivenih pomoću senzora i referentnih ispitnih metoda. G. Pehnc i sur. Ugovarač: Grad Zagreb.
353. IMI-P-430; 2019. Izvještaj o mjerenjima benzo(a)pirena (BaP) na mjernoj postaji na Peščenici za 2018. godinu (Provedba mjere M2 iz Programa zaštite zraka – mjerenja dodatnih parametara). G. Pehnc i sur. Ugovarač: Grad Zagreb, Gradski ured za energetiku, zaštitu okoliša i održivi razvoj.
354. IMI-P-431; 2019. Izvještaj o mjerenju ukupne taložne tvari uz eksploatacijsko polje Mekiš u Podravskim Sesvetama tijekom srpnja 2019. godine. G. Pehnc i sur. Ugovarač: Granulati Drava d. o. o., Podravske Sesvete.
355. IMI-P-432; 2019. Izvještaj o mjerenju masenih koncentracija PM_{10} frakcije lebdećih čestica i ukupne taložne tvari na lokaciji Golubovečki kamenolomi (26. kolovoza – 26. rujna 2019.). G. Pehnc i sur. Ugovarač: Golubovečki kamenolomi d. o. o., Novi Golubovec.
356. IMI-P-433; 2019. Izvještaj o praćenju kvalitete zraka na lokalitetu plinskog polja Molve tijekom 2019. godine (14. veljače – 16. ožujka 2019. i 27. lipnja – 27. srpnja 2019.). G. Pehnc i sur. Ugovarač: INA-Naftaplin, Zagreb, Zavod za javno zdravstvo Koprivničko-križevačke županije, Koprivnica.
357. IMI-P-434; 2019. Izvještaj o praćenju kvalitete zraka u zoni utjecaja CUPOVZ-a u Zagrebu (2019. godina). G. Pehnc i sur. Ugovarač: Zagrebačke otpadne vode upravljanje i pogon d. o. o., Zagreb.
358. IMI-P-437; 2019. Rezultati praćenja stanja radioaktivnosti u okolišu objekata termoelektrane Plomin (Izvješće za 2018. godinu). G. Marović i sur. Ugovarač: HEP Proizvodnja d. o. o. Termoelektrana Plomin I. Plomin.
359. IMI-P-438; 2019. Rezultati mjerenja radioaktivnosti plinskog polja Molve (Izvještaj za 2018. godinu). G. Marović i sur. Ugovarač: Križevačko-Koprivnička županija, Koprivnica.
360. PRLIĆ I. Početna procjena rizika od izlaganja radnika ionizirajućem zračenju porijeklom od NORM-a za vrijeme redovitog proizvodnog procesa čišćenja tubing cijevi u poduzeću STSI d. o. o. – Radionice za servis tubing cijevi Stružec kako je definirano Zakonom o radiološkoj i nuklearnoj sigurnosti (NN 141/13, 39/15, 130/17, 118/18) i pratećim pravilnicima, Izvadak iz studije procjene ozračenja radnika i referentne skupine stanovništva pri provedbi proizvodnih aktivnosti pri kojima može doći do povećanja ozračenja radnika i stanovnika od prirodnih izvora ionizirajućeg zračenja na radilištima INA grupe u Republici Hrvatskoj – početne procjene rizika. Klasa: 07-75/19-00/7, Ur.br.: IMI 100-08/19-1. Voditelj projektnog zadatka i glavni izrađivač izvješća: I. Prlić, suradnici IMI: L. Pavelić, S. Kobeščak, M. Justić, M. Surić Mihić, M. Avdić i J. Senčar te vanjski suradnici Jedinice: Z. Cerovac i M. Hajdinjak).

Međunarodni projekti, ugovori i suradnje

361. VARNAI VM. The Committee for Risk Assessment. Opinion proposing harmonised classification and labelling at EU level of 4-vinylcyclohexene diepoxide. ECHA, Helsinki, 2019.
362. PRLIĆ I. Izvješće nakon provedbe projekta br. 2 od 30. lipnja 2019.: Integrirani hardversko-softverski sustav za praćenje mikrolokacijskih parametara stanja okoliša – IPPSO/RC.2.2.08-0027