Arhiv za higijenu rada i toksikologiju

Archives of Industrial Hygiene and Toxicology

2021;72(Suppl. 1)

Abstracts of the 6th Croatian Congress of Toxicology with International Participation

CROTOX 2021

Rabac, Croatia, 3-6 October 2021

Cover page: *Phoenix*

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CROTOX 2021

EDITORIAL

Dear Reader,

It is with great pleasure that I present to you the Supplement to the *Archives of Industrial Hygiene and Toxicology* which comprises abstracts of all the presentations at the 6th Croatian Congress of Toxicology with International Participation, which is taking place in Rabac, Croatia in the period 3-6 October, 2021. The rich conference programme is showcased herein by all the abstracts which encompass a wide range of plenary and invited lectures and oral and poster presentations.

It must be admitted that the circumstances of holding this edition of the conference are significantly different from years past. The adage, and not meant in a positive sense, "May you live in interesting times" seems particularly apt to describe the period which we are currently passing through. Indeed, the rapid spread of a coronavirus and the accompanying declaration of a pandemic have dramatically altered the way in which we have lived our lives for the last year and a half, with concommitant effects on many planned public events which have either been drastically curtailed, postponed or cancelled. It is against this backdrop that the Croatian Congress of Toxicology with International Participation has endeavoured to realise its quadrennial conference and overcome all the challenges associated with holding such an event in a period of lockdowns and disrupted national and international travel.

It is with some resonance that these global events highlight the vital role that toxicology and toxicologists play in the modern world. In particular, the full spectrum push to rapidly roll out population-wide experimental treatments against coronavirus symptoms, and hence any potentially deleterious effects that may arise over short to long time scales, emphasises the need to support increased monitoring and research efforts in the field of human and clinical toxicology. The conference addresses not only coronavirus related issues such as the impacts of increased disinfectant and alcohol use but broader exposure scenarios ranging from exposure of foetuses to tobacco smoke, children taking analgesics and anti-inflammatory pharmaceuticals to adults consuming psychoactive substances. An aspect oftentimes overlooked is exposure through poisoning from accidental consumption of potentially harmful materials such as plants, which this conference addresses in addition to investigating potential benefts such as the anti-cancer, anti-oxidative, and anti-bacterial potential of plant-derived bioactive substances. Hand in hand with clinical toxicology goes exposure risk assessment and a broad variety of studies focussing on issues such as neonicotinoid and legacy pesticides use and hidden exposure pathways such as that through house dust provide an ideal base to support discourse among all the experts and participants at the conference. Advances in these areas will be underpinned by new developments in laboratory test systems, and a range of data is presented on emerging approaches incorporating 3D cell models and *in silico* computation methods.

Of course, there is an array of other modern challenges present in the world around us underscoring the continuing need for new approaches and efforts, for example addressing issues ranging from the application of genetically modified organisms to release of micro- and nanoscale materials in the environment, in the fields of food and environmental toxicology, respectively. It is entirely appropriate that attention is given to the area of ecotoxicology as our integration in the biome inevitably puts us at risk due to consumption of foods that may have bioaccumulated, trophically transferred and biomagnified toxic substances of anthropogenic origin such as herbicides and heavy metals. Indeed, this overlaps to a significant degree with food toxicology, where the safety of foodstuffs, ranging from fresh fuit and vegetables to honey and fermentation products, is of primary concern. In addition to the presentation of these studies, the recent rapid increase of interest in anthropogenic materials with micro- and nano-dimensions reaching the environment is also addressed, with data on microplastics, nanoparticles, and nanotubes impact on plant and animal models presented. Unfortunately, these few brief comments can only give a mere glimpse of the rich programme on offer at the 6th Croatian Congress of Toxicology with International Participation, and the important fundamental and applied data that is being presented.

While the presenters are rightly the stars of the show, it should be mentioned that a large number of people have been working quietly in the background to organise and bring to life this conference, and I feel it is appropriate to mention at this point, with thanks, the contributions of the Editor-in-Chief, Assistant Editors and Editorial Board of the *Archives of Industrial Hygiene and Toxicology* who have helped us realise this Proceedings book as a supplement to the journal. The enormous contribution of the members of the Organising and Scientific boards is also gratefully acknowledged.

In conclusion, the new data and approaches presented at the 6th Croatian Congress of Toxicology with International Participation, and outlined in this issue, are timely as they address an enormous wealth of both legacy and contemporary issues in all the fields of toxicological research. Looking around us, it seems we are indeed living in interesting times, and it is clear that the role toxicologists play will remain as important as ever as we continue into the future.

Guest Editor
Prof Daniel Mark Lyons, PhD

WELCOME ADDRESS

Dear Friends and Colleagues,

It is my great pleasure and honour to be able to welcome you on behalf of CROTOX 2021 and the Croatian Society of Toxicology (CST) at this 6th Croatian Congress of Toxicology with international participation in the charming town of Rabac.

Our plan was to organize CROTOX in October last year, but because of the COVID-19 pandemic we had to postpone it on three separate occasions. In the meantime, while we were waiting for the permission of health authorities for holding the congress, our Scientific and Organising Committees prepared plans for the Congress, invited the lecturers, edited our book of abstracts and organised each detail of the Congress. I am always delighted by the enthusiasm of our committees because the results of their efforts are amazing: we all have the opportunity to hear eminent toxicologists presenting the results of their most recent research in a joyful, smooth, and relaxed atmosphere.

In spite of all the problems, we can proudly say that the CST is very active and that our activities provide an adequate response to the modern challenges in toxicology. Due to the pandemic, we could not invite all of the members of our and other similar societies to give lectures in various fields of toxicology. However, we organised online lectures and gave fellowships to our members for participation at online scientific meetings.

The Croatian Society of Toxicology made use of the lockdown(s) to publish the monograph "25 Years of the Croatian Society of Toxicology". In this monograph, nine toxicologists from various institutions (medical schools, institutes, toxicology agencies, and public health agencies) gave an overview of the scientific, educational, and practical position of toxicology in Croatia. This monograph, written in Croatian and English, covers the 25-year history of the CST.

The systematic education of toxicologists in our country is still lacking and therefore we decided to organise a Continuing Education Course (CEC) before the beginning of the Congress. This CEC, financially supported by EUROTOX is entitled "Old methods, new perspective: new regulation and approach to toxicity testing of food chemicals". Eminent Croatian and international scientists agreed to share their knowledge with young scientists. As usual, in order to help young scientists to participate at CROTOX, the Organising Committee gave eight fellowships to young scientists. They will hold oral presentations of their works together with eminent scientists from various fields of toxicology. The abstracts of the oral and poster presentations will be published in the Abstract Book as a Supplement to the journal *Archives of Industrial Hygiene and Toxicology*, the official journal of the Croatian Society of Toxicology. I would like to thank the Editor-in-Chief and the Editorial Board of the Archives of Industrial Hygiene and Toxicology for accepting the abstracts of CROTOX 2021 to be published.

The Congress is held under the auspices of the Institute for Medical Research and Occupational Health, which is greatly acknowledged. We would like to thank our sponsors for supporting the organisation of the Congress.

On behalf of the Organising and Scientific Committees, I wish to thank all the participants of the Congress and all sponsoring organisations that made this Congress possible.

President of the Congress
Maja Peraica, MD, PhD, ERT

CROTOX 2021, Rabac, Croatia, October 3-6

Programme

Sunday, 3 October 2021 (Day 1)		
12:00 – 18:00	Registration of participants	
12:00 – 18:00	**Continuing Education Courses (CEC), including coffee & lunch breaks** **Moderator: Emanuela Corsini (Milan, Italy)**	
19:30 – 20:00	**Opening ceremony**	
PLENARY LECTURE **Chairs:** Maja Peraica, Daniel Mark Lyons		
20:00 – 20:45	**IL – 1**	**Andrew Collins** (Oslo, Norway) The comet assay; from nanoparticles to human populations
21:00	**Welcome reception**	
Monday, 4 October 2021 (Day 2)		
8:00 – 9:00	**Posters will be put up by presenters**	
SESSION 1 CLINICAL TOXICOLOGY **Chairs:** Arnes Rešić, Željka Babić		
9:00 – 9:35	**IL – 2**	**Ines Potočnjak** (Zagreb, Croatia) Intoxications in clinical settings
9:35 – 10:10	**IL – 3**	**Mila Lovrić** (Zagreb, Croatia) The diagnostic needs and possibilities of detecting new psychoactive substances in clinical practice
10:10 – 10:25	**OP – 1**	**Jelena Macan** (Zagreb, Croatia) Toxicological aspects of the increased use of disinfectants during the COVID-19 pandemic in Croatia
10:25 – 10:40	**OP – 2**	**Zrinka Franić (**Zagreb, Croatia) Plant poisoning reported to the Croatian Poison Control Centre during a ten-year period (2010-2019)
10:40 – 11:00	Silver sponsor presentation	**Labtim d.o.o.** **Ivica Blažević**
11:00 – 11:30	**Poster viewing and coffee break** sponsored by **Medic d.o.o**	
SESSION 2 ANALYTICAL TOXICOLOGY **Chairs:** Davorka Sutlović, Alica Pizent		
11:30 – 12:05	**IL – 4**	**Snežana Đorđević** (Belgrade, Serbia) Unconventional psychoactive substances – big analytical challenges
12:05 – 12:20	**OP – 3**	**Tanja Živković Semren** (Neuchâtel, Switzerland) Real-time (on-line) chemical characterisation of thermal aerosols by super secondary electrospray ionisation coupled with high-resolution mass spectrometry (Super SESI–HRMS)

12:20 – 12:50	Golden sponsor's presentation	**Alphachrom d.o.o.** **Matea Kovač & Ines Topalović Piteša** Microplastic – reality or science fiction?
12:50 – 14:00	**Lunch break**	
SESSION 3 EMERGING APPROACHES IN TOXICOLOGY **Chairs:** Davor Želježić, Biljana Antonijević		
14:00– 14:35	**IL – 5**	**Bojana Žegura** (Ljubljana, Slovenia) *In vitro* 3D cell cultures in genetic toxicology
14:35 – 15:10	**IL – 6**	**Ivica Dimkić** (Belgrade, Serbia) A new insight into *Bacillus* lipopeptides in terms of cytotoxic, genotoxic, and embryotoxic potential in correlation with synthetic pollutants
15:10 – 15:25	**OP – 4**	**Marijana Ćurčić** (Belgrade, Serbia) The effects of decabrominated diphenyl ether (BDE-209) and cadmium (Cd) mixture on thiol groups (SH) and copper (Cu) balance in Wistar rat's brain
15:25 – 15:40	**OP – 5**	**Ivan Ožvald** (Zagreb, Croatia) Micronucleus cytome assay results in obese patients with body mass index (BMI)≥35 on a 500-kcal-3-week diet controlled in hospital
15:40 – 16:10	**Poster viewing and coffee break** sponsored by **Medic d.o.o**	
SESSION 4 YOUNG SCIENTISTS AWARDS **Chairs:** Nevenka Kopjar, Andreja Prevendar Crnić		
16:10 – 16:25	**YSL – 1**	**Antonio Zandona** (Zagreb, Croatia) Cytotoxic effects of vitamin B3 derivatives in cultured cells
16:25 – 16:40	**YSL –2**	**Milan Gavrilović (**presenter: **Pedja Janaćković)** (Belgrade, Serbia) *In vitro* toxicology screening of *Centaurea calcitrapa* (Asteraceae) extracts, their phenolic profiles, and bioactivity
16:40 – 16:55	**YSL – 3**	**Martina Štampar** (Ljubljana, Slovenia) *In vitro* 3D cell model for detection of genotoxic effects
16:55 – 17:10	**YSL – 4**	**Renata Biba** (Zagreb, Croatia) Differently coated silver nanoparticles cause oxidative stress and induce cellular damage in tobacco (*Nicotiana tabacum*) seedlings
17:10 – 17:25	**YSL – 5**	**Carina Lackmann** (Frankfurt am Main, Germany/ Osijek, Croatia) The effects of chronic exposures of four commercial pesticide preparations on multiple levels of biological organisation in earthworm (*Eisenia andrei*)
17:25 – 17:40	**YSL – 6**	**Vedran Micek** (Zagreb, Croatia) Individual and combined subchronic oral exposure to ochratoxin A and citrinin affect the expression of organic cation transporters in rat kidneys
17:40 – 17:55	**YSL – 7**	**Zuzana Redžović** (Zagreb, Croatia) Adenylate energy charge (AEC) as a useful indicator of environmental stress in *Synurella ambulans* (Müller, 1846) from the hyporheic zone of the Sava River
17:55 – 18:10	**YSL – 8**	**Karla Jagić** (Zagreb, Croatia) Polybrominated diphenyl ethers in Croatian house dust and assessment of human exposure

19:30 – 21:30	**Poster & beer party** sponsored by **Carlsberg Croatia**	
21:30 – 22:00	**Posters will be taken down by presenters**	
Tuesday, 5 October 2021 (Day 3)		
SESSION 5 ECOTOXICOLOGY & EXPOSURE ASSESSMENT **Chairs:** Maja Peraica, Bojan Šarkanj		
9:00 – 9:35	**IL – 7**	**Doris Marko** (Vienna, Austria) *Alternaria* toxins in food – an underestimated hazard?
9:35 – 10:10	**IL – 8**	**Maja Šegvić Klarić** (Zagreb, Croatia) Aspergilli in damp dwellings – how diverse and dangerous are they?
10:10 – 10:25	**OP – 6**	**Zdenko Franić** (Zagreb, Croatia) Toxicity and radiotoxicity of honey and other beehive products
10:15 – 10:30	**OP – 7**	**Marija Kovačević** (Osijek, Croatia) Effects of strobilurins (azoxystrobin, pyraclostrobin, and trifloxystrobin) on reproduction and hatching delay in *Enchytraeus crypticus*
10:45 – 11:15	**Coffee break**	
SESSION 6 GENOTOXICOLOGY AND AGING **Chairs:** Andrew Collins, Goran Gajski		
11: 15 – 11:50	**IL – 9**	**Vanessa Moraes de Andrade** (Santa Catarina, Brazil) Melatonin supplementation over different time periods until aging modulates genotoxic parameters in mice
11:50 – 12:05	**OP – 8**	**Marko Gerić** (Zagreb, Croatia) Toxicological assessment of wastewater treatment processes: impact of pressure boat washing
12:05 – 12:20	**OP – 9**	**Gonca Çakmak** (Ankara, Turkey) Investigation of genotoxicity in buccal epithelial cells and determination of urinary metal levels of children with exposure to urban and industrial air pollution
12:20 – 12:40	Bronze sponsor presentation	**VWR International, LLC** **Cassandra Rusher** HTP-MS solutions from Avantor
12:40 – 14:00	**Lunch break**	
15:00 – 23:00	**Excursion and congress dinner**	
Wednesday, 6 October 2021 (Day 4)		
SESSION 7 COMPUTATIONAL TOXICOLOGY **Chairs:** Daniel Mark Lyons, Predrag Putnik		
9:00 – 9:35	**IL – 10**	**Goran Klobučar** (Zagreb, Croatia) Toxicity prediction and prioritisation of pharmaceuticals in the aquatic ecosystems
9:35 – 10:10	**IL – 11**	**Tin Klanjšček** (Zagreb, Croatia) Beyond descriptive modelling – predictive ecotoxicology using dynamic energy budgets

10:10 – 10:25	**OP – 10**	**Ines Haberle** (Zagreb, Croatia) Dynamic Energy Budget theory in (eco)toxicological research
10:25 – 10:55	**Coffee break**	
SESSION 8 NANOTOXICOLOGY & MICROPLASTICS **Chairs:** Bojana Žegura, Marko Gerić		
10:55 – 11:30	**IL – 12**	**Daniel Mark Lyons** (Rovinj, Croatia) The humble sea urchin in the Nano-cene: the gift that keeps on giving
11:30 – 12:05	**IL – 13**	**Mirta Smodlaka Tanković** (Rovinj, Croatia) Microplastics in the marine environment – distribution, availability, and risk assessment
12:05 – 12:20	**OP – 11**	**Ivana Hazdovac** (Rovinj, Croatia) The adverse impact of copper nanoparticles and role of copper speciation in the embryogenesis of sea urchin *Sphaerechinus granularis*
12:20 – 12:35	**OP -12**	**Petra Burić** (Pula, Croatia) Interaction of microplastics with silver nanoparticles and cypermethrin and their effect on early embryonal development of the sea urchin *Arbacia lixula*
12:35 – 13:00	**Closing lecture**	**Ivica Prlić** (Zagreb, Croatia) Toxicity of "5G"!?
13:00 – 13:20	**Closing ceremony**	

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Polyoxopalladates as potential antitumor drugs: *in vitro* toxicity assessment

Mirjana B. Čolović[1], Goran Gajski[2], Tian Ma[3], Anđelka Isaković[4], Sonja Misirlić-Denčić[4], Ulrich Kortz[3], and Danijela Z. Krstić[5]

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Polyoxopalladates (POPs) are a subclass of polyoxometalates (POMs) comprising discrete, anionic palladium(II)-oxo complexes. Although numerous studies have been conducted on the biological activity of POMs, their toxicity (e.g. non-selectivity) is frequently a limitation for real-world biomedical applications. Thus, the aim of this study was to evaluate the *in vitro* safety of the three POPs $Pd_{13}As_8$, $SrPd_{12}As_6$, and $Pd_{13}(PhAs)_8$, which exhibited strong antitumour activity against human neuroblastoma cell line SH-SY5Y, by performing a cyto/genotoxicity study on human healthy blood. Blood samples obtained from a healthy female donor were treated with three different concentrations (12.5, 25, and 50 μmol/L) of the POPs, and incubated at 37 °C for 4 and 24 h. A cytotoxicity (cell viability) assay was performed on isolated human peripheral blood lymphocytes stained with acridine orange and ethidium bromide. A genotoxicity test was carried out on whole blood by alkaline comet assay (microgel electrophoresis), and the percentage of tail DNA was used to assess the level of DNA damage. $Pd_{13}As_8$ did not affect neither cell viability nor DNA damage, related to the control, at either of the investigated concentrations (after both 4 and 24 h). On the contrary, higher concentrations (25 and 50 μmol/L) of both $SrPd_{12}As_6$ and $Pd_{13}(PhAs)_8$ induced a statistically significant decrease in cell viability after 24 h (up to 42 %), and a relative increase of tail DNA (up to 3×) was observed at 50 μmol/L, after 24 h. Therefore, $Pd_{13}As_8$ could be regarded as non-toxic to human healthy cells, whereas $SrPd_{12}As_6$ and $Pd_{13}(PhAs)_8$ require additional toxicity analysis.

KEY WORDS: antitumor activity; cell viability; comet assay; cyto/genotoxicity; polyoxometalates