EUGLOH

Annual Student Research Conference

Global Health Challenges: Diseases of Modern Life

September 28th – 30th 2020

Organized by University of Szeged, Hungary

EUGLOH

European University Alliance for Global Health

Co-founded by the Erasmus+ Program of the European Union

www.eugloh.eu

WELCOME

Dear EUGLOH Partners

We would like to thank all delegates for attending the first Annual Student Research Conference organised by the University of Szeged (Hungary) with the participation of member universities of the European University Alliance for Global Health (EUGLOH) collaboration. This pioneering event offers an opportunity to the students of the partner universities – the Ludwig-Maximilians University (Munich, Germany), the Lund University (Sweden), the University of Porto (Portugal), the University Paris-Saclay (Paris, France) and the University of Szeged (Hungary) – to contribute to a comprehensive overview of the research activities performed with the participation of students.

The conference programme comprises 10 sessions with 54 oral and 25 electronic poster presentations from the students' own work in multidisciplinary topics, with a primary focus on global health. The programme is also enriched by plenary talks given by distinguished experts of global health. We believe that current global health challenges underpin the importance of this international congress more than ever. Joint efforts to share scientific experiences and strengthen multidisciplinary cross-border educational and research collaborations will greatly contribute to overcoming the unprecedented global health crisis the world faces these days.

Due to the COVID-19 pandemic, the Congress will be organised in an innovative format. We use the latest information technology tools to deliver successful virtual scientific and social events and e-learning opportunities. The interactive electronic platform is not only ideal for sharing information, but also offers the possibility to build strong and productive relationships, which is the main mission of the EUGOH alliance.

We would like to thank the participating students and their supervisors for their joint efforts and express our gratitude to all conference participants for their invaluable contribution. We wish you all an enjoyable conference experience and successful presentations!

Yours faithfully, on behalf of the organisers,

Prof. Dr. Ferenc Peták
EUGLOH WP3 Academic Leader

CONFERENCE ORGANIZERS

Participating member universities of the EUGLOH alliance:

University of Szeged (Hungary)

Ludwig-Maximilians University (Munich, Germany)

Lund University (Sweden)

University of Porto (Portugal)

University Paris-Saclay (Paris, France)

CONGRESS ORGANIZING COMMITTEE

Prof. Dr. Ferenc Peták

Dr. Lilla Kocsis

László Maróti

Eszter Sasi-Pokriva

Enikő Koppány

Dr. József Tolnai

Dr. Gergely Fodor

Zsuzsanna Papp

Tamás Simon

Tamás Racskó

Rita Matijevic

Miklós Csúri

Mária Anna Fekete

Péter Hoffman

Márton Tóth

Beáta Sikó

Attila Huszár

General information: eugloh@rekt.szte.hu

Conference schedule

September 28. (Monday)

9:00 - 9:15	Opening, welcome
9:15 - 9:30	Plenary talk 1. Laurent Roybon (Lund)
9:30 - 9:45	
9:45 - 10:00	
10:00 - 10:15	**Oral session** Ageing and dementia as a global health challenge *Chairs: Eszter Farkas (Szeged), Micaela Galante (UPS), Alessia Zamborlini (UPS)*
10:15 - 10:30	
10:30 - 10:45	
10:45 - 11:00	
11:00 - 11:15	
11:15 - 11:30	
11:30 - 11:45	
11:45 - 12:00	
12:00 - 12:15	**Oral session** Noncommunicable and pandemic diseases *Chairs: Elisa Oliveira Braga Keating (Porto), Laurent Roybon (Lund)*
12:15 - 12:30	
12:30 - 12:45	
12:45 - 13:00	
13:00 - 13:15	
13:15 - 13:30	
13:30 - 13:45	
13:45 - 14:00	
14:00 - 14:15	
14:15 - 14:30	Plenary talk 2. Lennart Olsson (Lund)
14:30 - 14:45	
14:45 - 15:00	
15:00 - 15:15	**E-Poster discussion sessions** Global health: miscellaneous challenges I.- II. *Chairs: József Maléth (Szeged), Karin Geffert (LMU)*
15:15 - 15:30	
15:30 - 15:45	
15:45 - 16:00	
16:00 - 16:15	
16:15 - 16:30	
16:30 - 16:45	
16:45 - 17:00	
17:00 - 17:15	Plenary talk 3. Elísio Manuel de Sousa Costa (Porto)
17:15 - 17:30	
17:30 - 17:45	
17:45 - 18:00	Kahoot - science fun facts *Zsuzsanna Papp*
18:00 - 18:15	
18:15 - 18:30	
18:30 - 18:45	
18:45 - 19:00	

September 29. (Tuesday)

9:00 - 9:15	Plenary talk 4. Éric Morel (UPS)
9:15 - 9:30	
9:30 - 9:45	
9:45 - 10:00	**Oral session** Cardiovascular diseases *Chairs: Éric Morel (UPS), Zsolt Bagosi (Szeged)*
10:00 - 10:15	
10:15 - 10:30	
10:30 - 10:45	
10:45 - 11:00	
11:00 - 11:15	
11:15 - 11:30	
11:30 - 11:45	**Oral session** Environmental challenges: water and food contamination, climate change *Chairs: Edit Paulik (Szeged), Éric Morel (UPS)*
11:45 - 12:00	
12:00 - 12:15	
12:15 - 12:30	
12:30 - 12:45	
12:45 - 13:00	
13:00 - 13:15	
13:15 - 13:30	
13:30 - 13:45	
13:45 - 14:00	
14:00 - 14:15	
14:15 - 14:30	Plenary talk 5. Micheline Misrahi (UPS)
14:30 - 14:45	
14:45 - 15:00	
15:00 - 15:15	**Oral session** Cancer screening and care, Antimicrobial resistance *Chairs: Micheline Misrahi (UPS), Elisa Maria José Oliveira (Porto)*
15:15 - 15:30	
15:30 - 15:45	
15:45 - 16:00	
16:00 - 16:15	
16:15 - 16:30	
16:30 - 16:45	
16:45 - 17:00	
17:00 - 17:15	Plenary talk 6. Elisa Oliveira Braga Keating (Porto)
17:15 - 17:30	
17:30 - 17:45	
17:45 - 18:00	Virtual campus and city tour *Zsuzsanna Papp*
18:00 - 18:15	
18:15 - 18:30	
18:30 - 18:45	
18:45 - 19:00	
19:00 - 19:15	

September 30. (Wednesday)

9:00 - 9:15	Plenary talk 7. Karin Geffert (LMU)
9:15 - 9:30	
9:30 - 9:45	
9:45 - 10:00	**Oral session** Global health: miscellaneous challenges I. *Chairs: Beáta Udvari (Szeged), Karin Geffert (LMU)*
10:00 - 10:15	
10:15 - 10:30	
10:30 - 10:45	
10:45 - 11:00	
11:00 - 11:15	
11:15 - 11:30	
11:30 - 11:45	**Oral session** Global health: miscellaneous challenges II. *Chairs: Elísio Manuel de Sousa Costa (Porto), Matthias Siebeck (LMU)*
11:45 - 12:00	
12:00 - 12:15	
12:15 - 12:30	
12:30 - 12:45	
12:45 - 13:00	
13:00 - 13:15	
13:15 - 13:30	
13:30 - 13:45	
13:45 - 14:00	
14:00 - 14:15	
14:15 - 14:30	Plenary talk 8. Matthias Siebeck (LMU)
14:30 - 14:45	
14:45 - 15:00	
15:00 - 15:15	**E-Poster discussion session** Ageing, Dementia, Psychological and Mental Disorders *Chairs: Robert Perneczky (LMU), Elísio Manuel de Sousa Costa (Porto)*
15:15 - 15:30	
15:30 - 15:45	
15:45 - 16:00	
16:00 - 16:15	
16:15 - 16:30	
16:30 - 16:45	
16:45 - 17:00	
17:00 - 17:15	
17:15 - 17:30	
17:30 - 17:45	
17:45 - 18:00	
18:00 - 18:15	Closing ceremony, presentation of awards
18:15 - 18:30	

GUIDELINES FOR EVALUATION OF ORAL AND E-POSTER PRESENTATIONS

Prizes (1st, 2nd and 3rd) are awarded in each oral and E-poster session based on the consensus recommendation of the chairs. Presentations are ranked by the chairs based on the author´s own work by considering the following scoring criteria. To avoid conflicts of interest, a chair is not allowed to give points or participate in the debate if the speaker is from his/her workgroup.

Professional content of the presentation (20 points)	The background of the work clearly and comprehensibly presented. The methods are adequate and up-to-date. The presentation of the results is clear, concise, the statistical analyses are correct. The statistical methods support the statements in a correct and convincing way. The discussion of the results is concise and provides proper summary of the findings. Adequate knowledge of the bibliography relevant to the subject.
Evaluation of the format (max 10 points)	The visual documentation adequately follows the presentation, it is clear, comprehensible and supports the presentation. The graphs support the clear presentation of the results and they do not facilitate reading out the presentation. The text is grammatically correct and coherent with the main message of the presentation. The style of the presentation is precise, fluent and comprehensible.
Discussion skills (max 15 points)	The written questions are properly addressed, the answers are objective. Competence in the relevant literature and skills in scientific work are proven by the presenter.
Abstract (max 5 points)	The abstract is stylistically and grammatically correct. It includes all relevant results and information introduced in the presentation. Style and vocabulary are in harmony with the English scientific linguistic standards.

28 September 2020. MONDAY

OPENING AND WELCOME

28 September 2020. MONDAY, 9:00 – 9:45 (Central European Time - CET)

09:00 - 09:15 **WELCOME**
Márta Széll Vice-Rector for Strategic Planning, University of Szeged, Hungary
Ferenc Peták EUGLOH WP3 Academic Leader, University of Szeged, Hungary

09:15 - 09:45 **PLENARY TALK 1. - Laurent Roybon**
Lund University, Sweden
Patient induced pluripotent stem cells to model neurodegenerative diseases and develop therapies

Ageing and dementia as a global health challenge (oral session)

28 September 2020. MONDAY, 10:00 – 11:45 (CET)
Chairs: Eszter Farkas (University of Szeged, Hungary), Micaela Galante (Paris-Saclay University, France), Alessia Zamborlini (Paris-Saclay University, France)

10:00 - 10:15 **Meghna Dabur**
University of Porto
Fluorinated molecules and Nanotechnology for Alzheimer's disease therapy

10:15 - 10:30 **Zsófia Flóra Nagy**
University of Szeged
Comprehensive genetic analysis of a Hungarian amyotrophic lateral sclerosis cohort

10:30 - 10:45 **Bernát Nógrádi**
University of Szeged
Age-related degeneration of the motor system: from the motor end plate to the spinal cord

10:45 - 11:00 **Gergő Porkoláb, Anikó Szecskó**
University of Szeged
Alanine-glutathione dual-targeted nanoparticles enhance cargo delivery across the blood-brain barrier and into target cell types in the brain

11:00 - 11:15 **Réka Tóth**
University of Szeged
Cerebral edema induces simultaneous depolarization in response to anoxia

11:15 - 11:30 **Jehan Waeytens**
Paris-Saclay University
How to investigate isolated amyloid fibrils at the nanoscale: IR nanospectroscopy challenges and prospects

11:30 - 11:45 **Hussein Akel**
University of Szeged
SLNs VS PBNs in Nose-to-Brain Delivery of a Model Drug of Alzheimer's Disease

Noncommunicable and pandemic diseases (oral session)

28 September 2020. MONDAY, 12:15 – 14:00 (CET)

Chairs: Elisa Oliveira Braga Keating (University of Porto, Portugal), Laurent Roybon (Lund University, Sweden)

12:15 - 12:30 **Asli Alkis**
University of Szeged
Privacy concerns and considerations of contact tracing applications in the fight of COVID-19 pandemic

12:30 - 12:45 **Vanda Craveiro, Elisabete Ramos**
University of Porto
The association of insulin and HOMA-IR with body fat distribution

12:45 - 13:00 **Ana Rita Marinho**
University of Porto
Gender-effect on longitudinal association of dietary macronutrient intake during childhood and adiposity: findings from the Generation XXI Birth Cohort

13:00 - 13:15 **Mahwash Mukhtar**
University of Szeged
Fabrication of isoniazid loaded chitosan / thiolated chitosan and hyaluronic acid hybrid nanoplex DPIs as a potential TB treatment: Aerodynamic properties and in silico deposition in lungs

13:15 - 13:30 **Nádia Silva**
University of Porto
α-MSH reestablishes homeodynamics of obese adipose tissue by modulating cellular stress responses

13:30 - 13:45 **Tayfun Tümtürk**
University of Szeged
Covid-19, digital freedoms and transparency

13:45 - 14:00 **Sally Yaacoub**
Paris-Saclay University
Trend of antibiotic consumption and its association with influenza-like illnesses in France between 2004-2017

14:30 - 15:00 **PLENARY TALK 2. - Lennart Olsson**
Lund University, Sweden
Global health in a warmer world: how climate change may impact health and burden of disease

Global health: miscellaneous challenges I.- II. (e-poster discussion sessions)

28 September 2020. MONDAY, 15:15 – 17:30 (CET)
Chairs: **József Maléth** (University of Szeged, Hungary), **Karin Geffert** (Ludwig Maximilian University of Munich, Germany)

Global health: miscellaneous challenges I.

Yousif Ibrahim
University of Szeged
Effect of Plasticizer Type and Quantity on the Properties of Oral Chitosan Films

Petra Kovács
University of Szeged
In vitro metabolite profiling of designer drugs

Tímea Körmöczi
University of Szeged
Quantitative analysis of synthetic cannabinoids and their metabolites in human urine and blood samples

Cosima Lisi
University of Porto
Breastfeeding at 6 months in migrant and native women: what is the impact of formula industry marketing?

László Mérai, Ágota Deák, Mohamed Mahmoud Abdelghafour
University of Szeged
Degradation of organic pollutants by the help of intelligent photoreactive surfaces

Gyöngyi Anna Mezey
University of Szeged
Phone hygiene - the missing step in infection control

Helena Monteiro
University of Porto
Harmful Algae Blooms on the Portuguese coast: cross-checking events with remote sensing ocean color and temperature data for coastal management

Rafaela Pedro Silva, Célia Soares, Carina Herman-de-Sousa
University of Porto
Unravelling adenosine receptors role in subcutaneous fibroblasts as novel targets against myofascial pain

Evelin Polanek, Noémi Jónás
University of Szeged
Pregnant women's dietary behavior, dietary supplement intake and its influencing factors

Patrícia Sofia Ferreira Ramalho
University of Porto
Carbon-coated metallic magnetic nanoparticles for the removal of bromate in water

Duarte Silva, Sérgio Oliveira
University of Porto
Predicting outdoor thermal comfort/discomfort to prevent environmental illnesses

Global health: miscellaneous challenges II.

Virgínia Conceição
University of Porto
Depression and anxiety consequences of the COVID-19 pandemic: a longitudinal cohort study with university students

Colete Leite
University of Porto
A job stuck in the lungs: the "stone dust" in Penafiel

Jing Li
Ludwig Maximilian University of Munich
Therapeutic targeting of cytokinesis eradicates genomically silent childhood cancer

Helena Monteiro
University of Porto
Assessment of the ecological status of Sado estuary: Water Framework Directive approach

Saidu Muhammad Bello
University of Szeged
Ingol-type, ent-atisane and stachane diterpenes from Nigerian plant Euphorbia deightonii

Petra Party
University of Szeged
Development of nanonized dry powders inhalers to treat different respiratory diseases

Vasco Pires, Cristina Ferreira, José Silva
University of Porto
3D printing solutions to fight COVID-19

Hala Shalhoub
Paris-Saclay University
Gut microbiota-derived products as sensitizers to anticancer drugs against hepatocellular carcinoma

Bianka Végh
University of Szeged
Body conscious - here at the present-moment
Subtitle: The relationship between mindful attention awareness and body exercise

17:45 - 18:15 **PLENARY TALK 3. - Elísio Manuel de Sousa Costa**
University of Porto, Portugal
Ageing: a challenge for today and tomorrow

18:30 - 19:00 **Social program – Zsuzsanna Papp**
University of Szeged, Hungary
Kahoot! Quiz - Science fun facts

29 September 2020. TUESDAY

9:00 - 9:30 **PLENARY TALK 4. - Éric Morel**
Paris-Saclay University, France
The story of Epac as a new therapeutic target : from the brain to cardiology to cardio-oncology

Cardiovascular diseases (oral session)

29 September 2020. TUESDAY, 9:45 – 11:15 (CET)
Chairs: Éric Morel (Paris-Saclay University, France), Zsolt Bagosi, (University of Szeged, Hungary)

9:45 - 10:00 **Alexandra Fejes, Flóra Diána Gausz**
University of Szeged
Effect of Stellaria media tea in a diabetic rat model

10:00 - 10:15 **Flóra Diána Gausz, Alexandra Fejes**
University of Szeged
Investigation of the relationship between cardiolipin and prediabetes induced cardiac damage

10:15 - 10:30 **Dóra Halmi**
University of Szeged
Effects of kynurenic acid against simulated ischemia/reperfusion induced damage of H9c2 cells: focus on the modulation of apoptosis

10:30 - 10:45 **Shantanu Sharma**
Lund University
Early Life Factors in Relation to adult skin autofluorescence of Advanced Glycation End (AGE) products in a Swedish Cohort

10:45 - 11:00 **Pedro Simão Vaz de Salvador, Glória Conceição, Inês Falcão-Pires**
University of Porto
The role of Urocortin-2 in Heart Failure with Preserved Ejection Fraction

11:00 - 11:15 **Ildikó Varga**
University of Szeged
Effect of different music styles on heart rate during and after running

Environmental challenges: water and food contamination, climate change (oral session)

29 September 2020. TUESDAY, 11:45 – 14:00 (CET)

Chairs: Edit Paulik (University of Szeged, Hungary), Éric Morel (Paris-Saclay University, France)

11:45 - 12:00 **Catarina Carvalho, Daniela Correia**
University of Porto
Methylmercury exposure in different scenarios of fish intake in the Portuguese population

12:00 - 12:15 **Oriane Della-Negra**
Paris-Saclay University
Deciphering the chemical and microbiological degradation pathways of a recalcitrant molecule: the case of chlordecone

12:15 - 12:30 **Vânia Magalhães, Daniela Correia**
University of Porto
Ultra-processed foods consumption and its associated factors, in Portugal

12:30 - 12:45 **Sofia Santos**
University of Porto
Application of catalytic reduction process for inorganic species removal formed during ozonation of organic contaminants

12:45 - 13:00 **Ricardo Soares**
University of Porto
Effects of high Zn concentrations on Solanum lycopersicum L.'s nitrogen and GSH metabolism

13:00 - 13:15 **Marta Sousa**
University of Porto
Metabarcoding vs Microscope Approaches to Study Arctic Eukaryotic Microbiome

13:15 - 13:30 **Cristina Teixeira**
University of Porto
Easy processing carbon paper electrode for highly efficient perovskite solar cells

13:30 - 13:45 **André Torres-Pinto**
University of Porto
Graphitic carbon nitride: a promising solution for water treatment

13:45 – 14:00 **João Pedro Neves**
University of Porto
Effect of abiotic stress in Plant Specific Insert (PSI) expression and localization

14:30 - 15:00 **PLENARY TALK 5. - Micheline Misrahi**
Paris-Saclay University, France
Novel links between genes of infertility and DNA repair/cancer genes

Cancer screening and care, Antimicrobial resistance (oral session)

29 September 2020. TUESDAY 15:15 – 17:30 (CET)

Chair: Micheline Misrahi (Paris-Saclay University, France), Maria José Oliveira (University of Porto, Portugal)

15:15 - 15:30 **Mohamed M. Abdelghafour, Tamás Takács, Ágota Deák**
University of Szeged
Preparation of mucoadhesive biopolymer microparticles suitable for the encapsulation and surface immobilization of anticancer agents

15:30 - 15:45 **Pedro Miguel Alves, Natália Fagundes**
University of Porto
Reduction in viable surface-adhered bacteria promoted by efficient conjugation of antimicrobial peptide (Dhvar5) onto chitosan

15:45 - 16:00 **Zain Baaity**
University of Szeged
Challenging antibiotic resistance mechanisms in the 21st century - the case of Bacteroides spp.

16:00 - 16:15 **Ana Borges**
University of Porto
CCL18 on colorectal cancer immune modulation: an emerging pro-invasive and immunosuppressive chemokine

16:15 - 16:30 **Vasiliki Pantazi**
University of Szeged
The Regulatory Role of ATM and DNA-PK on P53 Non-Sequence-Specific DNA-Binding Upon DSB Induction

16:30 - 16:45 **Jean-baptiste Ronat**
Paris-Saclay University
Development of a stand-alone transportable clinical bacteriology laboratory for low-resource settings by Médecins Sans Frontières: a peculiar PhD project

16:45 - 17:00 **Fakhara Sabir**
University of Szeged
Steps toward the treatment of glioblastoma with coated liposomes: *n*-propylgallate containing hyaluronic acid stabilized product developed by means of QbD methodology

17:00 - 17:15 **Réka Eszter Szabó**
University of Szeged
Isolation of antibacterial phenolic compounds from Camelina microcarpa

17:15 - 17:30 **Máté Vadovics, Balázs Szücs**
University of Szeged
Investigation of the effects of oral candidiasis on the progression of oral squamous cell carcinoma

18:00 - 18:30 **PLENARY TALK 6. - Elisa Oliveira Braga Keating**
University of Porto, Portugal
Micronutrients in pregnancy: fostering the health of future generations

18:45 - 19:15 **Social program – Zsuzsanna Papp**
University of Szeged, Hungary
Virtual campus and city tour

30 September 2020. WEDNESDAY

9:00 - 9:30 **PLENARY TALK 7. - Karin Geffert**
Ludwig Maximilian University of Munich, Germany
Global Health Education – Training leaders of tomorrow.

Global health: miscellaneous challenges I. (oral session)

30 September 2020. WEDNESDAY, 9:45 – 11:45 (CET)
Chairs: Beáta Udvari (University of Szeged, Hungary), Karin Geffert (Ludwig Maximilian University of Munich, Germany)

9:45 - 10:00 **Dominika Csoma**
University of Szeged
Detection of mean arterial pressure during pregnancy

10:00 - 10:15 **Jair Gonzalez Marques**
Ludwig Maximilian University of Munich
Stool Metabolome Disclose Metabolic Alterations in Pediatric Crohn`s Disease and Provide New Tools for Diagnosing

10:15 - 10:30 **Blanka Zsuzsanna Jókai**
University of Szeged
Restoring endodontically treated premolars with different fiber-reinforced designs in case of healthy and bruxing patients as well

10:30 - 10:45 **Patrick Mboyo Bakambo**
Paris-Saclay University
The representation of local communities in public law

10:45 - 11:00 **Romain Plais**
Paris-Saclay University
Fluorescent Anion Receptor Combining Anion-π Interaction and Hydrogen Bonding: a Multidisciplinary Approach

11:00 - 11:15 **Yasmin Ranjous**
University of Szeged
Investigation of physical properties, toxicity and permeability of functionalized titanate nanotubes as novel vectors for drug delivery

11:15 - 11:30 **Daniel Silva**
University of Porto
Work and health in road transport sector: how to address professional drivers' health issues in the design of the future automated vehicles?

11:30 - 11:45 **Csilla Szebenyi**
University of Szeged
Investigate the relevance of cotH genes in the pathogenicity of Mucor circinelloides

Global health: miscellaneous challenges II. (oral session)

30 September 2020. WEDNESDAY,12:00 – 14:00 (CET)

Chairs: Elísio Manuel de Sousa Costa (University of Porto, Portugal), Matthias Siebeck (Ludwig Maximilian University of Munich, Germany)

12:00 - 12:15 **Louis Becquey**
Paris-Saclay University
A dataset for machine learning of RNA molecules' 3D structures

12:15 - 12:30 **Jean-Baptiste Bodin**
Paris-Saclay University
Biocompatible photoacoustic nanoparticular contrast agents based on BODIPY-scaffold and polylactide polymers

12:30 - 12:45 **Alexandra Borges**
University of Porto
Lipid nanoparticles as carriers of anthocyanin derivatives for topical applications

12:45 - 13:00 **Vivien Kardos**
University of Szeged
Digital challenges of the next generation in the field of law

13:00 - 13:15 **Martin Kócsó**
University of Szeged
The intellectual property aspects of counterfeit medicines

13:15 - 13:30 **Rita Magalhães**
University of Porto
Large Database Screening for the Identification of New Drugs Against Biofilm Formation in P.aeruginosa: a Computational Approach

13:30 - 13:45 **Botond Nagy**
University of Szeged
The health hazards of Hungarian prisons with special regard to those caused by high over-occupancy levels

13:45 - 14:00 **Shcherbakov Viacheslav**
Paris-Saclay University
The role of gold nanoparticles catalytic activity in the explanation of the radiosensitizing effect

14:30 - 15:00 **PLENARY TALK 8. - Matthias Siebeck**
Ludwig Maximilian University of Munich, Germany
Global health education & Global health workforce education

Ageing and dementia as a global health challenge (e-poster discussion sessions)

30 September 2020. WEDNESDAY,15:15 – 16:45 (CET)

Chairs: Robert Perneczky (Ludwig Maximilian University of Munich, Germany), Elísio Manuel de Sousa Costa (University of Porto, Portugal)

António André
University of Porto
Electroactive polymer-based composite material's role in a rehabilitation context – future perspectives

Marcell Juhász
University of Szeged
Is videogaming connected with other addictions?

Noémi Kmetykó
University of Szeged
Development and application of UHPLC-MS/MS method for analysis of kynurenic acid and its newest derivatives, in vitro permeability assay using primary rat brain endothelial cells

Sarah Maggioli
University of Porto
Is work affecting the mental wellbeing of health professionals? A study of antidepressant and benzodiazepine consumption among hospital workers.

Viviane Peçaibes, Diego Mergener
University of Porto
Positive Play for Mental Health in Modern Life: The Challenge of Anorexia Nervosa

18:00 - 18:30 **CLOSING CEREMONY, PRESENTATION OF AWARDS**

Representative members of the EUGLOH Alliance:
Ludwig-Maximilians University (Munich, Germany)
Lund University (Sweden), University of Porto (Portugal)
University Paris-Saclay (Paris, France)
University of Szeged (Hungary)

Abstracts

Listed in alphabetical order based on the last name of the first author

European University Alliance for Global Health

Mohamed M. Abdelghafour (PhD student), Faculty of Science and Informatics, University of Szeged
Tamás Takács (PhD student), Faculty of Science and Informatics, University of Szeged
Ágota Deák (PhD student), Faculty of Science and Informatics, University of Szeged

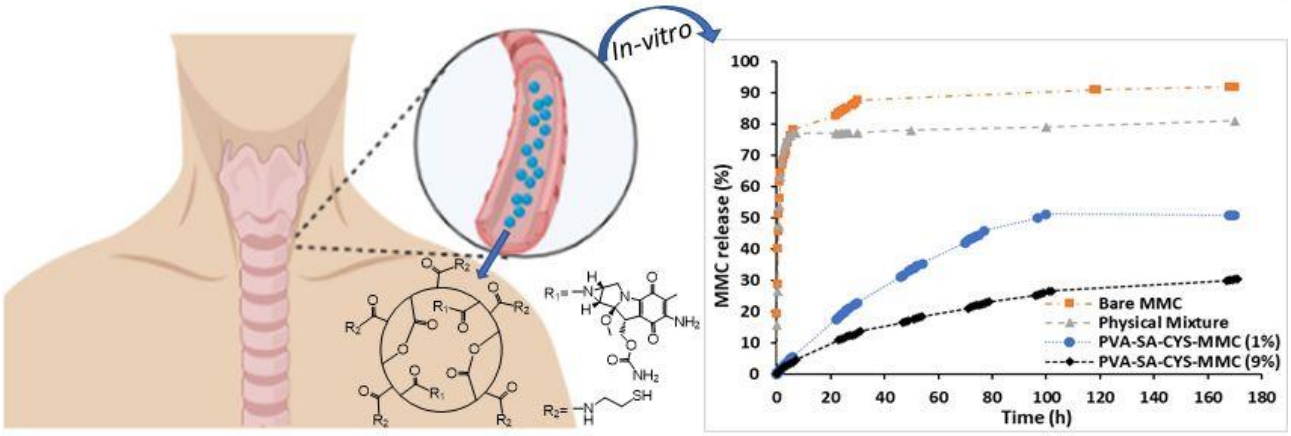
Preparation of mucoadhesive biopolymer microparticles suitable for the encapsulation and surface immobilization of anticancer agents

Mitomycin C (MMC) has long been used as an antitumor agent, but its undesirable side-effects minimize the dose in chemotherapy. MMC macromolecular prodrugs have been developed in recent years to reduce its side effect and improve therapeutics. The aim of the work is the synthesis of mucoadhesive polymer-based nanoparticles suitable for controlled drug delivery. Polyvinyl alcohol-succinic anhydride-Cysteamine-Mitomycin (PVA-SA-CYS-MMC) particles were synthesized by modification of initial hydrophilic PVA macromolecules with the different molar ratio of SA followed by direct coupling between PVA-SA, MMC, and CYS using water-soluble carbodiimide (EDC). The successful modification and conjugation reactions were confirmed by using FTIR and EDX measurements. The size and morphology of self-assembled nanocomposites particles were examined by TEM measurements. The *in-vitro* drug releasing experiments were performed for 7 days under physiological conditions (PBS, pH = 7.4) with the application of different kinetic models to evaluate the releasing kinetics. Improvement of the mucoadhesive properties of PVA was performed by inserting of cysteamine with thiol groups that can be formed strong covalent (disulfide) bond with the cysteine-rich subdomains of the mucus layer of the membrane. Mucoadhesive properties of PVA-SA-CYS were evaluated by rheological measurement with porcine mucin and turbidity measurement with pig intestinal membrane. The prepared conjugated particles with strong mucoadhesive properties are suitable for the prolonged drug release of MMC under physiological conditions. Moreover, the drug release rate was adjustable by the cross-link density. Hopefully, the prepared particles are a Promising drug delivery system (DDS) and it be useful in the area of cancer treatment.

Keywords: PVA, Mitomycin, Self-particle formation, Mucoadhesive measurement, prolonging drug release

Grant support: The authors are very thankful for the financial support from the Hungarian Scientific Research Fund (OTKA) K 132446 and for the financial support from the project named GINOP-2.3.2-15-2016-00013. This paper was also supported by the UNKP-20-5 New National

Supervisors:
Diána Szabó assistant professor
László Rovó professor, Department of Oto-Rhino-Laryngology and Head & Neck Surgery, University of Szeged, Hungary
László Janovák assistant professor, University of Szeged, Interdisciplinary Excellence Centre, Department of Physical Chemistry and Materials Science, Hungary



Hussein Akel (PhD student), Faculty of Pharmacy, University of Szeged

SLNs VS PBNs in Nose-to-Brain Delivery of a Model Drug of Alzheimer's Disease

Introduction: Nanoparticles have been classified as preferable nose-to-brain carriers due to their notable improvement of drug delivery, since they can protect the encapsulated drug from biological and chemical degradation, and extracellular transport. SLNs and PBNs are considered the best candidates for this purpose.
Methods: QbD approach was applied to optimize the formulations, which were prepared by Double-emulsion solvent evaporation. The Morphological study, EE& DL, in-vitro: permeation, release tests were done to compare between the two nanocarriers, then the mucoadhesion test was performed on the optimal formulation with and without chitosan coating.
Results: SLNs showed higher EE& DL than PBNs 72.71&2.23, 62.29&2.41, respectively. Encapsulation of meloxicam in both forms resulted in a better in-vitro release and permeation behavior in comparison with the plain drug with the superiority of SLNs. SLNs demonstrated good mucoadhesiveness properties, which were enhanced by chitosan coating.
Conclusions: Formulating meloxicam, as a model of anti-AD drugs, in a form of SLNs for the nose to brain delivery, can be a good choice to enhance release and permeation properties over PBNs, with a good mucoadhesion characteristics enhanced by chitosan coating.

References:

Akel, H., Ismail, R., & Csóka, I. (2020). Progress and perspectives of brain-targeting lipid-based nanosystems via the nasal route in Alzheimer's disease. EJPB, 148, 38-53.
Nikvsarkar, M., Banerjee, A., Shah, D., Trivedi, J., Patel, M., Cherian, B. and Padh, H. 2006, Iranian Biomedical Journal, 10(3), 151-155.

Keywords: Alzheimer's Disease, Nose-to-Brain, SLNs, PBNs, In vitro assessment

Supervisor:
Assoc. Prof. Ildiko Csoka, Institute of Pharmaceutical Technology and Regulatory Affairs, Faculty of Pharmacy, University of Szeged, Hungary

Asli Alkis (PhD student), Faculty of Law and Political Sciences, University of Szeged

Privacy concerns and considerations of contact tracing applications in the fight of COVID-19 pandemic

COVID-19 's unexpected outbreak has impacted the world at large. Most states have sought to protect their citizens and mitigate their own way of overloading the health system. One of the most effective strategies is to keep people as much as possible in quarantine and to use technology to track people who are likely to be in touch with others.
In this presentation, we will discuss the personal data management of the most common of these technological methods, the mobile contact tracing applications. For doing this, we will focus on the basic working principles of these applications. We will examine the specific applications and protocols we have chosen (Singapore's BlueTrace, Apple, and Google's Exposure Notification, and the open protocol DP-3T) with a comparative method. Last but not least, we will discuss whether it is possible to protect public health using these applications and whether we need to compromise our privacy in order to ensure public safety.

Keywords: COVID-19, privacy, contact tracing apps

Supervisor:
Szilvia Varadi senior lecturer

Pedro Miguel Alves (PhD student), Faculty of Engineering, University of Porto
Natália Fagundes (MSc student), LAQV-REQUIMTE, University of Porto

Reduction in viable surface-adhered bacteria promoted by efficient conjugation of antimicrobial peptide (Dhvar5) onto chitosan

Antimicrobial peptides are considered an improvement over antibiotics, as they present activity against a wide spectrum of bacteria, while not extensively promoting bacterial resistance. Peptides can be protected from enzymatic degradation, preserving their bioactivity, by covalent conjugation onto biopolymers. To that end, click reactions have been explored due to their high yield under ambient conditions and ability to avoid the formation of undesired products. Nonetheless, UV-triggered thiol-ene click reactions have rarely been applied for antimicrobial peptide conjugation.
In the present work, thiol-norbornene photoclick chemistry (TNPC) was used to conjugate a modified version of the antimicrobial peptide Dhvar5 (bearing a N-terminal or C-terminal cysteine). Norbornene groups were introduced onto chitosan by the reaction of the latter with carbic anhydride in a co-solvent (aqueous/organic) system. Then, UV-triggered TNPC (λ = 365 nm) was performed to conjugate the AMP onto norbornene-modified chitosan (NorChit). Chitosan modification steps were monitored by Fourier Transform Infra-Red (FTIR), X-Ray Photoelectron Spectroscopy (XPS), Nuclear Magnetic Resonance (^{1}H NMR) and Amino Acid Analysis (AAA). To evaluate antimicrobial activity, films of Dhvar5-NorChit were produced by spin-coating and tested against *S. epidermidis* (ATCC 35984).
Chitosan was successfully functionalized with norbornene groups (degree of substitution: ~40%). Conjugation of 18.5% of initial AMP to NorChit led to 34.0 μmol of peptide being present per gram of Dhvar5-NorChit. Consequently, films of Dhvar5-NorChit showed a reduction in both viable and total adhered bacteria. Altogether, results suggest that TNPC is an efficient chemistry for Dhvar5 conjugation onto chitosan, originating a modified polymer with promising antibacterial activity.

Keywords: Antimicrobial peptides, thiol-ene chemistry, chitosan, norbornene

Grant support: P.A. thanks FCT for the doctoral grant SFRH/BD/145471/2019. Financially supported by FCT-MCTES as part of project "AntINFECT" (POCI-01-0145-FEDER-031781). FCT-MCTES is further acknowledged for funding LAQV-REQUIMTE Research Unit (UID/QUI/50006/2019).

Supervisors:
Maria Cristina Teixeira Lopes da Costa Pinto Lopes senior research fellow, i3s, Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Portugal
Paula Alexandra de Carvalho Gomes senior research fellow, LAQV-REQUIMTE, Universidade do Porto, Portugal
Fabíola Maria Tavares Alves da Costa Moutinho research fellow, i3s, Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Portugal

António André (PhD student), Faculty of Engineering, University of Porto

Electroactive polymer-based composite material's role in a rehabilitation context – future perspectives

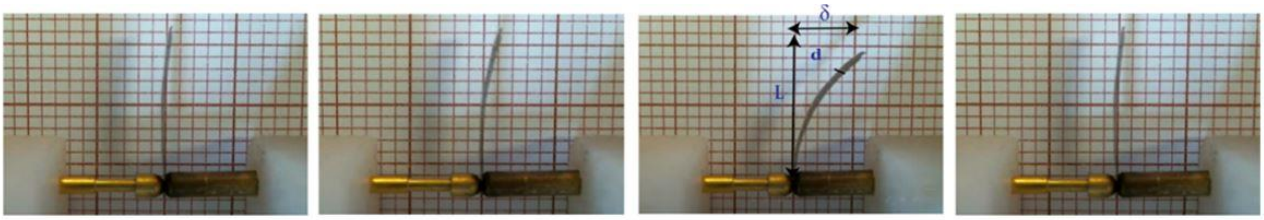
The process of aging is characterized by a progressive decline of skeletal muscle mass, with an impact on the quality of life. The majority of older individuals need rehabilitation to preserve/restore some mobility functions. A possible avenue for helping these people improving their lives could be through the usage of wearable artificial muscles. These soft actuators, made from electroactive polymer-based composite materials, have many advantages due to the material properties of their constituents. On one side electroactive materials can change their shape/size when excited by an external stimulus (for example an electric field). Beyond that, they are among the best alternatives to emulate biological muscles [1]. Also, being part of a polymeric material family gives them some needed and important mechanical characteristics for improved usability in rehabilitation context [1], such as flexibility or low density and weight.
In literature is already possible to find several recent studies based on these composite materials that show good preliminary results as evidenced by Correia et all [2]. A displacement of approximately 6 mm considering a composite material constituted by PVDF and an ionic liquid polymer. Combining these promising results with a wearable solution, makes it a viable research avenue.

[1] Bar-Cohen Y. et all; "Electroactive polymer (EAP) actuators – background review"; Mechanics of Soft Materials; 2019.
[2] Correia D. et all; "Ionic Liquid Cation Size-Dependent Electromechanical Response of Ionic Liquid/Poly(vinylidene fluoride)-Based Soft Actuators"; The Journal of Physical Chemistry; 2019

Keywords: aging, rehabilitation, electroactive polymers (EAP), soft actuators, composite materials, artificial muscles, exoskeleton

Grant support: The authors gratefully acknowledge funding from FCT, Portugal, under grant SFRH/BD/147807/2019, and project MImBI - PTDC/EME-APL/29875/2017 financed through FEDER and FCT. This work was supported by FCT, through INEGI, under LAETA, project UIDB/50022/2020

Supervisor:
Pedro Martins scientific advisor, U. Porto Faculty of Engineering/INEGI



Zain Baaity (PhD student), Faculty of Medicine, University of Szeged

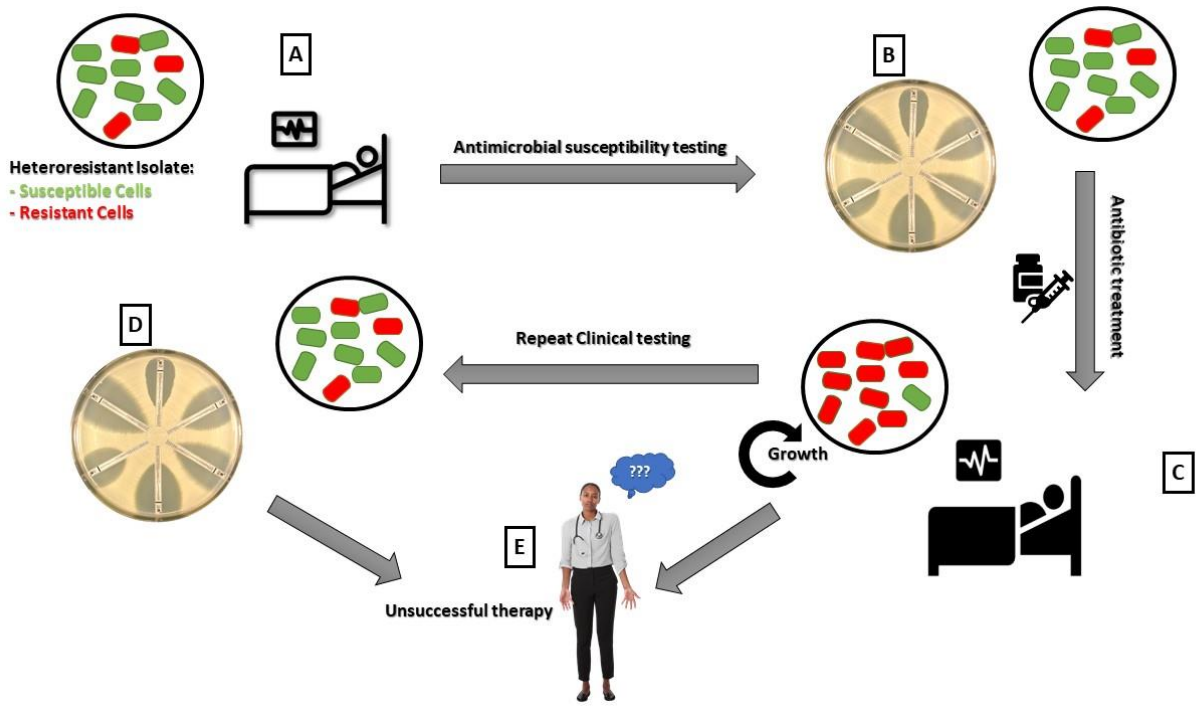
Challenging antibiotic resistance mechanisms in the 21st century - the case of Bacteroides spp.

Introduction: *B. fragilis* is a constant threat residing in gut microbiotas and originating from there it is the foremost cause of some life-threatening infections as sepsis. It is usually highly resistant to antibiotics but the most useful drugs against it are the carbapenems and 5-nitroimidazoles. For carbapenem resistance the heteroresistance is an interesting phenomenon with serious treatment concerns and metronidazole can be used efficiently in strict anaerobic infections.
Methods: We used the following phenotypic tests: agar dilution and Etest MIC determination, population analysis profile (PAP) experiments (10 heterogeneously imipenem resistant and 5 control *B. fragilis* strains). These latter values and imipenemase production, the expression data of the *cfiA*, GNAT and XAT toxin-antitoxin genes were measured by qRT-PCR and then correlated with each other. For metronidazole resistance we analyzed 12 resistant *Bacteroides* isolates with plasmid screening, sequencing and typed them to establish their relatedness to other strains.
Results: Carbapenem heterogeneously resistant strains tended to give broader growth ranges in PAP analyses and they also produced higher specific imipenemase activities than silent strains. Parameters of the PAP curves, imipenem MICs, imipenemase activities and gene expressions of the *cfiA*, GNAT and XAT genes correlated well. In metronidazole resistance we found that *nimE*-IS*Bf6* pairs caused the resistance which were resided in 5.6-11 kb plasmids, we also noted that 6 of these strains also harbored carbapenem resistance genes (*cfiA*).
Conclusion: In our study we analyzed important antibiotic resistance mechanisms of *Bacteroides*. The examination of carbapenem heteroresistance was characterized firstly for B. *fragilis* and the metronidazole resistance mechanism confirmed previous data.

Keywords: B. fragilis, carbapenems, heteroresistance, metronidazole, PAP, AMR

Grant support: This study was supported by grants from the Medical Faculty of University of Szeged, Richter Talentum Fund and Tempus Stipendium Hungaricum.

Supervisors:
Dr. József Sóki associate professor, University of Szeged, Institute of Clinical Microbiology
Dr. Ferenc Somogyvári associate professor, University of Szeged, Institute of Medical Microbiology and Immunobiology



Louis Becquey (PhD student), Paris-Saclay University

A dataset for machine learning of RNA molecules' 3D structures

RNAs (ribo-nucleic acids) are biomolecules implied in many processes of life, and promising candidates as drug targets or therapeutic agents by themselves. A fundamental problem in this research field is the determination of RNA structures. To avoid expensive and time consuming lab experiments, we wish we could predict the shape and folding of RNA molecules in-silico by machine-learning methods.
In order to speed-up advances in machine-learning based approaches, a dataset integrating all necessary information is required, to avoid spending time on data gathering and cleaning. Several datasets have been proposed and released over the years for specific tasks such as image classification, speech-recognition, and more recently for protein structure prediction, but none exists yet about RNA. Information about RNA is spread between several databases depending on the level we are interested in: sequence, secondary structure, 3D structure, or interactions with other macromolecules.
We propose the first standardized and automatically generated dataset dedicated to RNA combining together: RNA sequences, homology information (sequence variability), and information derived by annotation of available 3D structures solved by experimental methods (including canonical and non-canonical interactions, and backbone torsion angles). The data is retrieved from public databases PDB, Rfam and Silva and compiled in an integrated dataset available on the EvryRNA website. We also provide a brief statistical description of the resulting dataset.

Supervisor:
Fariza Tahi, IBISC UEVE

Jean-Baptiste Bodin, Justine Cois, Flora Lefebvre, Magali Noiray, Gilles Clavier, Jérôme Gateau, Nicolas Tsapis, Rachel Méallet Renault
Paris-Saclay University

Biocompatible photoacoustic nanoparticular contrast agents based on BODIPY-scaffold and polylactide polymers

Photoacoustic imaging is an emerging biomedical imaging modality combining optical and ultrasound waves to map optical-absorption contrast at centimetric depth with sub-millimeter resolution. The key is the photoacoustic (PA) effect: optically absorbing structures emit ultrasound waves when excited with a ns-laser pulse. To reach cm-depth, PA imaging operates in the near-infrared (NIR) window in biological tissue (650-1000nm). NIR optical absorbers can thus be mapped throughout the range of depths and resolution explorable with medical ultrasound. We have designed novel PA molecules based on the BODIPY scaffold. These PA-BODIPYs were used as initiators for the ring opening polymerization of lactide to yield BODIPY-polylactide, that were further formulated into nanoparticles (NP). We present here the full spectroscopic and photoacoustic characterizations of the PA-BODIPYs, the corresponding polymers and NPs. Results show BODIPY NPs are promising contrast agents for PA imaging. The pegylation prevent the NPs from being uptake by macrophage.

Supervisor:
Rachel Méallet-Renault, ISMO-UMR8214, UPSaclay - Faculté des Sciences

Alexandra Borges (MSc student), Faculty of Sciences, University of Porto

Lipid nanoparticles as carriers of anthocyanin derivatives for topical applications

Anthocyanins display vibrant colors in nature which combined with their antioxidants and antimutagenic properties, makes them targets of interest for food and cosmetic industries and seem to be promising molecules for topical applications. However, their instability towards pH in aqueous solutions difficult their application in various matrices. Thus, anthocyanins derivatives, more stable molecules, represent a great alternative for certain purposes [1]. Lipid nanoparticles can be of great use when the main goal is to increase drug stability and solubility and are already being used in topical applications due to their similarity with skin lipids and cells membranes [2]. Thus, the purpose of this work was to develop lipid nanoparticles loaded with anthocyanin derivatives for skin topical applications. Various lipid nanocarriers were prepared, with the main goal of enhancing anthocyanins derivatives bioavailability and different assays were performed in order to study these nanoparticles. Size, polydispersity index, zeta potential and encapsulation efficiency were determined [3].

References

1. Oliveira, J., et al. (2017) (28), Synlett
2. Garces, A., et al. (2018). Eur J Pharm Sci 112: 159-167
3. Fang, Z. and B. Bhandari (2010). Trends in Food Science & Technology 21(10): 510-523.

Acknowledgments

This work received financial support from FEDER funds through COMPETE, POPH/FSE, QREN, and FCT (Fundação para a Ciência e Tecnologia) by a research contract (SFRH/BPD/84805/2012), an investigator contract (IF/00225/2015), and grants PTDC/QUI-OUT/29013/2017, REDE/1517/RMN/2005. This work also received financial support (UID/QUI/50006/2019) with funding from FCT/MCTES through national funds and FEDER-Interreg España-Portugal Programme (project ref 0377_IBERPHENOL_6_E).

Keywords: Anthocyanins; Lipid nanoparticles; Topical applications

Supervisors:
Joana Oliveira scientific advisor, Faculty of Sciences of University of Porto
Iva Fernandes scientific advisor, Faculty of Sciences of University of Porto

Ana Borges (MSc student), Faculty of Medicine, University of Porto

CCL18 on colorectal cancer immune modulation: an emerging pro-invasive and immunosuppressive chemokine

INTRODUCTION: Macrophages and regulatory T cells (Tregs) are immune cells associated with tumor progression and unfavorable outcomes. However, in colorectal cancer (CRC), the role of immune tumor microenvironment is still under characterization. CCL18 is an anti-inflammatory chemokine, mainly produced by macrophages, associated with Tregs differentiation and poor prognosis in malignancies. We recently demonstrated that tumor-derived matrices polarize macrophages towards an anti-inflammatory phenotype, promoting cell invasion via CCL18. This project aims to understand how CCL18 modulates cancer cell invasion and immune surveillance escape within the CRC microenvironment.
METHODS: Characterization of CCL18 and FoxP3-Treg marker expression was performed by immunohistochemistry in a series of CRC surgical resections containing normal mucosa, invasive front and tumor. Human macrophages, Tregs and CRC cells were tri-cultured and soluble factors (including MMP-9, CCL18) quantified by ELISA. Molecular mechanisms involved on CCL18-mediated CRC invasion were evaluated by western blot.
RESULTS: On 68 CRC cases, CCL18 and FoxP3 are highly expressed at the invasive front of advanced tumors. When macrophages, Tregs and cancer cells were tri-cultured, a significant increase of MMP-9 and CCL18 secretion was observed. Moreover, stimulation with CCL18 induced CRC cell invasion and phosphorylation of EGFR downstream partners.
CONCLUSION: Data suggest that CCL18 and Tregs might be involved on CRC progression, given their high expression at the invasive front. Increased CCL18 and MMP-9 levels in tri-cultures propose a promotion of an immunosuppressive pro-invasive environment. CCL18 promotes cancer cell invasion and activates EGFR signaling, appointing novel therapeutic candidates to impair CCL18 pro-invasive activity.

Keywords: macrophages, Tregs, CCL18, tumor microenvironment, colorectal cancer

Grant support: MAGICIAM (PTDC/BTM-SAL/31859/2017) by Portuguese Science Foundation - FCT

Supervisors:
Maria José Cardoso Oliveira principal researcher, group leader
Ana Patrícia Pereira Cardoso assistant research fellow, i3S - Instituto de Investigação e Inovação em Saúde da Universidade do Porto

Daiana Cristine Bundchen (PhD student), Faculdade de Farmácia, University of Porto

Intradialytic exercise improves functional capacity, muscle performance and vitality in patients with end-stage renal disease: Results from an umbrella review

Introduction: We conducted an Umbrella Review that aimed to understand the clinical benefits associated with different modalities of intradialytic exercise (IDE) in patients with end-stage renal disease (ESRD).
Methods: The search was performed until July 9, 2020, on Scopus, Web of Science, Cochrane Database, CINAHL, and PubMed to identify meta-analytical studies assessing the effects of IDE in patients with ESRD with pre- and post-interventions assessments.
Results: Ten studies were included and 48 unique meta-analyzes were examined. Eight meta-analyzes were supported by suggestive evidence (p<0.05, small heterogeneity, absence of small-study effects and excess significance bias) with medium to large effect sizes (range: 0.58-1.13). Clinical benefits were found for the patients' functional capacity associated with aerobic exercise (d = 0.81; k = 6), resistance training (d = 0.58; k = 6), neuromuscular electrical stimulation (d = 0.70; k = 5), and inspiratory muscle training (d= 1.13; k = 2), measured by the 6-minute walk test (6MWT). Functional capacity also improved with combined training, measured by VO2peak (d = 1.01; k = 5) and by the duration of a cardiopulmonary test and (d = 1.07; k= 4). Patients' perception of vitality (less fatigue) also improved with combined training (d = 0.60; k = 3). Muscle performance improved with neuromuscular electrical stimulation (NMES) (d = 1.19; k = 7).
Conclusion: Meta-analytical results suggest that intradialytic exercise improves patients' functional capacity for most modalities when measured by the 6MWT. Combined exercise is beneficial for patients' levels of vitality while NMES improves muscle performance.

Keywords: hemodialysis, exercise training, clinical benefits, meta-analysis

Supervisors:
Helena Sousa PhD student, Universidade de Aveiro
Daniela Figueiredo research fellow, Universidade de Aveiro
Elísio Costa professor, Universidade do Porto

Catarina Carvalho (PhD student), Faculty of Medicine, University of Porto
Daniela Correia (PhD student), Faculty of Sciences, University of Porto

Methylmercury exposure in different scenarios of fish intake in the Portuguese population

Introduction: Portugal is the European country with the highest intake of fisheries and aquaculture products. Fish and seafood are a source of methylmercury, that is associated with neurodevelopment risks.
Objective: The aim of this study is to estimate and characterize the exposure to methylmercury in the Portuguese population with national representative consumption data.
Methods: Consumption data was obtained from the National Food, Nutrition, and Physical Activity Survey (IAN-AF 2015-2016) (n=5811). Dietary intake was assessed through 2*day-diaries/2*24-hour-recalls The mean exposure to methylmercury was estimated for the current population and for several alternative scenarios of fish consumption, representing different weekly intakes of fish: one, three, five, and seven times a week. The prevalence of inadequate intake of methylmercury was estimated, considering the tolerable weekly intake (TWI)=1.3 µg/kg body weight (bw) in the current and alternative scenarios.
Results: Current mean weekly exposure to methylmercury was 0.65 µg/kg bw for the general population, being higher in children from 2-5 years old (1.62 µg/kg bw). The prevalence of exposure above the TWI is especially high in this group (37%). Reducing the number of fish and seafood consumption occasions to one or three times a week decreases this prevalence to 7.3% or 23.1%, respectively. On the contrary, eating fish daily increases the prevalence of inadequacy to 44.7% in this age group.
Conclusions: Current exposure to methylmercury from fish may be of concern, particularly for young children. However, these results must be complemented with data on the potential benefits of other fish components to neurodevelopment.

Keywords: Fish, Methylmercury, Risk, Neurodevelopment

Grant support: FCT individual doctoral grant (SFRH/BD/146078/2019); National Food Nutrition and Physical Activity Survey (IAN-AF 2015-2016) (EEA Grants - Public Health Initiatives - PT06-000088SI3).

Supervisors:
Duarte Paulo Martins Torres associate professor, Faculty of Food and Nutrition Sciences
Carla Maria de Moura Lopes associate professor, Faculty of Medicine
Milton Severo Barros da Silva Statistician and Data Analyst, Faculty of Medicine

Virgínia Conceição (MSc student), Faculty of Medicine of the University of Porto, University of Porto

Depression and anxiety consequences of the COVID-19 pandemic: a longitudinal cohort study with university students

Background: For young people, just as in the general population, COVID-19 caused many changes in their lives. Literature review has shown an increased risk for mental illness symptoms as a consequence of the pandemic.
With this study, we aimed to evaluate the impact of the COVID-19 pandemic in university students' anxiety and depression symptoms.
Methods: This study is part of a larger longitudinal research on university students' mental health with the Portuguese version of The Patient Health Questionnaire (PHQ-9) and the Portuguese version of the Generalised Anxiety Disorder (GAD-7) data with
evaluations on January, May, and October 2019 and June 2020, as well as socio-demographic information.
Results: 341 university students (257 females and 84 males) were included in this study, with a mean age of 19.91 (SD=1.58). In June 2020, the mean for perceived well-being loss was 60.47% (SD=26.56) and 59.54% (SD=28.95) for mental health loss. In the PHQ-9, the proportion of students with scores equal or above 15 ranged between 22.6% and 25.5% in 2019, however, in June 2020, the proportion was significantly higher (37.0%). The proportion of GAD-7 scores above the cut-off 10 ranged between
46.0% and 47.8% in 2019, and, in 2020, 64.5% of the students scored 10 or above. Compared with preceding trends, PHQ-9 scores were 3.11 (CI=2.40-3.83) higher than expected, and GAD-7 scores were 3.56 (CI=2.75-5.37) higher.
Discussion: COVID-19 had a negative impact on depressive and anxiety symptoms in university students, in line with the literature and confirming the vulnerability of young people in such uncertain times.

Keywords: depression, COVID-19

Supervisors:
Ricardo Gusmão associate professor, Faculty of Medicine, University of Porto, Portigal
Inês Rothes research fellow, Faculty of Psychology and Education Science, University of Porto, Portugal

Vanda Craveiro (PhD student), Faculty of Medicine, University of Porto
Elisabete Ramos (PhD student), Faculty of Medicine, University of Porto

The association of insulin and HOMA-IR with body fat distribution

Introduction: Body fat distribution is hypothesized as being related with different metabolic answers. We aimed to evaluate the association of insulin and insulin resistance with body fat distribution.
Methods: We analyzed 1047 individuals (27-years-old) from the EPITeen cohort. Total and regional body fat mass were determined by dual-energy X-ray absorptiometry. Participants were classified as normal weight (18.5≤BMI<25.0 kg/m^2) and overweight (BMI ≥25.0 kg/m^2). Insulin resistance was assessed using the homeostatic model assessment (HOMA-IR). The association of insulin and HOMA-IR with body fat distribution (fat % in trunk and fat % in legs) was estimated using linear regression.
Results: Among those with normal weight, insulin increased 0.14 µU/ml for each 1% increase of fat in trunk, and 0.07 µU/ml for each 1% increase of fat in legs, and in the overweight, insulin increased 0.30 µU/ml for each 1% increase of fat in trunk, and 0.15 µU/ml for each 1% increase of fat in legs. Concerning HOMA-IR, in the normal weight, HOMA-IR increased 0.03 units for each 1% increase of fat in trunk, and 0.01 units for each 1% increase of fat in legs, and in the overweight, HOMA-IR increased 0.06 units for each 1% increase of fat in trunk, and 0.03 units for each 1% increase of fat in legs.
Conclusions: Fat mass in trunk increases more insulin and insulin resistance than fat mass in legs, and this happens both in normal and in overweight participants. This could be explained by the different composition of fat in the trunk, when comparing to the limbs.

Keywords: Body fat, fat distribution, DXA, metabolic health, insulin resistance, cohort

Grant support: PhD Grant SFRH/BD/149264/2019 (VC) co-funded by the FCT and the POPH/FSE Program

Supervisor:
Elisabete Conceição Pereira Ramos professor, UNIVERSITY OF PORTO: EPIUnit – Instituto de Saúde Pública da Universidade do Porto & Departamento de Ciências da Saúde Pública e Forenses e Educação Médica da Faculdade de Medicina da Universidade do Porto

Table 1. The association of insulin and HOMA-IR with body fat distribution.

	Normal weight *n* 730		Overweight (pre-obese & obese) *n* 317	
	% Trunk fat	% Legs fat	% Trunk fat	% Legs fat
	β (95% CI)			
Insulin (µU/ml)	0.14 (0.12, 0.17)	0.07 (0.05, 0.09)	0.30 (0.24, 0.36)	0.15 (0.09, 0.21)
HOMA-IR	0.03 (0.02, 0.03)	0.01 (0.01, 0.02)	0.06 (0.05, 0.07)	0.03 (0.01, 0.04)

CI: confidence interval; HOMA-IR: homeostatic model assessment – insulin resistance

Dominika Csoma (ME student), Faculty of Medicine, University of Szeged

Detection of mean arterial pressure during pregnancy

Introduction: The cardiovascular system of women adapts to pregnancy to maintain the growth of the fetus. To provide the proper blood perfusion there are several changes in the mean arterial pressure values. The aim of this prospective study is to measure MAP of each gestational week and compare them to each gestational week's result. Hemodynamical changes in pregnancy are different in every trimester. Normally the MAP decreases at the beginning of the pregnancy, and starts to increase in the third trimester.
Methods: We have examined 189 pregnant women between the May 2020 and July 2020. We were using a validated device, TENSIOMED Arteriograph 2020, which can monitor the mean arterial blood pressure (MAP) systolic arterial pressure (SBPAo), also the pulse wave velocity (PWVAo), and the axial-brachial index (ABI). The mean arterial pressure describes the blood perfusion to the organs, and it can be calculated if the dyastolic blood pressure and one third of the pulse pressure is added together.
Results:

Gestational weeks	**12** (N=48)	**13** (N=16)	**15**(N=3)	**19** (N=20)	**20** (N=56)	**21** (N=8)
PWVAo (mean ±SD)	7,24±0,26	6,89±0,44	6,97±0,84	7,07±0,32	7,17±0,28	7,38±0,84
SBPAo (mean ±SD)	114,47±3,36	112,00±4,37	110,00±20,82	102,35±2,92	103,41±3,04	114,20±14,9
MAP (mean ±SD)	88,30±2,00	83,83±2,16	80,50±5,00	81,63±2,40	82,36±1,64	83,00±5,72
ABI (mean ±SD)	1,06±0,04	1,11±0,06	0,95±0,10	1,09±0,04	1,07±0,04	1,00±0,16

Conclusion: We found that the MAP decreases from the 12th week to the 15th, and then starts to rise. The future goal would be to determine the MAP value for every gestational week, and predict future cardiovascular diseases in connection with pregnancy, for example pre-eclampsia and diabetes.

Keywords: MAP, pregnancy

Supervisors:
Andrea Suranyi scientific senior fellow
Abel Altorjay clinician, Department of Obstetrics and Gynecology, University of Szeged, Hungary

Meghna Dabur (PhD student), Faculty of Engineering, University of Porto

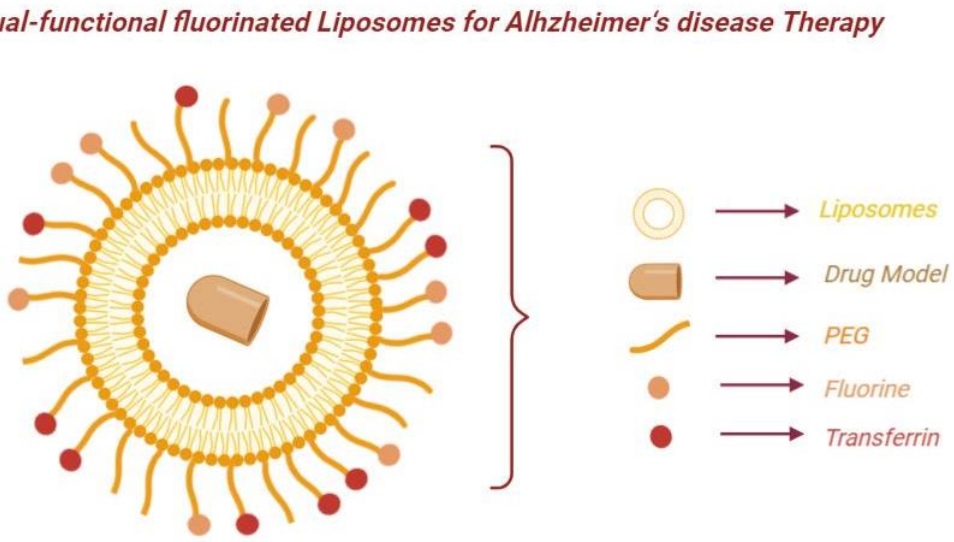
Fluorinated molecules and Nanotechnology for Alzheimer's disease therapy

Alzheimer's disease (AD) is a global health concern that leads to cognitive impairment, dementia, and affects millions of people annually. There is still no medically accepted treatment. The exact mechanism behind the symptoms of AD is still not fully understood in the medicinal field and therefore developing therapeutic medications is a challenging task. One of the main limiting factors to develop new therapies for AD is the blood-brain barrier (BBB). Most of the drugs do not have the capacity to penetrate the BBB. Research studies have shown fluorine molecules as promising agents to increase BBB permeability. Additionally, fluorine demonstrated to be efficient in the inhibition of protein misfolding, mainly for the beta-amyloid peptide (Aβ) (one of the key hallmarks of Alzheimer's disease). Taking advantage of the remarkable fluorine properties, a new approach comprising the blending of fluorinated molecules with nanotechnology is proposed as a promising therapeutic treatment to meet the desired properties of BBB passage. This research work proposes to develop fluorinated lipid-based nanoparticles (NPs) with a dual function: to treat AD by inhibiting Aβ aggregation and increase BBB permeability, facilitating the transport of drugs across the brain.

Keywords: Blood-Brain Barrier; Amyloid-beta peptide; Fluorine; Drug delivery Systems; Nanotechnology; Liposomes.

Grant support: This work was financially supported by: Base Funding-UIDB/00511/2020 of the Laboratory for Process Engineering, Environment, Biotechnology and Energy—LEPABE—funded by national funds through the FCT/MCTES (PIDDAC).

Supervisors:
Joana Loureiro senior research fellow, University of Porto (Faculty of Engineering, LEPABE)
Maria do Carmo Pereira professor, University of Porto (Faculty of Engineering, LEPABE)



Oriane Della-Negra (PhD student), Paris-Saclay University

Deciphering the chemical and microbiological degradation pathways of a recalcitrant molecule: the case of chlordecone

Chlordecone is an organochlorine insecticide, classified as a Persistent Organic Pollutant (POP) in 2009 by the Stockholm convention. It was massively used in the French West Indies (FWI) from 1972 to 1993[1]. Its application on banana plantations is responsible for long-term pollution of environmental compartments (soils, sediments and water ressources), contaminating the whole food chain[1-3]. The high population impregnation associated with the chronic toxicity of chlordecone causes serious public health, socio and economic problems[4-7].

Because of its hydrophobic properties and low chemical reactivity, chlordecone readily binds in soils and sediments rich in organic matter and persists in the environment. Its specific structure, made of a bishomocuban cage, makes it very stable and highly difficult to degrade. Chlordecone persistence predictions, taking into account leaching and infiltration phenomenon, estimated its presence in the FWI environment for several decades to hundreds of years[8]. Until recently, only two studies mentioned a marginal chlordecone transformation in FWI soils, thus confirming the previous predictive models[9-10].

Several laboratory studies have demonstrated a possible microbial degradation of chlordecone in liquid media[11-13]. In the recent years, we succeeded to completely transform chlordecone into several transformation products (TPs) in anaerobiosis, using bacterial consortia or isolated bacteria (*Citrobacter* sp.86 and *Desulfovibrio* sp.86)[14-17]. The present work aims at elucidating every TP formed within microbial chlordecone transformation and deciphering the mechanisms involved.

The use of several analytical tools (gas or liquid chromatography coupled with a mass spectrometer) enabled to detect several chlorinated TPs generated during chlordecone bacterial transformations. Interestingly, in specific incubation conditions, *Citrobacter* sp.86 and *Desulfovibrio* sp.86 completely degraded chlordecone into three families of TPs that corresponded to hydrochlordecones (A), polychloroindenes (B) and polychloroindenecarboxylic acids (C). Structural elucidation of these TPs was done through chemical biomimetic reactions enabling to produce enough quantity of each of them to perform nuclear magnetic resonance experiments.

In microbial conditions, the hypothesis of the involvement of corrinoids was put forward, and mutants of *Citrobacter* sp.86 containing deleted genes involved in anaerobic corrinoid biosynthesis pathway were done. *Via* this technic, we successfully managed to show that these cofactors contributed to chlordecone ring-opening dechlorination[18].

In a second time, it was also noticed that *Desulfovibrio* sp.86 placed in different incubation conditions did not generate A, B and C families, but an extra family named F. Instead of opening and dechlorinating chlordecone, the gem-diol function was transformed into a thiol function[17]. It was the first time that such an activity was observed and is under investigation to understand the underlying mechanism.

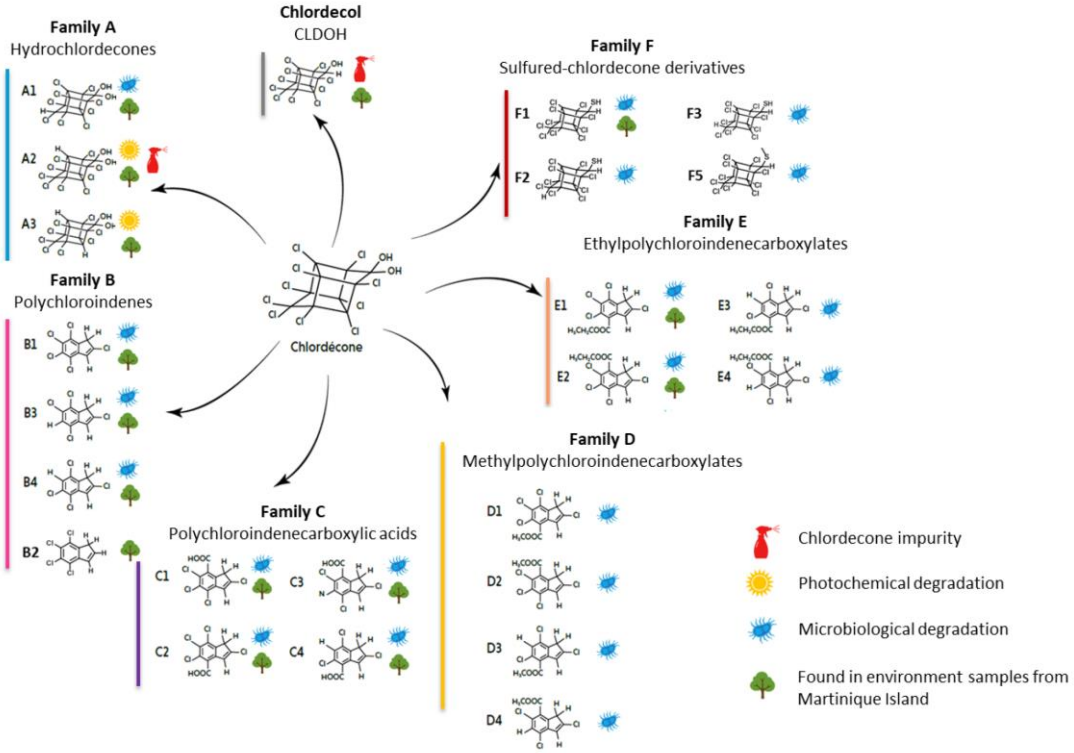


Figure 1: Chlordecone transformation product structures

After all these results, it was wondered whether such microbiological transformation could take place directly in FWI environment. We benefit from the home-made library of chlordecone TPs to search for them in environmental samples from Martinique Island. The dual GC-MS and LC-MS analysis revealed the systematic presence of one or more TPs in all the samples originally contaminated by chlordecone[16-17]. This prospective study shows that the paradigm of absolute persistence of chlordecone, taken for granted for decades, now seems obsolete. From now on, new monitoring and risk priorities need to be set up and a more in-depth field study should be conducted. It also questions the extent of the microbial ring-opening dechlorination and the reductive sulfidation processes that were discovered. Indeed, both microbiological activities were proven to be effective on other substrates such as mirex, another chlorinated POP that shares the same bishomocuban structure as chlordecone, and a number of carbonyl compounds, respectively.

Supervisors:
Denis Le Paslier, Pierre-Loïc Saaidi, Davide Audisio
UMR 8030 Génomique Métabolique - Laboratoire LGBM, UEVE

[1] Vilardebo, A.; Beugnon, M.; Melin, P.; Lecoq, J.; Aubert, B. (1974). Chlordécone et autres insecticides dans la lutte contre le charançon du bananier Cosmopolites sordidus GERM. *Fruits, 29*, 267-278.
[2] Le Déaut, J. Y.; Procaccia, C. (2009). Les impacts de l'utilisation de la chlordécone et des pesticides aux Antilles: bilan et perspectives d'évolution. *Office parlementaire d'évaluation des choix scientifiques et technologiques, 487*.
[3] Lesueur Jannoyer, M.; Cattan, P.; Woignier, T.; Clostre, F. (2016). *Crisis management of chronic pollution: contaminated soil and human health*. CRC Press: Boca Raton. États-Unis
[4] Deloumeaux, J.; Bhakkan, B.; Eyraud, R.; Braud, F.; Manip M'Ebobisse, N.; Blanchet, P.; Brureau, L. (2017). Prostate cancer clinical presentation, incidence, mortality and survival in Guadeloupe over the period 2008-2013 from a population-based cancer registry. *Cancer Causes & Control, 28*, 1265-1273.
[5] Gely-Pernot, A.; Hao, C.; Legoff, L.; Multigner, L.; D'Cruz, S. C.; Kervarrec, C.; Jegou, B.; Tevosian, S.; Smagulova, F. (2018). Gestational exposure to chlordecone promotes transgenerational changes in the murine reproductive system of males. *Scientific Reports*, *8*, art. 10274.
[6] Multigner, L.; Costet, N.; Monfort, C.; Blanchet, P.; Kadhel, P.; Bataille, H.; Cordier, S. (2018). Chlordécone : un perturbateur endocrinien emblématique affectant les Antilles françaises. *Bulletin Epidémiologique Hebdomadaire*, *22-23*, 480-485.
[7] ANSES. (2017). Exposition des consommateurs des Antilles au chlordécone, résultats de l'étude Kannari.
[8] Cabidoche, Y. M.; Achard, R.; Cattan, P.; Clermont-Dauphin, C.; Massat, F.; Sansoulet, J. (2009). Long-term pollution by chlordecone of tropical volcanic soils in the French West Indies: a simple leaching model accounts for current residue. *Environmental Pollution*, *157*, 1697-1705.
[9] Devault, D. A.; Laplanche, C.; Pascaline, H.; Bristeau, S.; Mouvet, C.; Macarie, H. (2016). Natural transformation of chlordecone into 5b-hydrochlordecone in French West Indies soils: statistical evidence for investigating long-term persistence of organic pollutants. *Environmental Science and Pollution Research*, *23*, 81-97.
[10].Fernández-Bayo, J. D.; Saison, C.; Voltz, M.; Disko, U.; Hofmann, D.; Berns, A. E., Chlordecone fate and mineralisation in a tropical soil (andosol) microcosm under aerobic conditions. (2013). *The Science of the Total Environment*, *463-464*, 395-403.
[11] Orndorff, S. A.; Colwell, R. R. (1980). Microbial transformation of kepone. *Applied and Environmental Microbiology, 39*, 398-406.
[12] George, S. E.; Claxton, L. D. (1988). Biotransformation of chlordecone by *Pseudomonas* species. *Xenobiotica, 18*, 407-416.
[13] Jablonski, P. E.; Pheasant, D. J.; Ferry, J. G. (1996). Conversion of Kepone by *Methanosarcina thermophila*. *FEMS Microbiology Letters, 139*, 169-173.
[14] Chaussonnerie, S*.; Saaidi, P. L*.; Ugarte, E*.; Barbance, A.; Fossey, A.; Barbe, V.; Gyapay, G.; Bruls, T.; Chevallier, M.; Couturat, L.; Fouteau, S.; Muselet, D.; Pateau, E.; Cohen, G. N.; Fonknechten, N.; Weissenbach, J.; Le Paslier, D. (2016). Microbial degradation of a recalcitrant pesticide: chlordecone. *Frontiers in Microbiology*, *7*, art. 2025. * co-first authors
[15] Chevallier, M. L.; Cooper, M.; Kummel, S.; Barbance, A.; Le Paslier, D.; Richnow, H. H.; Saaidi, P. L.; Adrian, L. (2018). Distinct carbon isotope fractionation signatures during biotic and abiotic reductive transformation of chlordecone. *Environmental Science & Technology*, *52*, 3615-3624.
[16] Chevallier, M*.; Della-Negra, O*.; Chaussonnerie, S.; Barbance, A.; Muselet, D.; Lagarde, F.; Darii, E.; Ugarte, E.; Lescop, E.; Fonknechten, N.; Weissenbach, J.; Woignier, T.; Gallard, J.-F.; Vuilleumier, S.; Imfeld, G.; Le Paslier, D.; Saaidi, P.-L. (2019). Natural chlordecone degradation revealed by numerous transformation products characterized in key French West Indies environmental compartments. *Environmental Science & Technology,* 53(11): 6133-6143. * co-first authors
[17] Della-Negra, O*.; Chaussonnerie, S*.; Fonknechten, N.; Barbance, A.; Muselet, D.; Marti,n D.; Fouteau, S.; Fischer, C.; Saaidi, P-L.; Le Paslier, D. (2020) Transformation of the recalcitrant pesticide chlordecone by *Desulfovibrio* sp.86 with a switch from ring-opening dechlorination to reductive sulfidation activity. *Scientific Reports*, submitted, 10:13545. * co-first authors
[18] Barbance, A*., Della-Negra, O*.; Chaussonnerie, S.; Delmas, V., Muselet, D.; Ugarte, E., Saaidi, P-L.; Weissenbach, J.; Fischer, C.; Le Paslier, D., Fonknechten, N. (2020) Genetic analysis of *Citrobacter* sp.86 reveals involvement of corrinoids in chlordecone and lindane biotransfor. *Frontiers in Microbiology*, submitted. * co-first authors

Alexandra Fejes (ME student), Faculty of Medicine, University of Szeged
Flóra Diána Gausz (ME student), Faculty of Medicine, University of Szeged

Effect of Stellaria media tea in a diabetic rat model

Introduction: Diabetes mellitus is a disease characterized by elevated blood glucose levels and impaired glucose tolerance. Nowadays, medicinal plants – for instance Chichweed (*Stellaria media*) - have gained popularity as treatment. Chickweed is a widespread species, mainly consumed as salad or tea. Chickweed tea is believed to have anti-diabetic effect; however, its efficacy has not been proved. Hence, our goal was to investigate the effect of *Stellaria media* tea in a diabetic rat model.
Methods: Male Wistar rats were used in three experimental groups (n=10 in each group). The control group received standard laboratory rat chow for 20 weeks, while the other two groups received fructose-enriched diet and were subjected to streptozotocin injection on week 17. Half of the diabetic rats were treated with *Stellaria media* tea, while the others received destilled water. Blood glucose levels were measured every 4 weeks, accompanied with OGTT from week 12. At termination of the animals, blood samples were collected from the abdominal aorta and working heart perfusion was performed.
Results: The fructose-enriched diet and streptozotocin injection significantly increased serum glucose levels compared to control (8.33±0.30 vs. 5.97±0.16 mmol/L, $p<0.05$). Chickweed tea did not prevent blood glucose elevation (8.45±0.37 mmol/L). Diabetes induced a cardiac dysfunction, described by deterioration of cardiac output and cardiac work. However, *Stellaria media* preserved cardiac function is settings of diabetes.
Conclusions: Our results show that *Stellaria media* tea has beneficial effect on the negative cardiac alterations caused by experimental diabetes, but it is not proceeded through the improvement of carbohydrate metabolism.

Keywords: Stellaria media, chickweed, diabetes, cardiomyopathy, oral gavage, blood glucose, oral glucose tolerance test, working heart perfusion

Grant support: GINOP-2.3.2-15-2016-00006, EFOP-3.6.2-16-2017-00006, 20391-3/2018/FEKUSTRAT

Supervisors:
Dr. Virág Demján PhD student, Metabolic Diseases and Cell Signaling Research Group (MEDICS), Department of Biochemistry, Faculty of Medicine, University of Szeged
Andrea Sója PhD student, Metabolic Diseases and Cell Signaling Research Group (MEDICS), Department of Biochemistry, Faculty of Medicine, University of Szeged
Dr. Tamás Csont associate professor, Metabolic Diseases and Cell Signaling Research Group (MEDICS), Department of Biochemistry, Faculty of Medicine, University of Szeged

Kerolyn Garcia (MSc student), Faculty of Pharmacy, University of Porto
Liliana Rodrigues (MSc student), Rectory, University of Porto
Inês Dias (BSc student), ICBAS, University of Porto

Impact of an educational intervention for digital skills in European old adults

Europe is facing demographic changes with a large growth of its older adult population. Associated with it, elderly European citizens represent approximately 1/3 of older adults who have never used the computer. Improving digital skills in older adults is one way of improving their quality of life through an active lifestyle (education, social participation, hobbies, etc) and freedom of choice and decisions (leisure time, information, travelling, health care, etc). With this work, we aimed to evaluate the impact of the presential courses - educational intervention from ICTskills4All project, an Erasmus+ project - in digital skills of a group of elderly European citizens.
An observational study was conducted, which included 16 adults (44% males and 56% females, age: 65,16±18,6 years) from Portugal and Latvia. Educational interventions were running during eight sessions, and included digital skills contents for beginners. All participants have been evaluated for digital skills knowledge and satisfaction with the intervention, in the beginning and in the end of the educational program.
The participants showed improvements in their basic digital skills, namely in use and beneficials of social networks, safe use of the internet and searching tools, creation of safe passwords, use of YouTube and identification of different symbols and images. Moreover, satisfaction with the intervention was high overall,, especially regarding the exchange of experiences with colleagues and assistants.
Our results showed that this educational intervention has beneficial effects for participants in digital skills and also in the social dimensions.

Keywords: digital skills; education intervention; old adults.

Supervisors:
Elisio Costa professor, UCIBIO, REQUIMTE, Faculty of Pharmacy and Competences Center on Active and Healthy Ageing (Porto4Ageing Reference Site), University of Porto, Porto, Portugal
Margô Karnikowski professor, Science and Health Technologies, University of Brasilia – UnB, Brazil;
Madara Mara Irbe assistant lecturer, RASA - Riga Active Seniors Alliance

Flóra Diána Gausz (ME student), Faculty of Medicine, University of Szeged
Alexandra Fejes (ME student), Faculty of Medicine, University of Szeged

Investigation of the relationship between cardiolipin and prediabetes induced cardiac damage

Introduction: Prediabetes is a symptomless disease which mostly remains unrecognised. Prediabetes induces cardiac damage, which involves mitochondrial dysfunction. One of the main components of the mitochondrial inner membrane is cardiolipin. The cardiolipin level decreases in diabetes mellitus correlated to diabetic myocardial damage. Our work aimed to examine the relationship between prediabetes induced cardiac damage and cardiolipin levels.
Methods: We used 16 male Wistar rats. The rats were divided into two groups. The control group received a normal diet while the fructose-fed group received 60% fructose-supplemented chow for 24 weeks. During the experiment, we measured fasting blood sugar levels and oral glucose tolerance. In the 24th week, animal hearts were isolated and cardiac functions were examined by working heart perfusion. With mass-spectrometry, we determined cardiolipin levels in the myocardium.
Results: The results of fasting blood sugar monitoring and oral glucose tolerance test showed slightly but significantly elevated values due to fructose feeding indicating the development of the prediabetic condition. The isolated working heart perfusion revealed diastolic dysfunction in the fructose-fed group. With mass-spectrometry, we detected decreased cardiolipin levels due to the increased fructose intake compared to control group (28,1±2,1 vs. 37,8±2,1). We detected significant cardiolipin remodelling in the fructose-fed group. Cardiolipin is essential in mitochondrial and myocardial function so the defect of this molecule indicates myocardial dysfunction.
Conclusions: Fructose enriched diet indicates decreasing cardiolipin levels and cardiolipin remodelling, which cause mitochondrial dysfunction. Our results show that the decreased amount of cardiolipin can play an important role in prediabetes induced cardiac damage.

Keywords: cardiolipin, remodeling, prediabetes, oral glucose tolerance test, mass-spectrometry

Grant support: GINOP-2.3.2-15-2016-00006, EFOP-3.6.2-16-2017-00006,20391-3/2018/FEKUSTRAT

Supervisors:
Dr. Gergő Szűcs research fellow, Metabolic Diseases and Cell Signaling Research Group (MEDICS), Department of Biochemistry, Faculty of Medicine, University of Szeged
Dr. Tamás Csont associate professor, Metabolic Diseases and Cell Signaling Research Group (MEDICS), Department of Biochemistry, Faculty of Medicine, University of Szeged
Andrea Sója PhD student, Metabolic Diseases and Cell Signaling Research Group (MEDICS), Department of Biochemistry, Faculty of Medicine, University of Szeged

Jair Gonzalez Marques (PhD student), Faculty of medicine, Ludwig Maximilian University of Munich

Stool Metabolome Disclose Metabolic Alterations in Pediatric Crohn`s Disease and Provide New Tools for Diagnosing.

Crohn's Disease (CD) is an inflammatory bowel disease, a disorder involving chronic inflammation of the digestive tract. CD is clinically diagnosed using a combination of different approaches: medical history, physical findings, endoscopy, imaging, and laboratory studies, including histopathology. Stool metabolomics may be used to increase the level of accuracy in the diagnosis and follow up of the disease. We used HPLC/Q-TOF and GC/Q-TOF to profile the stool metabolome in samples from CD pediatric patients aiming to provide more information regarding disease activity as well as to provide biomarkers for better understanding the pathogenesis of CD.
Samples from 42 pediatric CD patients and 64 healthy control subjects were used. The analysis was performed by HPLC/Q-TOF in the positive and negative ion mode (PIM / NIM) and derivatized for GC/Q-TOF measurements. A combination of univariate and multivariate analysis was used to mining for significant features and correlation analysis was performed to find a potential correlation between the significant compounds and the inflammatory markers as well as with the weighted pediatric CD activity index (wPCDAI). After quality control, a total of 127 / 165 features was putatively identified using MS/MS data, and 47 / 99 features had the molecular formula generated in the negative and in positive ion mode, respectively using HPLC and 86 features putatively identified by GC. Eight compounds were found significant in the NIM, three in the PIM, and three compounds were found significant by GC. Six of the significant features showed correlation with wPCDAI score and the inflammatory markers.

Keywords: Crohn's Disease, Stool Metabolome, HPLC/Q-TOF, GC/Q-TOF

Supervisor:
Berthold Koletzko professor, Dr. von Haunersches Kinderspital, Head of Department of Metabolism and Nutrition for children and adolescent medicine, LMU

Dóra Halmi (ME student), Faculty of Medicine, University of Szeged

Effects of kynurenic acid against simulated ischemia/reperfusion induced damage of H9c2 cells: focus on the modulation of apoptosis

Introduction: Acute myocardial infarction is a leading cause of death worldwide. In order to develop new therapeutic strategies, the investigation of potential cardiocytoprotective agents capable of increasing the resistance of cardiac cells against ischemia and reperfusion is of great importance.
Aim: In this study, we aimed to reveal the cellular effects of kynurenic acid (KYNA) on simulated ischemia/reperfusion (SI/R) injury focusing on potential antiapoptotic effects.
Materials and Methods: H9c2 cardiomyoblasts underwent 6 hr simulated ischemia and 2 hr reperfusion, while 64 µM KYNA treatment was applied continuously in order to examine its potential antiapoptotic effects. Several morphological features of apoptosis were examined: the ratio of apoptotic nuclei and the frequency of DNA double strand break formation was investigated using immunofluorescent staining, moreover, the level of apoptotic membrane blebbing was determined via light microscopy. To further corroborate our findings, expression of Bcl-2 associated X (BAX) and B-cell lymphoma extra large (Bcl-XL) was also investigated by western blot.
Results: In preliminary experiments, we found that KYNA has a dose-dependent cardiocytoprotective effect against SI/R-induced damage of H9c2 cells. SI/R caused progressive apoptotic membrane blebbing, increased the ratio of apoptotic nuclei and the frequency of DNA double strand breaks. KYNA treatment significantly attenuated the increase of these apoptotic markers. KYNA treatment also antagonized both the increase of the proapoptotic BAX, as well as the decrease of the antiapoptotic Bcl-XL following SI/R.
Discussion: We conclude that KYNA-induced protection against the harmful effects of SI/R may involve attenuation of apoptotic processes.

Keywords: cardiocytoprotection, apoptosis, H9c2, ischemia/reperfusion, kynurenic acid

Grant support: Our work was supported by GINOP-2.3.2-15-2016-00034 and 20391-3/2018/FEKUSTRAT.

Supervisors:
Renáta Gáspár assistant professor
Tamás Csont associate professor, Metabolic Disease and Cell Signaling (MEDICS) Group, Department of Biochemistry, Interdisciplinary Excellence Centre, University of Szeged

Yousif Ibrahim (PhD student), Pharmacy, University of Szeged

Effect of Plasticizer Type and Quantity on the Properties of Oral Chitosan Films

Nowadays, chitosan attracts the attention of pharmaceutical technologists regarding poorly absorbable drugs, particularly of biological origins, such as peptides and proteins, due to its unique properties, such as biocompatibility, biodegradability, safety, superior mucoadhesivity and absorption enhancing capacity. The present work aimed to investigate the effect of the different plasticizers /propylene glycol and polyethylene glycol (PEG-400)/ on the properties of chitosan films. The films were prepared with the simple casting method by dissolving chitosan in aqueous acetic acid (AA) or citric acid (CA). The minimum film-forming temperature (MFFT) of the prepared solutions was investigated with a Rhopoint-60 MFFT apparatus in a temperature range of 15 to 60°C. The obtained films were investigated with Fourier Transform-spectrometry (FTIR). The tensile strength, mucoadhesivity, moisture content, thickness, surface free energy (SFE) and the thermal properties (TG-DSC-MS) of the films were examined as well. It was found that chitosan has a high capacity to incorporate a high quantity of plasticizers. The addition of the plasticizers increases the flexibility of the films and affects both the mucoadhesivity and SFE values. All prepared solutions showed a low MFFT, which enables them to be efficiently used as coatings for thermosensitive materials. The addition of PEG-400 increases the thermal stability of both AA- and CA-based chitosan films. It was concluded that CA-based chitosan solutions/films made with PEG-400 could serve as novel stable oral films or as coating solutions to deliver poorly absorbable drugs.

Keywords: chitosan, citric acid, minimum film-forming temperature, mucoadhesivity, polyethylene glycol, propylene glycol, thermal stability

Grant support: This research was supported by EU-funded Hungarian grants EFOP-3.6.1-2016-00008 and EFOP-3.6.3-VEKOP-16-2017-00009.

Supervisors:
Géza Regdon jr. associate professor, University of Szeged, Institute of Pharmaceutical Technology and Regulatory Affairs, Szeged, Hungary
Katalin Kristó assistant lecturer, University of Szeged, Institute of Pharmaceutical Technology and Regulatory Affairs, Szeged, Hungary
Tamás Sovány associate professor, University of Szeged, Institute of Pharmaceutical Technology and Regulatory Affairs, Szeged, Hungary

Blanka Zsuzsanna Jókai (ME student), Faculty of Dentistry, University of Szeged

Restoring endodontically treated premolars with different fiber-reinforced designs in case of healthy and bruxing patients as well

Introduction: As the number of bruxing and clenching patients rises all over the world, extreme occlusal forces are occuring, often leading to fracture of the tooth-restoration unit. The aim was to investigate the fatigue-survival of endodontically treated (ET) premolars reinforced by various fiber-reinforced post-core composites (FRCs) during different loading conditions.
Methods: 150 intact premolars were collected and randomly divided into ten groups (n=15). One group served as control (intact teeth). After endodontic treatment standard MO cavities were prepared and restored with different post-core fiber-reinforced materials and designs. Three groups (A1-A3) received only coronal fillings. Two groups (B1-B2) were restored with short post (3 mm) and fillings, while the remaining four groups (C1-C4) were restored with different long posts (6 mm) and fillings. Fatigue-survival was measured using a cyclic-loading machine in all specimens. Both normal and extreme biting forces were simulated.
Results: Teeth reconstructed with an individually-made long FRC post (Group C3) did not differ from intact teeth regarding fatigue-survival ($p>0.05$). The rest of the groups produced significantly lower survival ($p<0.05$) compared to intact teeth during normal biting forces. When extreme forces were applied, none of the tested direct restorative methods were able to reinforce the ET teeth as all restored specimen differed statistically from the control group.
Conclusions: Restoring ET premolars with the aid of individually-made long FRC post showed promising achievement regarding fatigue-survival in case of normal biting forces, whereas the tested direct methods are not suitable to reinforce these teeth in case of bruxing patients.

Keywords: normal loading, extreme loading, bruxing, fracture resistance, fatigue survival, root canal treated teeth

Supervisor:
Márk Fráter DMD., M.Sc., PhD assistant professor

Marcell Juhász (PhD student), Faculty of Medicine, University of Szeged

Is videogaming connected with other addictions?

Introduction: In Hungary, 3.7 million people played videogames in 2019; 62% of men and 52% of women in the total adult population, most frequently between age of 18 to 25. Gaming disorder (GD) has been included into ICD-11, and DSM-5 also lists internet gaming disorder (IGD) in Section III. We examined the possible connection between videogaming and certain types of addictions as GD, smoking and alcohol drinking.
Methods: Gamers, from the south-eastern region of Hungary, took part in our survey, based on a self-administered printed questionnaire. The sample size was 142 adults, between 18-35 years, from both genders (except two persons under 18). It was divided into two sub-groups, gamers and casuals, based on average playing time (over/under 1h/day). Our main focus was on gaming time as a predictor of GD.
Results: No relationship of gaming time was found to gaming disorder, to any aspect of smoking, and to alcohol drinking generally. Positive association was seen only with frequency of drinking five units of alcohol in the previous year (χ^2=10.071 p<.039). Self-declared presence of GD was in our sample 8.8% from total.
Conclusions: Our data show high prevalence of GD, and suggest that playing time alone may not be a predictor of problematic gaming, distinction with intense playing should be made. Comparing results with international studies relating smoking and alcohol drinking, findings are controversial, the situation is still unclear in both cases, further investigations are required.

Keywords: videogaming, gaming disorder, internet gaming disorder, lifestyle

Grant support: SZTE-ÁOK-PhD-kieg (2019/11)

Supervisors:
Edina Horváth associate professor, Department of Public Health, Faculty of Medicine, University of Szeged
Edit Paulik professor, Department of Public Health, Faculty of Medicine, University of Szeged

Vivien Kardos (PhD student), Faculty of Law and Political Sciences, University of Szeged

Digital challenges of the next generation in the field of law

Digitalisation is one of the crucial challenges of today, which has increasing impacts on the legal business as well as the expected digital competences. In this context, the question arises as the degree to which the current law students, the future professionals have knowledge on the actual trends and challenges in legal informatics. Furthermore, how they have prepared for the implementation of the *'digital lawyer concept'.*
I intend to show a brief feedback based on the results of the empirical research among law students. The outcome is based on quantitative - with the total participation of 128 law students - and qualitative, which involved 11 interviewees, data acquisition. The contradiction can be established between the importance of trends in legal informatics and the reality from the viewpoint of law students, as they do not have sufficient knowledge of trends. This is supported that the recognition of the relevance of informatics has not always been stated in the visualisation of the future jurists. Some kind of aversion and distancing can be identified in connection with the usage of technology for professional purposes, which has been corroborated by the findings of the learning methodological habits.
The results highlighted how hard it could be to be open-minded for profession-related technological solutions, moreover, to learn to use them adequately. It has become evident that law students use the achievements of modern technology, but they have limited knowledge, so the expectations of the 21st century require additional knowledge, competences and improvement of the appropriate attitude.

Keywords: digital challenges, empirical research, law students

Grant support: This research was carried out in the framework of the project nr. EFOP-3.6.2-16-2017-00007, with the support of the European Union.

Supervisor:
Péter Kovács Ph.D associate professor, Department of Statistics and Demography University of Szeged

Noémi Kmetykó (BSc student), Institute of Pharmaceutical Analysis, University of Szeged

Development and application of UHPLC-MS/MS method for analysis of kynurenic acid and its newest derivatives, in vitro permeability assay using primary rat brain endothelial cells

Introduction: The kynurenic pathway has a great influence on the central nervous system. The interruption of the kynurenics' chemical balance may lead to the development of neurodegenerative diseases such as Alzheimer's disease. Restoring the chemical balance has many difficulties since the kynurenics that have positive effect can get through the blood-brain barrier only in a very minimal rate. Nowadays best possible therapy seems to be the use of derivatives of kynurenic acid (**KYNA**) as an active ingredient.
Methods: The level of **KYNA** and its derivatives (**SZR104, SZR72**), which were passed through the primary rat brain endothelial cells of *in vitro* permeability assay, was determined by a targeted ultra-high performance liquid chromatography combined with electrospray ionisation triple quadrupole tandem mass spectrometry (UHPLC-ESI-MS/MS) method. The **SZR73** was used as an internal standard during analysis.
Results: The main parameters of sample preparation procedure and UHPLC-ESI-MS/MS method were optimized. The targeted analytical method and related sample preparation procedure was successfully applied for quantification of **KYNA**, **SZR104** and **SZR72** in biological samples. Overall, the derivatives **SZR72** and **SZR104** have better transportation through the blood-brain barrier than the **KYNA**. In terms of transportation, the results were the following in descending order: **SZR104**, **SZR72** and **KYNA**
Conclusions: Using the developed method on the biological samples from the in vitro permeability assay, we have found that the amount of transported kynurenics is linked to the duration of the assay and the chemical modification of **KYNA** improved the permeability of its derivatives.

Keywords: blood-brain barrier, in vitro permeability assay, UHPLC-ESI-MS/MS, kynurenic acid and its derivatives

Grant support: This research was supported by the EU-funded Hungarian grant EFOP-3.6.1-16-2016-00008 and GINOP-2.3.2-15-2016-00034 EU.

Supervisor:
Róbert Berkecz senior lecturer, Institute of Pharmaceutical Analysis, University of Szeged

Martin Kócsó (ME student), Faculty of Law, University of Szeged

The intellectual property aspects of counterfeit medicines

During my researches I wrote about the intellectual property aspects of counterfeit medicines. In the aspects of the conference this is important due to the fact that the counterfeiting of medicines unlike the basic counterfeiting, does not only cause financial damages but can also affect directly the health of the consumers. As an example the head secretary of Interpol announced that 40 years of terrorism caused 65 000 deaths, while in some states, the counterfeiting of medicines causes up to 200 000 a year. This clearly shows us that the counterfeiting of medicines containes a huge risk of health damages. As their sources are illegal, their quality, their affects and their production methods are unknown. The use of these medicines is also dangerous, while looking like legitimate medicines they might contain false substance or no substance at all, they may be produced of polluted or questionable quality ingredents. My researches not only show theoretical but also practical issues and how law enforcements react on these. I bring as an example, some of the most significant cases in medicine counterfeiting - such as the online trading of falsified medicines. On top of these matters I also adress the situation of generic and innovative medical manufacturing companies and the effects of counterfeiting on their markets. Besides the legal and health aspects as a closure I also write about the ethical sides of this topic - such as the moral downside of using intellectual property and the usage of one's health status with profit intensions.

Keywords: intellectual property, counterfeit medicines, profit intensions, drug companies, generic drugs, WTO, innovative medical companies, health damages, legitimate medicines, legal aspects, questionable quality

Supervisor:
Márta Görög Dr., Prof. professor, Institute of Civilistic Studies

Tímea Körmöczi (PhD student), Faculty of Pharmacy, University of Szeged

Quantitative analysis of synthetic cannabinoids and their metabolites in human urine and blood samples

Introduction: Synthetic cannabinoids (SCs) are the most rapidly growing class of new psychoactive substances (NPS), which are a range of drugs that have been designed to mimic the effects of illegal drugs. The rapid growth in popularity of SC use among teenagers and young adult is a serious problem. These products are saturated in various plants crumb, which are usually smoked, like marijuana. Most SCs are agonist of the cannabinoid receptors, which is linked to the psychoactive effects or ”high” of weed. Consumption of SCs verified from biological samples (urine, blood, etc.) with liquid chromatography coupled to tandem mass spectrometer (LC-MS/MS) technique. Due to rapid metabolism of the mother compound, it is not enough to detect only the parent compounds for confirmation of SCs consumption. 5F-MDMB-PICA and 4F-MDMB-BINACA have been the most seized SCs by the police in recent months.
Methods: The aim of this study was to quantitatively determine these SCs and their main metabolites in human urine and blood by developed targeted LC-MS/MS method. Optimized liquid–liquid extraction procedures were used to enrich the SCs and their metabolites from human urine and blood. Two MRM transitions quantifier ion and qualifier ion were selected for qualitative and quantitative analysis of targeted compounds using external calibration procedure.
Results and Conclusion: In summary, our analytical approach is suitable to detect and confirm the consumption of SCs. Generally, the concentration of the main metabolites was higher than related parent compounds in urine and blood samples.
Acknowledgements: This research was supported by the EU-funded Hungarian grant EFOP 3.6.1-16-2016-00008.

Keywords: synthetic cannabinoids, LC-MS/MS, metabolite, urine, blood

Grant support: This research was supported by the EU-funded Hungarian grant EFOP-3.6.1-16-2016-00008.

Supervisor:
Dr. Róbert Berkecz senior lecturer, Institute of Pharmaceutical Analysis, University of Szeged

Petra Kovács (ME student), Faculty of Pharmacy, University of Szeged

In vitro metabolite profiling of designer drugs

Introduction: The designer drugs have similar psychoactive effect of the well-known illegal drugs, like amphetamine, cocaine, cannabis etc. The focus of our research was on the synthetic cannabinoids (SCs) as a main group of designer drugs. These products have higher binding abilities to the CB_1 and CB_2 cannabinoid receptors than THC, the main psychoactive compound of marijuana. Due to their fast metabolism prior to renal excretion, in forensic and toxicological practice, identification of metabolites in addition to the parent molecule is required to justify consumption.
Methods: The aim of this study was the determination of metabolites of the new designer drugs of 2020 by *in vitro* human liver microsome (HLM) assay. The SCs were incubated at 37°C with HLM for 30 min. After liquid-liquid extraction of HLM samples, the analysis was performed on ultra-high-performance liquid chromatography coupled to Thermo Scientific Q Exactive Plus hybrid quadrupole-Orbitrap mass spectrometer. The identification of metabolites was based on their fragmentation patterns.
Results and conclusion: We could identify 23 metabolites of **FUB-144** and 42 metabolites of **MDMB-4en-PINACA** SCs. With knowing of the metabolite profile of SCs, we can confirm the drug consumption from authentic urine samples using targeted analytical method.

Keywords: synthetic cannabinoids, metabolites, human liver microsome

Grant support: This research was supported by the EU-funded Hungarian grant EFOP 3.6.1-16-2016-00008.

Supervisors:
Róbert Berkecz senior lecturer, Institute of Pharmaceutical Analysis, University of Szeged
Tímea Körmöczi PhD student, Institute of Pharmaceutical Analysis, University of Szeged

Colete Leite (BSc student), Faculdade de Psicologia e de Ciências da Educação, University of Porto

A job stuck in the lungs: the "stone dust" in Penafiel

There is still a lack of awareness about the health impact of work. Silicosis was considered the most serious occupational disease of the XX century, yet, despite being a preventable disease with long-known and well established causes, it still has a significant prevalence among quarry workers in some regions.
The goal of this study is to explore the occupational disease silicosis in the municipality of Penafiel, regarding the personal experiences of those who have been living with silicosis after developing it as a result of quarrying, as well as the points of views of different entities involved in this problematic.
Data were collected through 7 in-depth interviews to individuals diagnosed with silicosis and 4 interviews to personalities representing the different entities involved, including political figures, employers, union representatives and medical entities.
Results show that silicosis has social and psychological consequences on those who have been diagnosed with it, at both a personal and a professional level, since workers typically end up having to retire early. Besides, the diagnosis of this occupational disease usually takes a long time, and during this period workers might face additional hardships.
The workplace is meant to allow for making a living, not for losing health, hence the need for continuous supervision and intervention, in a joint and coordinated effort from all the entities involved.

Keywords: respiratory diseases, silicosis, stoneworkers, work, health, risks, satety, occupational diseases

Supervisor:
Liliana Maria da Silva Cunha senior lecturer, Faculdade de Psicologia e de Ciências da Educação

Jing Li (PhD student), Pathology Institute, Ludwig Maximilian University of Munich

Therapeutic targeting of cytokinesis eradicates genomically silent childhood cancer

Chromosome instability (CIN) is a hallmark of cancer. Yet, many childhood cancers including Ewing sarcoma (EwS) feature remarkably 'silent' genomes with minimal CIN. Here, we show in the EwS model how uncoupling of mitosis and cytokinesis via targeting protein regulator of cytokinesis (PRC1) or its activating polo-like kinase 1 (PLK1) can be employed as new therapeutic approach. We find that the EwS-specific oncogenic transcription factor EWSR1-FLI1 hijacks PRC1, which physiologically safeguards controlled cell division, through binding to a proximal enhancer-like GGAA-microsatellite thereby promoting tumor growth and poor clinical outcome. Via integration of transcriptome-profiling and functional *in vitro* and *in vivo* experiments including CRISPR-mediated enhancer editing, we discover that high PRC1 expression creates a therapeutic vulnerability toward pharmacological PLK1 inhibition that can eradicate even chemo-resistant EwS through massive CIN-induction and apoptosis.
Collectively, our results exemplify how aberrant activation of PRC1 by a dominant oncogene can promote malignancy but provide opportunities for targeted therapy. In this respect we identify PRC1 as a predictive biomarker for PLK1 inhibitors, many of which are being tested in clinical trials.

Keywords: Ewing sarcoma, PRC1, cytokinesis, PLK1

Grant support: This work was mainly supported by a grant from the German Cancer Aid (DKH-70112257 to T.G.P.G) and the Chinese Scholarship Council (CSC, to J.L.).

Supervisor:
Thomas G. P. Grünewald professor, Max-Eder Research Group for Pediatric Sarcoma Biology, Institute of Pathology, Faculty of Medicine, LMU Munich, Munich, Germany/Hopp Children's Cancer Center (KiTZ), Heidelberg, Germany/Division of Translational Pediatric Sarcoma Research, German Cancer R

Cosima Lisi (PhD student), Faculty of Medicine, University of Porto

Breastfeeding at 6 months in migrant and native women: what is the impact of formula industry marketing?

Introduction: Breastfeeding lifelong benefits are far-reaching. However, optimal breastfeeding practices may be negatively affected by marketing of formula and related products. Whether market factors have a different impact on migrants' breastfeeding practices when compared to natives, has been poorly investigated. Our study aims to assess the effect of market factors on breastfeeding at 6 months (any and exclusive), comparing migrant and native women.
Methods: A longitudinal study was conducted within baMBINO, a nationwide project on perinatal health among migrant women in Portugal. Our final sample included 249 migrants and 203 natives recruited between April 2017 and March 2019 in 32 public maternities. Multivariate logistic regression was performed and interactions were tested.
Results: Any and exclusive breastfeeding rates at 6 months were higher among migrants (87.6 % and 14.9% respectively) than natives (64.5 % and 9.4%). Exposure to market factors was widespread, although higher among natives. Mothers born in Portuguese-speaking African countries (aOR 6.78 95% CI 3.13-14.68) and Brazil (aOR 2.68 95% CI 1.15-6.23) were more likely to breastfeed when compared to natives. Brazil-born mothers were also more likely to exclusive breastfeed (aOR 2.44 95% CI 1.00-6.00). Additionally, acculturation negatively influenced exclusive breastfeeding. Reporting exposure to formula discounts was associated with decreased likelihood of any (aOR 0.51 95% CI 0.26-0.98) and exclusive breastfeeding (aOR 0.42 95% CI 0.17-1.01), regardless of being migrant.
Conclusions: Exposure to formula discounts is a risk factor for either any and exclusive breastfeeding at 6 months, in both migrants and natives. Banning formula discounts may improve breastfeeding rates at 6 months.

Keywords: Breastfeeding, migrants, market factors

Grant support: FEDER funds through POCI and FCT under the scope of the project baMBINO (POCI-01-0145-FEDER-016874; PTDC/DTPSAP/6384/2014), the EPIUnit (UIDB/04750/2020), the PhD grant PD/BD/128082/2016 (CL) co-funded by the FCT and POPH/FSE Program

Supervisors:
Henrique Barros senior lecturer, EPIUnit – Instituto de Saúde Pública, Universidade do Porto; Departamento de Ciências de Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina da Universidade do Porto
Cláudia de Freitas assistant lecturer, EPIUnit – Instituto de Saúde Pública, Universidade do Porto; Departamento de Ciências de Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina da Universidade do Porto; Centre for Research and Studies in Sociology, University Institute of Lisbon

Rita Magalhães (MSc student), Faculty of Medicine, University of Porto

Large Database Screening for the Identification of New Drugs Against Biofilm Formation in P.aeruginosa: a Computational Approach

Biofilms are highly organized communities of bacteria attached and enclosed in a self-produced matrix. These structures show differences in gene expression when compared with similar free-flowing cells. They are highly resistant to antibiotics and host immune response. One of the main mechanisms of biofilm formation is Quorum-Sensing (QS), the intercellular communication in bacteria. This mechanism results in alterations in gene expression in a population density dependant manner (10.1039/C2OB25835H). *P.aeruginosa* is a highly pathogenic bacteria capable of forming biofilms through QS. The development of inhibitors against these QS mechanisms is a promising therapeutic strategy to combat *P.a* related infections (10.1039/c4cc10393a).
Molecular Docking (10.2174/0929867311320180002) is a computational method used to accurately predict the preferred binding pose between two molecules. Virtual Screening (10.1016/j.abb.2015.05.011) (VS) is the application of docking to large databases of compounds. The development and optimization of specific VS protocols capable of identifying compounds with inhibition potential against *LasR* is a possible strategy to reduce biofilm formation in *P.aeruginosa.*
This work reports on the identification of compounds for the inhibition of quorum-sensing in P.aeruginosa. Several molecular docking software were used in the screening of large databases of natural, marine and FDA approved compounds with unknown activity against *LasR*. The best performing compounds can now be tested experimentally for their action against *LasR*. We have also developed and published a freely available Biofilm Structural Database (10.1016/j.tibtech.2020.04.002), comprising several protein structures involved in biofilm formation, development, and virulence, extremely useful for all researchers that wish to study biofilm pathogenicity.

Keywords: biofilms, quorum-sensing, Pseudomonas aeruginosa, molecular docking, virtual screening, computational biology

Grant support: This work has been supported by the Fundação para a Ciência e a Tecnologia (FCT) (UIDB/04378/2020)

Supervisors:
Sérgio Filipe Maia de Sousa senior research fellow, UCIBIO/REQUIMTE, BioSIM – Departamento de Medicina, Faculdade de Medicina da Universidade Do Porto, Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal
André Melo college professor, LAQV/REQUIMTE, Departamento de Química e Bioquímica, Faculdade de Ciências da Universidade do Porto, Rua do Campo Alegre, 4169-007 Porto, Portugal
Cláudia Tatiana Freitas Vieira PhD student, UCIBIO/REQUIMTE, BioSIM – Departamento de Medicina, Faculdade de Medicina da Universidade Do Porto, Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal

Vânia Magalhães (PhD student), Institute of Public Health, University of Porto
Daniela Correia (PhD student), Faculty of Sciences, University of Porto

Ultra-processed foods consumption and its associated factors, in Portugal

Introduction: The consumption of ultra-processed foods (UPF), characterized by being energy-dense and rich in additives, has increased worldwide. In addition, UPF are usually packaged, which may also lead to harmful effects on health (through migration of substances) as well as on the environment (through accumulation). This work aimed to describe the UPF consumption in Portugal and its associated factors.
Methods: Participants from the Portuguese National Food, Nutrition and Physical Activity Survey (IAN-AF) 2015-2016, aged 3-84y were included (n=5005). Dietary intake was assessed through 2-day-diaries/2-24-hour-recalls. UPF were identified using NOVA classification. Associations between sociodemographic/behavioural factors and UPF consumption (grams) were evaluated through linear regression models.
Results: UPF consumption accounted for 23.8% of the total energy intake (quantity: 313 grams/day). Considering adults as reference, all lower age groups consume more quantity of UPF (e.g.: adolescents - βfemale:192, 95%CI:135;249; βmale:327, 95%CI:277;377). Lower educated individuals showed to have a lower consumption compared to the more educated (βfemale:-51, 95%CI:-86;-16; βmale:-68, 95%CI:-124;-12). In males, there was a lower UPF consumption in those who were married/couple when compared to singles (β:-48, 95%CI:-96;-1). And, in females, being a current or a former smoker was associated with a higher consumption of UPF compared to never smokers (β:79, 95%CI: 41;118; β:42, 95%CI:8;75, respectively).
Conclusions: Younger ages and higher education level were significantly associated with higher UPF consumption in males and females. Being a single male or a smoking female were the other factors that were shown to be associated with a higher UPF consumption.
PT06-000088SI3; POCI-01-0145-FEDER-032090; POCI-01-0145-FEDER-031949

Keywords: Ultra-processed foods; NOVA; national survey; Portugal

Grant support: IAN-AF,2015-2016: EEA Grants Program, Public Health Initiatives (PT06-000088SI3). UPPer: POCI-01-0145-FEDER-032090; FOCAcCIa: POCI-01-0145-FEDER-031949

Supervisors:
Carla Lopes associate professor, Departamento de Ciências da Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina da Universidade do Porto; EPIUnit - Instituto de Saúde Pública da Universidade do Porto
Duarte Torres associate professor, Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto; EPIUnit - Instituto de Saúde Pública da Universidade do Porto
Sara Rodrigues professor, Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto; EPIUnit - Instituto de Saúde Pública da Universidade do Porto

Sarah Maggioli (ME student), Faculty of Psychology and Social Sciences, University of Porto

Is work affecting the mental wellbeing of health professionals? A study of antidepressant and benzodiazepine consumption among hospital workers.

Depression is the main cause of disability worldwide (WHO, 2018). Both depression and psychotropic medication consumption have repeatedly been associated with hazardous working conditions. Work is not the only factor to be associated with depression but the change in working conditions and the support offered to workers represent a more effective way to reduce the high prevalence of these issues. Specifically among health professionals, who represent more than 10% of OECD countries' workforce, these hazardous conditions seem to be particularly high. In this study, we analyze levels of consumption among health professionals from a public hospital and the possible relation to working conditions.
This is a cross-sectional metanalysis. Sample is of 2601 workers and data regarding consumption was provided by the Occupational Health Service and treated by the researcher using IBM SPSS® software. The study was approved by the Hospital's ethics committee.
6% consume psychotropic medication, of whom 94% were women. The most common professional groups were technical assistants (14%) operational assistants (12%) and superior technicians (8%). 57% were over 52 years old and 38% had been in the institution for over 20 years.
Numbers were lower than expected. This can be due to low support for mental health issues in Portugal, self-medicating, omitting their consumption to the occupational health physicians or even to the fact workers who are too ill to work are not represented in this sample. A bigger study with health professionals in Europe would be helpful to understand the overall representation these numbers may have.

Keywords: Psychotropic Medication, Depression, Anxiety, Health Professionals, Psychosocial risks, Work

Supervisor:
Liliana Cunha college associate professor, University of Porto

Ana Rita Marinho (PhD student), Faculty of Medicine, University of Porto

Gender-effect on longitudinal association of dietary macronutrient intake during childhood and adiposity: findings from the Generation XXI Birth Cohort

Background: Few studies focus on assessing the independent effect of each macronutrient intake on increased adiposity from early childhood into adolescence, considering age and sex-differences.
Aim: To prospectively assess dietary macronutrients intake at the age of 4, 7 and 10y, with adiposity outcomes at 7 and 10 years of age, by sex.
Methods: Data from the population-based birth cohort Generation XXI was used (n=6537). At 4, 7- and 10 years old, dietary data, anthropometrics and socio-demographics were collected. Children's dietary intake was evaluated by a Food Frequency Questionnaire (FFQ), calibrated with food diaries and applied to caregivers by trained interviewers. Age- and sex-specific body mass index z-scores (zBMI), waist-to-hip ratio (Whr) and percentage of body fat (%FM) were used as measures of adiposity. Structural equation modelling tested the independent association between each macronutrient (protein, carbohydrates, fat and fiber) and each measure of adiposity.
Results: An increase in energy (Kcal) from fiber intake at the age of 7 was associated with lower zBMI, %FM and Whr at 10 years old, both in boys and girls. At the age of 10, increased protein intake was associated with higher adiposity. Increased protein intake was associated with higher zBMI in boys (β=0.036 95%CI 0.002, 0.070), while in girls was associated with higher %FM (β=0.403 95% CI 0.037, 0.770).
Conclusion: Our study suggests that higher intake of fiber showed to be protective in the development of adiposity, and high intake of protein at 10y seemed to be related with increased adiposity with differences according to sex.

Keywords: childhood, cohort studies, adiposity, macronutrient intake

Grant support: This work was developed in the scope of the project FOCAcCIa- FEDER/COMPETE-FCT (PTDC/SAU-PUB/31949/2017),supported by EPIUnit(ISPUP-EPIUnit/ISPUP/UP)(UIBD/04750/2020) and a PhD Grant (SFRH/BD/147822/2019) by the Foundation for Science and Technology(FCT)

Supervisors:
Carla Lopes associate professor, Department of Public Health and Forensic Sciences, and Medical School, Faculty of Medicine, University of Porto, Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal. EPIUnit – Institute of Public Health, University of Porto, Rua das Taipas, nº 135,
Milton Severo senior lecturer, Department of Public Health and Forensic Sciences, and Medical School, Faculty of Medicine, University of Porto, Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal. EPIUnit – Institute of Public Health, University of Porto, Rua das Taipas, nº 135,

Patrick Mboyo Bakambo (Phd student) Paris-Saclay University

Representation of local communities in public law

Generally speaking, representation is a process whereby a person, the representative, translates subtly the presence of another, the represented. In legal terms, it relates to a technique allowing the representative to want and act in the name and on behalf of the principal. In this junction of will and power by acts which immediately engage the represented, a major challenge must be met: the representative tends to seek what is best, as the represented would do himself.

In the current context of modernization of public policies, characterized in particular by a change in the paradigms of territorial public action, the undertaking of a study on the representation of local communities in public law is a challenge, and is likely to be to arouse apprehension. Indeed, there has never been a general, or multidisciplinary, agreed upon concept to which the term "representation" can be attached. In addition, the both polysemous and proteiform character of the concept has resulted in the use of the term, in doctrine and jurisprudence, suffering from a lack of rigor.

As part of our research, we propose applications of the representation of local communities (regions, departments, municipalities, intercommunalities) through public law mechanisms that allow representatives to want and act in their name and on their behalf. Also, following an empirical approach, we have tried to identify legal situations from which we can concretely deduce that this is a representation of local communities.

Thus, we first aim to demonstrate that the polysemy of the term representation leads to a different conception of the types of representation in public law: representation-mandate, representation-empowerment and representation-incarnation. This polysemy is reflected, on the one hand, by the plurality of representation mechanisms applicable to local communities and, on the other hand, by the great variety of their representatives.

Then we propose to highlight the subsequent manifestations of the representation of local communities by showing that the representation mechanisms applied are differently receptive to representativeness. Indeed, the impact of the sociological concept of representativeness is visible in our research through its transversal integration within certain mechanisms of representation, while other mechanisms resist it.

Moreover, the subtlety of our research, even its interest, is that it combines conceptual reflection with empirical demonstration. The idea is to understand the functioning of representation mechanisms, while maintaining the transcendent objective of the general interest in the exercise of the powers vested in local authorities.

Supervisor:
BUI-XUAN Oliva, Centre de recherche Léon Duguit, UEVE

László Mérai (PhD student), Faculty of Science and Informatics, University of Szeged
Ágota Deák (PhD student), Faculty of Science and Informatics, University of Szeged
Mohamed Mahmoud Abdelghafour (PhD student), Faculty of Science and Informatics, University of Szeged

Degradation of organic pollutants by the help of intelligent photoreactive surfaces

Nowadays, the water and air pollution are still-emerging global problems. A possible solution for these issues is the application of semiconductor photocatalysts (e.g. TiO_2) and their composites. By the proper choice of matrix materials and surface functionalization, the surface properties, and therefore the antimicrobial and self-cleaning nature of the photocatalyst filler materials can also be tuned in order to achieve the best performance in specific scenarios [1,2]. Thanks to this versatility, visible light-active composite materials have increasing worldwide popularity in healthcare and environmental remediation applications as a demand for greener, cheaper, and preferably chemical-free solutions emerges in these fields [3,4].
In this poster presentation, we introduce visible light-photoreactive surfaces with tunable wetting properties and photodegradation efficiency against different organic model pollutants in liquid and gas media. The presented Ag-TiO_2-containing composite coatings offer a green and non-toxic alternative to chemical treatment methods. Moreover, the new generation of these coating can have self-healing nature [2] or real-time tunable wetting properties due to their responsivity to external magnetic field and temperature: this provides switchable affinity towards different pollutants and may open new perspectives in sophisticated liquid manipulation applications, as well [5].

References

[1] L. Mérai et. al., eXPRESS Polym. Lett.12 (2018) 12.
[2] L. Mérai et. al., Catal. Today 328 (15) (2019) 85.
[3] Á. Deák, L. Janovák, et. al. Appl. Surf. Sci. 389 (2016) 294.
[4] L. Janovák et. al., Chem. Commun. 54 (2018) 650.
[5] L. Mérai et. al., Polymers 12(9) (2020) 1890.

Keywords: self-cleaning, photocatalysis, composite surface, intelligent surface, multifunctional coating

Grant support: Hungarian Ntl. Research, Development and Innov. Office [2018-2.1.10-TÉT-MC-2018-00005]; New Ntl. Excellence Program of the Ministry for Innov. and Technology [UNKP-20-3 and UNKP-20-5]; the János Bolyai Research Scholarship of the Hungarian Acad. of Sci.

Supervisors:
László Janovák senior lecturer, University of Szeged, Department of Physical Chemistry and Materials Science, Faculty of Science and Informatics, H-6720, Rerrich Béla tér 1, Szeged, Hungary
Imre Dékány professor emeritus, University of Szeged, Department of Physical Chemistry and Materials Science, Faculty of Science and Informatics, H-6720, Rerrich Béla tér 1, Szeged, Hungary
Dániel Sebők research fellow, University of Szeged, Department of Applied and Environmental Chemistry, Faculty of Science and Informatics, H-6720, Rerrich Béla tér 1, Szeged, Hungary

Gyöngyi Anna Mezey (PhD student), Faculty of Medicine, University of Szeged

Phone hygiene - the missing step in infection control

Introduction: Smartphones became commonplace in the hospital environment, and as reservoirs of pathogens they have the potential to compromise hand-hygiene. Although there have been investigations on contaminated phones of the hospital staff, there is a need to focus on medical students and their attitude towards the disinfection of personal devices.
Methods: Fourth-year medical students, altogether 94, have been surveyed from the Faculty of Medicine, University of Szeged. The online questionnaire contained questions about the students' habits regarding their use of smartphones in the hospital, frequency and mode of disinfection, and changes of attitude due to the COVID-19 pandemic.
Results: Out of the 94 students, only 5.3% disinfected their smartphones at least once a day, while 26.6% never disinfected their phones at all. 46.8% of students didn't change the frequency of disinfection after the COVID-19 outbreak, although female students were more likely to do so ($p<0.01$). Using one's phone in the hospital environment became just natural, with 23.3% of students taking their phones into the operating theater and 18% using it in physical examinations. Even though 33% of students reported that they have family members vulnerable to infections, they were not more rigorous in their cleaning habits compared to other students.
Conclusions: Even though medical students used their smartphones extensively during clinical practices, only a minority was mindful of its cleanliness. The devices thus have the potential to carry pathogens from patient to patient and to home as well.

Keywords: smartphones, disinfection, medical students' attitude, smartphone use in hospital

Grant support: EFOP 3.6.3-VEKOP-16-2017-00009; ÚNKP-19-3

Supervisor:
Edit Paulik professor, Department of Public Health, Faculty of Medicine, University of Szeged

Helena Monteiro (MSc student), Faculty of Sciences, University of Porto

Harmful Algae Blooms on the Portuguese coast: cross-checking events with remote sensing ocean color and temperature data for coastal management

Phytoplankton are essential for the feeding of commercially important bivalves, crustaceans and fish. In most cases, algal blooms are beneficial for aquaculture and wild fishing. However, in some situations, so-called “HABs” (Harmful Algal Blooms) can have negative effects, causing impacts on human health and economic losses (for example, aquaculture, tourism). In the last two decades there has been an increase in the occurrence of toxic phytoplankton blooms and the appearance of species never mentioned in Iberian waters. These may be related to the increased use of coastal waters for aquaculture, anthropogenic eutrophication and the transport of toxic microalgae in the ballast waters of ships. Earth observation can provide important information about the spatial and temporal distribution and the destination of blooms, with scales not available for conventional monitoring techniques. The present work aims to take advantage of public databases (for example, HAEDAT, Copernicus program) to correlate the color of the ocean and temperature data available on some of the public platforms with the detection of the occurrence of harmful algae proliferation by remote sensing. From the analysis of the HAEDAT database, it was possible to observe that in Portugal, from 1987 to 2019, there were 630 HAB events, with Diarrhetic Intoxication by Shellfish (DSP) being the most common Portuguese waters syndrome. Chlorophyll a and temperature products were extracted from SENTINEL 3 imagery (Copernicus Program - 2016-2019) for periods coinciding with the HAB events in recent years to identify patterns in the development and destination of flowering, to assist management coastal.

Keywords: HABs, Earth Observation, Ocean Color, Sea Surface Temperature, Coastal Management, Portugal

Supervisors:
Priscila Goela assistant research fellow, CIMA– Centre for Marine and Environmental Research, University of Algarve
Sónia Cristina assistant research fellow, CIMA– Centre for Marine and Environmental Research, University of Algarve

Helena Monteiro (MSc student), Faculty of Sciences, University of Porto

Assessment of the ecological status of Sado estuary: Water Framework Directive approach

The Sado estuary has been subject of several studies to assess the impact of anthropogenic pressures and eutrophication processes on the quality of the ecosystem and the sustainable development of aquaculture. The present work intends to evaluate the ecological status of the Sado estuary in the winter season, considering four sampling campaings (AQUASADO project), using the metrics proposed by Water Framework Directive (WFD). The physical and chemical characterization of the water was carried out also to evaluate the variation of abiotic factors in the distribution and occurrence of phytoplankton communities in the estuary. The most abundant phytoplankton organisms observed belong to the classes *Chlorophyceae* and *Bacillariophyceae*. Regarding chlorophyll concentration, the highest values were registered in September (4.4 µg L^{-1}) and November (3.1 µg L^{-1}), while in October (2.3 µg L^{-1}) and February (2.4 µg L^{-1}) the lowest values were observed. With regard to the oxygen dissolved (DO) results, these revealed values of 117 % (in September) and 127 % (in February), for the more upstream stations. The concentrations of nitrate+nitrite (NOx) and ammonia (NH_4), in all months, ranging from 0.13-0.27 mg L^{-1} and 0.06 to 0.11 mg L^{-1}, respectively. Phosphorus (PO_4^{2-}) concentrations remained constant in all seasons and sampled periods (0.02-0.03 mg L^{-1}). The results showed that the reference limits proposed by the WFD were not exceeded (Chl-a <6.67 ug L^{-1} ; DO < 109 %; NOx < 0.3 mg L^{-1} ; NH_4 < 0.2 mg L^{-1} and PO_4^{2-} < 0.05 mg L^{-1}).

Keywords: Phytoplankton; Abiotic Factors; WFD; Sado Estuary

Supervisors:
Sara Antunes associate professor, Department of Biology, Faculty of Sciences, Interdisciplinary Center for Marine and Environmental Research (CIIMAR), University of Porto
Carla Palma Laboratory Head of Hydrographic Institute, Head of Chemical and Pollution of the Marine Environment of Hydrographic Institute - Navy

Saidu Muhammad Bello (PhD student), Faculty of Pharmacy, University of Szeged

Ingol-type, ent-atisane and stachane diterpenes from Nigerian plant Euphorbia deightonii

Euphorbiaceae is a very large and diverse plant family with over 210 plant genera and more than 6,500 species, mostly found in tropical and temperate regions. Plants of Euphorbiaceae family have shown high diversity of structurally unique diterpenoid compounds which have attracted interest from biogenetic, synthetic, biological and toxicological areas of research. Some diterpenes were found to display antiviral activity against Chikungunya virus, HSV, or proved to be a potent and selective inhibitor of HIV-1 replication. *Euphorbia deightonii* Croizat is native to West Africa. It is thorny, succulent, 6 m height plant. Traditional healers in Nigeria used it for treatment of leprosy and woman sterility. Aim of our study was to isolate diterpenes from aerial parts of *E. deightonii* and evaluation of anti-HBV activities of some selected compounds.

Fractionation of methanol extract of *E. deightonii* by a combination of solvent-solvent partition, open column chromatography, VLC, PLC and HPLC led to the isolation of 30 diterpenes: 27 ingol derivatives, two *ent*-atisane and one stachane type diterpenes. Their structures were established using NMR analysis and HR-MS spectra. All compounds were isolated from *E. deightonii* for the first time of which 9 diterpenes are new natural compounds. Furthermore, until our research, one ingol derivative was only known from synthetic source.

Anti-HBV effect of three selected ingols was carried out in Taiwan with lamivudine as the positive control. The result showed one of the compounds inhibited the DNA replication of HBV (IC_{50} 11.625 µm). We plan to evaluate the anti-HBV activity of all isolated diterpenes.

Keywords: Euphorbia deightonii , diterpene, chromatography, ingol, ent-atisane, stachane, HBV

Grant support: Stipendium Hungaricum from Tempus Public Foundation

Supervisor:
Dóra Rédei senior lecturer, Department of Pharmacognosy, University of Szeged

Mahwash Mukhtar (PhD student), Pharmacy, University of Szeged

Fabrication of isoniazid loaded chitosan / thiolated chitosan and hyaluronic acid hybrid nanoplex DPIs as a potential TB treatment: Aerodynamic properties and in silico deposition in lungs

As the causative agent resides in alveolar macrophages, hence the site-specific drug delivery still remains the challenge for tuberculosis therapy. Existing therapies have low drug encapsulation or accumulation in non-target organs. Recently, dry powder inhalers (DPIs) are being explored for drug deposition in deeper lung tissues. Hyaluronic acid (HA) has shown affinity for CD44 macrophage receptors with chitosan/thiolated chitosan as biodegradable mucoadhesive. DPIs comprised of CS/TC in conjugation with HA were synthesized encapsulating isoniazid (INH) by using Quality by Design (QbD) approach, followed by Design of Experiment (DoE). Nanosuspensions were prepared by ionic gelation method and later freeze dried to obtain the nano-powders. Average particle size was 300.2 nm ± 20.3 and 342 nm ± 18.8 for CS/HA NPs and TC/HA NPs respectively. FPF % < 3 µm was calculated to be 46.86 % and 53.11 % for CS/HA and TC/HA nano-powders individually. Physico-chemical compatibility of polymers and drug were investigated using *in-vitro* characterization techniques. *In-vitro* release and permeation studies were correlated in terms of pattern of drug content dissolved over time. Moreover, *in-silico* studies and aerodynamic profile demonstrated the promising results of DPI in terms of particle deposition in the deeper lung.

Keywords: Thiolated chitosan, nanoplexes, isoniazid, in silico, factorial design, tuberculosis

Grant support: This work was supported by the GINOP-2.3.2-15-2016-00036 ('Development and application of multimodal optical nanoscopy methods in life and materials sciences'), Ministry of Human Capacities, Hungary grant 20391-3/2018/FEKUSTRAT.

Supervisor:
Rita Ambrus associate professor, Faculty of Pharmacy, Institute of Pharmaceutical Technology and Regulatory Affairs, University of Szeged, Szeged, Eötvös utca 6, 6720, Hungary

Zsófia Flóra Nagy (ME student), Faculty of Medicine, University of Szeged

Comprehensive genetic analysis of a Hungarian amyotrophic lateral sclerosis cohort

Introduction: Amyotrophic lateral sclerosis is a fatal neurodegenerative disease, which affects lower- and upper motor neurons. About 5-10% of the cases show a positive family history, while the other cases remain sporadic. Until now more than 120 genes have been associated with the disease. Our aim was to investigate the role of 35 genes in the Hungarian population.
Methods: 107 non-related sporadic ALS patients were recruited for this project. Our study was based on new generation sequencing techniques and repeat length analysis. A control group of 200 healthy individuals was used for comparison. The detected variants were validated via Sanger sequencing.
Results: In around 10% of the patients we were able to detect a pathogenic hexanucleotide repeat expansion in the *C9orf72*gene. By using new generation sequencing methods we identified 31 variants in 16 major ALS genes. The most frequently mutated genes were the following: *NEK1* (5.6%), *NEFH*, *SQSTM1* (3.7%), *KIF5A, SPG11* (2.8%), *ALS2, CCNF, FUS, MATR3, TBK1* and *UBQLN2* (1.9%). Potentially pathogenic variants were detected in one person in the *ERBB4, FIG4, GRN* and *SIGMAR1* genes. However, we could not confirm the role of an intermediate length polyglutamine repeat expansion found in the gene *ATXN2* as a risk factor for ALS.
Discussion: With the combination of fragment length analysis and new generation sequencing techniques we were able to identify a possibly pathogen variant in 41% of the patients. Our results contribute to broadening the knowledge about the genetic background of ALS.

Keywords: amyotrophic lateral sclerosis, ALS, genetics

Grant support: Szegedi Tudós Akadémia program (EMMI, TSZ:34232-3/2016/INTFIN) Nemzeti Agykutatási Program 2.0 (Grant No. 2017-1.2.1.-NKP-207-00002)

Supervisors:
Prof. Dr. Márta Széll professor, University of Szeged, Department of Medical Genetics
Margit Pál PhD research fellow, University of Szeged, Department of Medical Genetics

Botond Nagy (ME student), Faculty of Law and Political Sciences, University of Szeged

The health hazards of Hungarian prisons with special regard to those caused by high over-occupancy levels

A nation's attitude towards the health of one of the most vulnerable groups in the population mirrors its attitude towards health in general. For this reason I examined whether or not the Hungarian prison conditions take a toll on the inmates' health. I studied approximately a hundred judicial decisions (2014-2019), which gave me a strong basis to make general observations about the conditions of prisons. The focus of my research is on the amount of space that prisoners are provided, which, in an extreme case of 2016, did not reach 0.4 m² per capita. Twenties of inmates were living in the same overcrowded cells, within abominable conditions. Bedbugs infested the cells, incontinent prisoners soiled under themselves and there was smoke in the atmosphere. These have caused lung diseases, pneumonia, rashes, upper-respiratory tract and fungal infections. The prisoners' sedentary lifestyle has led to being overweight and diabetic, developing kidney disease, liver failure and cardiovascular complications. The inhuman environment has caused paranoia, depression, insomnia and suicidal attempts. Most of these problems have been created by over-occupancy levels sometimes as high as 290%, with the average being around 110.1-141%. Such a place is not fit for its reintegrative purpose. On this basis, all governments leading counties with the same problems should build more prisons, while renovating those they already have. The prisoners' health matters too. And it is not only about them. It is about the health of our society. The condition of the inmates leaving prisons has a great impact on that.

Keywords: health, hazards, prisons, over-occupancy, prisoners, inmates, mental, physical, complications, diseases, infections, respiratory, cardiovascular, depression, insomnia

Supervisor:
Zsuzsanna Juhász associate professor, Institute of Criminal Sciences

João Pedro Neves (BSc student), Faculdade de Ciências, University of Porto

Effect of abiotic stress in Plant Specific Insert (PSI) expression and localization

Adverse conditions caused by abiotic stress modulate the plant development and growth by altering some morphological and cellular mechanisms. To face this problem, plants, along with physiological adaptations, developed intracellular mechanisms. Protein trafficking within the cell involves innumerous complexes and receptors that has been characterized along the years. For this study, some were selected based on their role and localization within the endomembrane system: BP-80, VTI12, SYP121, SYP23, SYP51, VAMP, RMR1 and EXO70. The Plant Specific Insert (PSI) is a domain present in some aspartic proteinases that modulates their trafficking to the vacuole in a non-conventional way, bypassing the Golgi. It is known that stress situations can alter protein sorting to the vacuole, changing their routes via a Golgi-independent pathway. Our goal is to evaluate the expression levels of different aspartic proteinases and respective PSIs, and well-characterized genes involved in the vacuolar pathway, in plants submitted to different abiotic stresses (osmotic, oxidative, saline and heavy metals). The results obtained point to a different response of the three aspartic proteinases under study which indicates that different, yet related, aspartic proteinase genes respond differently to different types of stress, indicating a fine-tuned regulation. Furthermore, our results regarding the endomembrane system effectors show us that EXO70, RMR1, SYP51, SYP121 and VTI12 are up regulated in all the stress conditions, while VAMP, SYP23 and BP80 are downregulated. This demonstrates that adverse conditions caused by abiotic stress can alter the expression of key proteins involved in the protein trafficking machinery.

Keywords: Plant Specific Insert; Abiotic Stress; Protein trafficking;Endomembrane remodeling;

Supervisor:
Claudia Sofia de Jesus Queirós Pereira research fellow, GreenUPorto; Faculdade de Ciências - Rua do Campo Alegre s/n

Bernát Nógrádi (ME student), Faculty of Medicine, University of Szeged

Age-related degeneration of the motor system: from the motor end plate to the spinal cord

Introduction: Growing evidence suggests that ageing adversely affects motor end plates, thus impairs the function of skeletal muscles. While certain aspects of motoneuronal ageing have been documented, the dynamics and time course of these degenerative processes are largely unknown.
Aim: We examined multiple aspects of the functional and morphological alterations associated with motoneuronal ageing and whether all parts of the motor unit are uniformly affected by the advanced age.
Material and Methods: C57BL/6 mouse with age ranging from 3 to 24 months were used. Acetylcholinesterase staining was used to visualize neuromuscular junctions (NMJs) in the *extensor digitorum longus* (EDL) muscle. Retrograde marker and vesicular acetylcholine transporter staining were used to quantify the innervating and surviving motoneurons in the sciatic motor pool of the spinal cord. Calcium histochemistry was performed and analyzed with electron microscopy, along with characterization of mitochondrial morphometry.
Results: The ratio of pathological NMJs drastically increases in the 18-month-old EDL muscle, while mitochondrial swelling and calcium elevation were already significant at 12 months. In the spinal cord, the number of surviving and innervating motoneurons shows declining tendency, however it is only significant in 24-month-old animals. Mitochondrial swelling and calcium increase were also detected in the motoneuronal soma, but only from 18 months on.
Conclusion: The progressive degeneration of NMJs is coupled with a relatively well preserved motoneuron pool, suggesting an age-related dying-back mechanism. As this phenomenon is associated with neurodegenerative disorders, such as amyotrophic lateral sclerosis, our results may shed more light on the “accelerated ageing” hypothesis of such conditions.

Keywords: motoneuronal ageing, neuromuscular junctions, dying-back phenomenon

Grant support: This work was supported by the Szeged Scientists Academy under the sponsorship of the Hungarian Ministry of Human Capacities (EMMI: 11136-2/2019/FIRFIN) and the Economy Development and Innovation Operative Programme (GINOP 2.3.2.).

Supervisors:
László Siklós scientific advisor, Department of Biophysics, Biological Research Centre, Szeged, Hungary
Roland Patai research fellow, Department of Biophysics, Biological Research Centre, Szeged, Hungary
Krisztián Pajer assistant professor, Department of Anatomy, Histology and Embryology, University of Szeged Szeged, Hungary

Vasiliki Pantazi (PhD student), Faculty of Dentistry, University of Szeged

The Regulatory Role of ATM and DNA-PK on P53 Non-Sequence-Specific DNA-Binding Upon DSB Induction

Introduction: ATM and DNA-PK kinases play a potential role in the coordination of P53 tumor suppressor protein but less is known about the regulation of P53 in non-sequence specific DNA-binding. Our aim is to characterize the role of ATM and DNA-PK in P53 non-sequence specific DNA-binding at RNAPII-transcribed gene regions.
Materials and Methods: Both HCT116 p53+/+ and p53-/- cell lines were treated with 20 μM DNA-PK and 10 μM ATM inhibitors for 1 hour before the induction in different time-points of Actinomycin D (ActD)-mediated DNA Double-Strand Breaks (DSBs). To examine the changes in the protein levels of P53, its activated form (S15P-P53), RNAPII complex, its elongating form (S2P-RNAPII) as well as γH2AX, S1981P-ATM and S2056P-DNA-PK, cells were harvested and subjected to Western Blot analysis.
Results: In HCT116 p53-/- the protein levels of S2P-RNAPII were decreased upon the following conditions: 24h ActD, ATMi + 24h ActD and DNAPKi + 24h ActD. However, in HCT116 p53+/+, only following the combined treatment of ActD and ATM inhibitor, we could observe reduced S15P-P53 and S2P-RNAPII protein levels.
Conclusions: Our results demonstrate a potential role of P53 in the regulation of S2P-RNAPII upon transcription block, enhanced by ATM. P53 presumably acts as a negative regulator upon DSB induction, hindering the RNAPII removal from the impaired regions. This peculiar function of P53 described in our work could contribute to a further insight into the DNA repair mechanisms and challenge the field of current tumor research by providing a new direction in drug development and cancer therapy.

Keywords: Transcription Block, P53, DNA-PK, ATM

Grant support: GINOP-2.3.2-15-2016-00020

Supervisors:
Pankotai Tibor habil Dr. assistant lecturer, Faculty of Dentistry, Department of Oral Biology and Experimental Dental Research
Borsos Barbara Dr. research fellow, Faculty of Dentistry, Department of Oral Biology and Experimental Dental Research

Petra Party (PhD student), Faculty of Pharmacy, Institute of Pharmaceutical Technology and Regulatory Affairs, University of Szeged

Development of nanonized dry powders inhalers to treat different respiratory diseases

Introduction: Pulmonary drug delivery has lots of advantages such as high bioavailability, rapid onset of action, limited drug degradation and improved patient compliance. Inhalable nanoparticles also decrease the effect of the lung defense mechanisms. The non-steroidal anti-inflammatory meloxicam (MX) was used as a model active ingredient. It could be useful for the treatment of non-small cell lung cancer, cystic fibrosis and chronic obstructive pulmonary diseases. Our aim was to produce dry powders containing nanoparticles using wet milling and nano spray drying. We expect from our samples rapid dissolution, high permeability and outstanding alveolar deposition.
Methods: We used a two-step preparation method. The nanoparticle sized suspension was prepared with wet milling, using polyvinyl alcohol (PVA) and MX. The nanosized powders were obtained with nano spray drying of the suspension and leucine (LEU). The particle size and morphology were determined with dynamic light scattering and scanning electron microscopy. The structure was analysed with X-ray powder diffraction. True density, dissolution in simulated lung media and *in vitro* absorption was measured. Aerodynamic properties were tested with *in vitro* and *in silico* methods.
Results: We worked out a nanoparticle preparation method, by combining wet milling and nano spray drying for pulmonary administration. We managed to prepare 500-800 nm sized particles, with amorphous active ingredient. The dissolved and the absorbed amount of MX increased. The alveolar lung depositions of the samples containing LEU were promising *in vitro* and *in silico.*
Conclusion: Our products are suitable for pulmonary delivery, therefore they could treat different respiratory diseases also.

Keywords: nano spray dryer, dry powder inhalers, meloxicam, andersen cascade impactor, in silico assesment

Grant support: Gedeon Richter excellence PhD scholarship, Gedeon Richter's Talentum Foundation

Supervisor:
Rita Ambrus associate professor, University of Szeged, Institute of Pharmaceutical Technology and Regulatory Affairs, Eötvös street 6, H-6720 Szeged, Hungary

Viviane Peçaibes (PhD student), Faculty of Fine Arts, University of Porto
Diego Mergener (PhD student), Faculty of Fine Arts, University of Porto

Positive Play for Mental Health in Modern Life: The Challenge of Anorexia Nervosa

Introduction: *Positive play* is a concept focused on how games contribute to human potential. It blooms from the humanistic field of Design acting on the cultural triangle: Man2Man (affectivity, norms, procedures); Man2Environment (education, business, politics); Man2Spiritual (beliefs, ideologies).
Objectives: Our research aims to define and apply the concept of *Positive Play* to mental health, namely in anorexia nervosa (a severe mental disorder and of one of the major mental health challenges regarding treatment), developing ludic instruments and games.
Methods: From bodies of knowledge in game design, human-centered design, positive computing, human-computer interaction, user experience, philosophy of media and computation, mental health, and well-being, we research how games can be instruments for human potential, integrating rhetorics for empowerment, inclusion, satisfaction and well-being in their designs.
Results: In the case of anorexia nervosa, *Positive Play* is demonstrated in the design of games to help in the prevention, treatment, monitoring of the disease. Their development process involves a multidisciplinary team, including mental health specialists, patients and family members.
Discussion: Through various examples of games in development, the relevance and potential contribution of *Positive Play* to the treatment of mental disorders and to the promotion of mental health is discussed, inspecting how it makes games efficient instruments for: 1) helping and motivating players act to the limit of their capabilities; 2) activating positive emotions and behaviour change in players; 3) promoting insight to make life objectives clear and attainable; 4) empowering people for social interaction and participation; 5) engage players to face real-world problems.

Keywords: positive play, game design, human potential, anorexia nervosa, mental health

Grant support: The research of the first author is funded by national funds through FCT – Fundação para a Ciência e a Tecnologia, I.P., in the scope of the contract SFRH/BD/145986/2019.

Supervisors:
Pedro Cardoso professor, professor, Faculty of Fine Arts, University of Porto/INESC TEC.

Bruno Giesteira professor, INESC TEC / Faculty of Fine Arts, University of Porto
Liliana Castro medical specialist, ICBAS / CINTESIS

Rafaela Pedro Silva (MSc student), Instituto de Ciências Biomédicas de Abel Salazar (ICBAS-UP), University of Porto
Célia Soares (BSc student), Instituto de Ciências Biomédicas de Abel Salazar (ICBAS-UP), University of Porto
Carina Herman-de-Sousa (PhD student), Instituto de Ciências Biomédicas de Abel Salazar (ICBAS-UP), University of Porto

Unravelling adenosine receptors role in subcutaneous fibroblasts as novel targets against myofascial pain

Chronic myofascial pain is associated to diffuse subcutaneous inflammation, tissue disorganization and sensory nerves stimulation. Subcutaneous fibroblasts release huge amounts of ATP when challenged by inflammatory mediators (Pinheiro et al, 2013 J Biol Chem 288:27571). ATP is rapidly converted into adenosine by ecto-NTPDases1/2 and ecto-5'-nucleotidase. Extracellular adenosine is a powerful modulator of inflammatory and neuronal responses. Understanding the mechanisms by which subcutaneous fibroblasts respond to adenosine and communicate with sensory neurons may be paramount to discover new drug targets for myofascial pain. Using immunofluorescence confocal microscopy, we show here that rat subcutaneous fibroblasts exhibit high A_3 receptor amounts, followed by A_{2A} and A_{2B} receptors, with only minute amounts of the A_1 receptor being detected. The adenosine analogue, NECA (10 and 100 nM, n=3), progressively decreased fibroblast cells growth (MTT assay) and collagen production (Sirius Red assay) up to day 21 of the cells in culture. Selective activation of the A_{2A} receptor with CGS21680 (1 nM, n=3) decreased collagen production from day 14 onwards. Activation of the A_3 receptor subtype with 2-Cl-IB-MECA (10 and 100 nM, n=4) showed a late pro-fibrotic effect only observed at culture day 28. The predominant anti-fibrotic effect exert by activation of the A_{2A} receptor subtype is promising given to the fact that this receptor also suppresses responses in other immune-mediated conditions (Oliveira et al, 2015, 2015: 460610).
This abstract was chosen among the best poster presentations in Health Sciences at the IJUP 2020 Porto Meeting.

Keywords: Nociception, chronic pain, subcutaneous fibroblasts

Grant support: Work supported by FCT (UID/BIM/4308/2019)

Supervisors:
Fátima Ferreirinha associate professor, Laboratório de Farmacologia e Neurobiologia/MedInUP
Maria Adelina Costa associate professor, Departamento de Química, Instituto de Ciências Biomédicas Abel Salazar (ICBAS-UP)
Paulo Correia-de-Sá professor, Laboratório de Farmacologia e Neurobiologia/MedInUP

Vasco Pires (MSc student), Faculty of Engineering, University of Porto
Cristina Ferreira (MSc student), Faculty of Engineering, University of Porto
José Silva (MSc student), Faculty of Engineering, University of Porto

3D printing solutions to fight COVID-19

Introduction: At the start of the COVID-19 pandemic, the 3D printing community joined efforts to supress the needs of health facilities. Rapidly, reusable masks, visors and even ventilator components were developed. After the peak of the pandemic, these immediate needs decreased. However, health experts warn for the possibility of a second wave of contagion. Thus, it became necessary to arm public buildings, with solutions capable of preventing COVID-19 dissemination. Besides the direct contact with an infected individual, surface-to-surface contact must not be underestimated. SARS-CoV-2 can be found for days in some surfaces, which combined with the tendency for humans to touch their faces, can be hazardous to one's health. Thus, hands-free devices were developed to equip the academic buildings, such as touchless door-knobs and touchless sanitizer dispensers. Portable devices were created as well to facilitate opening doors and pressing buttons. Protective equipment such as reusable masks and ear savers, was developed and optimized for printing as well.
Methods: Several CAD tools were used, and the parts were printed via FDM. The product development methodology consists on iteratively designing and printing the component until a satisfactory concept is achieved. Solutions were based on previously existing solutions found withing open sources and adapted for 3D printing, and other solutions were developed from scratch. A numerical study and optimization for each component validates the original concepts.
Results
The final parts consist on novel solutions with high commercial value and interest for the user. Each solution is optimized for 3D printing and focused on ergonomics and utility.

Keywords: COVID-19, 3D Printing, FDM, Product Development

Supervisors:
Jorge Américo De Oliveira Pinto Belinha college professor, INEGI - Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial
Fernando Jorge Lino Alves college associate professor, INEGI - Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial
Ana assistant research fellow, INEGI - Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial

Romain Plais,[1] Guy Gouarin,[1] Anne Gaucher,[1] Violette Haldys,[2,3] Arnaud Brosseau,[4] Gilles Clavier,[4] Jean-Yves Salpin,[2,3] and Damien Prim *[1]

[1] ILV, Université Paris-Saclay, UVSQ, CNRS, 78035 Versailles

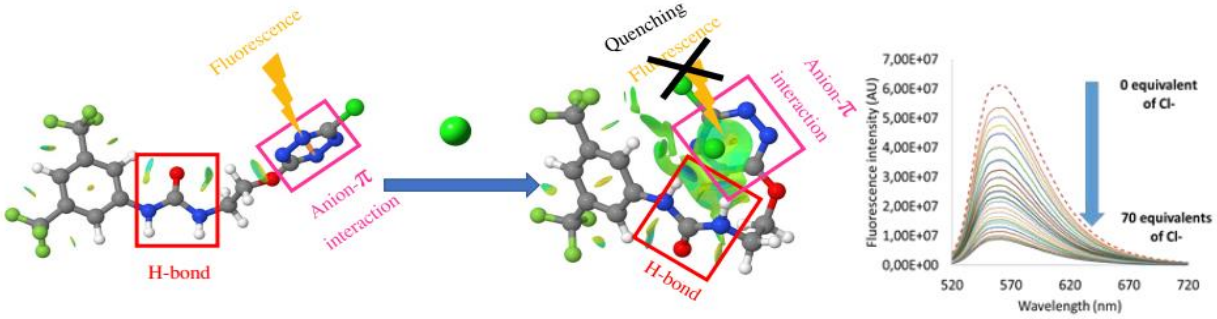
[2] LAMBE, Université Paris-Saclay, UEVE, CNRS, 91025 Evry

[3] LAMBE, Université Paris-Seine, U-Cergy, CNRS, 91025 Evry

[4] PPSM, Université Paris-Saclay, ENS Paris-Saclay, CNRS, 94235 Cachan

Fluorescent Anion Receptor Combining Anion-π Interaction and Hydrogen Bonding: a Multidisciplinary Approach

Anions are widely spread in several areas such as biology, medicine, catalysis and environment. [1] As an example, anions have a predominant role in channelopathies such as cystic fibrosis or Dent's disease [1].
Therefore, the development of anion receptors is a milestone in today's organic chemistry. Despite the widespread use of cation receptors, molecular recognition of anion receptors is still in his infancy. The prediction, the determination of the three-dimensional architecture of the receptor-anion complex involved and potential applications are among the challenges of this rising area of chemistry.
The development of such molecules is based on the use of one or multiple weak interactions such as anion-pi interactions, halogen or hydrogen bonding but also hydrophobic effects. These weak interactions individually contribute to the structuration and properties of complex three-dimensional receptors. However, associated within a single polyfunctional molecular platform, a combination of several weak interactions is likely to generate stronger and more selective bindings and thus modulating existing or forthcoming properties.
Moreover, numerous publications are based on anion receptors bearing fluorescent probes that enable colorimetric or photophysical detection/characterization of binding/transport properties. [2] In this context, we designed new anion receptor platforms comprising both a hydrogen-bond donor and a π-deficient heterocycle not only able to generate π-anion interactions but also act as a fluorophore. [3,4] The joint presence of both structural units within a unique platform and their synergistic roles towards anion recognition are evidenced by DFT calculations. Then, the complexation will be discussed by a broad scope of experimental methods (high resolution mass spectroscopy, NMR, UV-Visible, Fluorescence and decays titrations). [3



References:

[1] R. Plais, A. Gaucher, G. Clavier, D. Prim. *Review in Preparation.*
[2] T. L. Mako, J. M. Racicot, M. Levine. *Chem. Rev.* **2019**, 1, pp. 322-477.
[3] R. Plais, G. Gouarin, A. Gaucher, V. Haldys, A. Brosseau, G. Clavier, J.-Y. Salpin, D. Prim. *ChemPhysChem* **2020.** 41, 1249-1257.
[4] R. Plais, H. Boufroura, G. Gouarin, A. Gaucher, V. Haldys, A. Brosseau, G. Clavier, J.-Y. Salpin, D. Prim. *Manuscript in preparation.*

Supervisors:
Pr. Damien Prim, Institut Lavoisier de Versailles, UVSQ

Evelin Polanek (PhD student), Faculty of Medicine, University of Szeged
Noémi Jónás (ME student), Faculty of Medicine, University of Szeged

Pregnant women's dietary behavior, dietary supplement intake and its influencing factors

INTRODUCTION: Protection of maternal and infant health is globally a healthcare priority. Promotion of healthy life start – including healthy nutrition – should begin before the conception. The aim of our study was to evaluate the nutritional habits, its potential influencing factors, and possible pregnancy-connected consequences among women who delivered their baby in Szeged, Hungary.
METHODS: A questionnaire-based study was conducted in Szeged, Hungary. Primary data were collected by a self-reported questionnaire, and secondary data were obtained from patient documentations. Present data show the results of 301 included pregnancies, of which data were assessed by using IBM SPSS 26.0.
RESULTS: 46.8% of pregnant women consumed enough dairy product, and 53.5%, 56.5% and 26.2.% ate at least daily twice servings of vegetables, fruits and whole grain products, respectively. More than half (63.8%) of women consumed fish, and 43.9% consumed oily seeds less than monthly. Nonetheless, 55.8%, 42.6% and 20.9% ate at least once a week sweets, chips and pizza or hamburger, respectively. 68.1% used pregnancy vitamins; dietary supplement intake was significantly influenced by maternal age, educational level, marital status and pregnancy planning. A significant correlation was observed between oily seed consumption (p=0.046); chips consumption (p=0.03) and maternal high blood pressure; and processed meat and gestational preeclampsia (p=0.011). The more frequent vegetable and fruit consumption tended to lower the probability of premature birth (p=0.018; p=0.036).
CONCLUSIONS: Poor nutritional behaviour was observed among the included women. Improvement of health consciousness and promotion of a healthier nutritional behaviour is needed in order to facilitate healthy life start.

Keywords: pregnancy, nutritional behaviour, vitamin intake, diet, pregnancy outcome, healthy life start

Grant support: Hetényi Géza grant, EFOP 3.6.3-VEKOP-16-2017-00009

Supervisors:
Andrea Szabó associate professor, Department of Public Health, Faculty of Medicine, University of Szeged, Szeged, Hungary
Edit Paulik professor, Department of Public Health, Faculty of Medicine, University of Szeged, Szeged, Hungary
Hajnalka Orvos professor, Department of Obstetrics and Gynecology, Faculty of Medicine, University of Szeged, Szeged, Hungary

Gergő Porkoláb (PhD student), Faculty of Science and Informatics, University of Szeged
Anikó Szecskó (MSc student), Faculty of Science and Informatics, University of Szeged

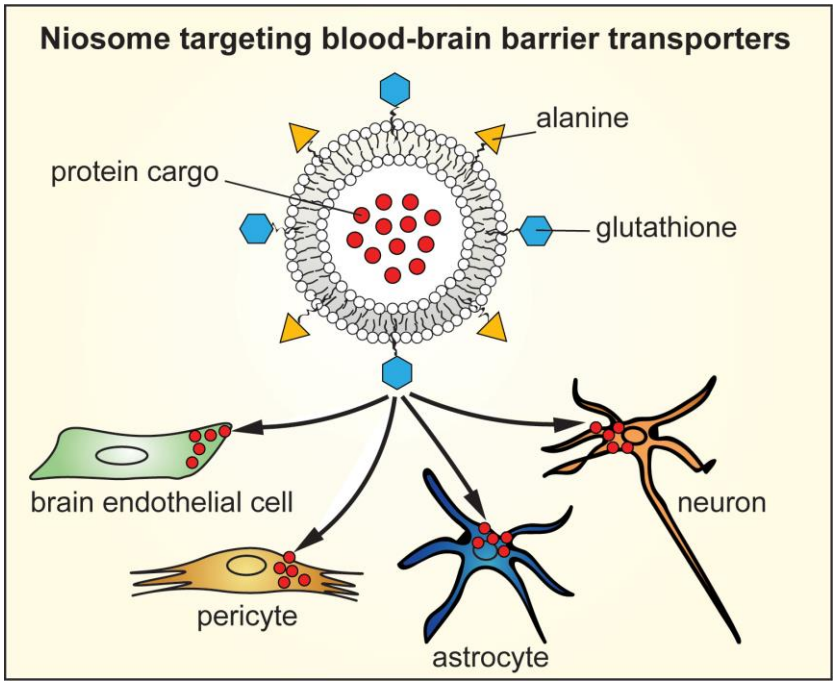
Alanine-glutathione dual-targeted nanoparticles enhance cargo delivery across the blood-brain barrier and into target cell types in the brain

Introduction: The treatment of neurological diseases is hindered by inefficient drug delivery across the blood–brain barrier (BBB). A promising strategy to increase the brain penetration of drugs is to encapsulate them into nanoparticles that target highly expressed transporters at the BBB. Our aim was to design nanoparticles that can both cross the BBB and interact with multiple brain cell types to reach their therapeutic targets.
Methods: Vesicular nanoparticles were prepared with a protein cargo (EBA, 67 kDa or mCherry, 27 kDa) and functionalized with the combination of alanine and glutathione as targeting ligands. Nanoparticles were characterized by their size, surface charge and shape by dynamic light scattering and atomic force microscopy. We monitored the effects of nanoparticles on the viability of cultured brain endothelial cells, pericytes, astrocytes and neurons by a real-time, impedance-based cell analysis. We utilized fluorescent spectrophotometry and confocal microscopy to quantify and visualize cargo taken up by these cell types. To test the mechanism of uptake, inhibitors of cell metabolism and endocytosis were used.
Results: Alanine-glutathione dual-targeted nanoparticles enhanced cargo delivery into all brain cell types tested compared to non-targeted particles. The cellular uptake of nanoparticles was energy-dependent and was partially mediated by endocytosis. Dual-targeted nanovesicles also increased cargo delivery into astrocytes after crossing layers of brain endothelial cells and pericytes in a co-culture model of the BBB.
Conclusion: Our data indicate that alanine-glutathione dual-labeling of nanoparticles can potentially be exploited to deliver drugs, even biopharmacons, across the BBB and into therapeutically relevant cell types in the brain.

Keywords: blood–brain barrier, drug delivery, nanoparticle, brain endothelial cell, pericyte, astrocyte, neuron, alanine, glutathione

Grant support: G.P.: Szeged Scientists Academy under the sponsorship of the Hungarian Ministry of Human Capacities (EMMI:11136-2/2019/FIRFIN); New National Excellence Program (UNKP-20-3-SZTE-482); S.V.: Premium Postdoctoral Research Program (PREMIUM-2019-469)of the HAS

Supervisors:
Prof. Mária Deli scientific advisor, Institute of Biophysics, Biological Research Centre
Dr. Szilvia Veszelka senior research fellow, Institute of Biophysics, Biological Research Centre
Dr. Mária Mészáros assistant research fellow, Institute of Biophysics, Biological Research Centre



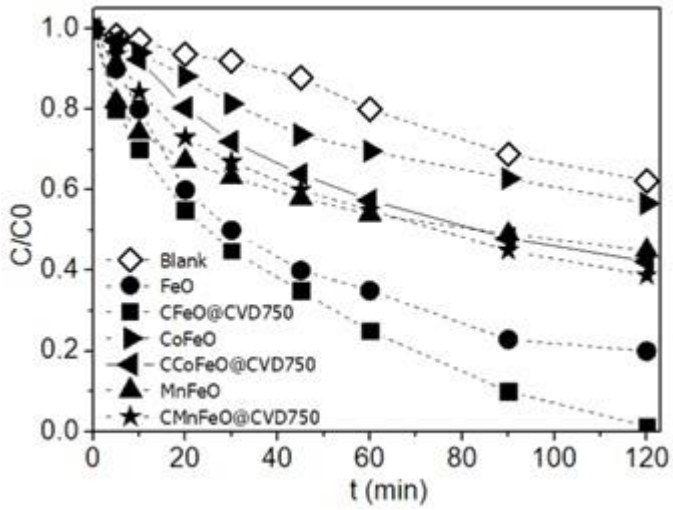
Patrícia Sofia Ferreira Ramalho (MSc student), Faculty of Engineering, University of Porto

Carbon-coated metallic magnetic nanoparticles for the removal of bromate in water

Bromate in water has been associated with a significant risk of cancer, becoming one of the pollutants frequently detected in drinking water and wastewater. The catalytic reduction has been recognized as an effective treatment technique to remove ions by reducing them over metal catalysts in the presence of a reducing agent, usually hydrogen. Therefore, the aim of this study is the synthesis of metallic magnetic nanoparticles coated with carbon (C-MNP) to be applied as a catalyst in the removal of bromate in water. The use of magnetic nanoparticles coated with carbon will enable the catalyst recovery by magnetic separation and also taking advantage of the catalytic properties of the carbon materials.
In this work, the metallic (Fe, Co or Mn) MNP were based on FeO cores coated with carbon by chemical vapour deposition process (CVD) using ethane as carbon source. The catalytic reduction of bromate in water (10 mg L^{-1}) was carried out in a semi-batch reactor in the presence of hydrogen at ambient temperature and atmospheric pressure.
The highest removal was obtained with the CFeO@CVD750 sample, resulting in a 99 % conversion at 120 min of reaction. The iron particles proved to be the most promising catalysts for the conversion of bromate to bromide. At the end of the first cycle, the materials were easily removed from solution, due to their magnetic character, and applied in another 4 cycles without losing their catalytic properties.

Keywords: metallic magnetic materials, chemical vapour deposition, Bromate reduction, recyclable.

Supervisors:
Manuel Fernando Ribeiro Pereira professor, Supervisor
Olívia Salomé Gonçalves Pinto Soares assistant researcher, Co-Supervisor



Yasmin Ranjous (PhD student), Pharmacy, University of Szeged

Investigation of physical properties, toxicity and permeability of functionalized titanate nanotubes as novel vectors for drug delivery

TNTs have distinctive physicochemical properties, such as biocompatibility, high surface area, stable tubular structure and chemical resistivity, which make them a promising technique for drug delivery purposes. However, TNTs cannot permeate intestinal cell layers due to their high hydrophilicity.
TNTs were functionalized by using trichlorooctylsilane (TCOS), trichloroocatdecylsilane (TCOdS) and Mg stearate (MgSt) in order to increase their hydrophobicity. After that, H, C, N, and S contents of the functionalized TNTs were investigated in a vario EL cube elemental analyzer (Elementar, Langenselbold, Germany) and surface free energy was measured with a DataPhysicsOCA20 optical contact angle tester (DataPhysics, Germany). Permeability and cytotoxicity experiments were tested by using Caco-2 cell lines, which were implanted on Transwell® (Corning Costar, USA) filters; Cytotoxicity was tested with the MTT method.
OCA results revealed that using different molecular sizes of the functionalizing reagent (particularly TCOS and TCOdS) did not affect significantly the functionalized TNTs' polarity, which has linear concentration dependency. Maximum hydrophobicity was achieved by using the same amount of the reagent so based on that, the functionalization reagent may be selected on an economical basis. On the other hand, the TNTs' surface characteristics showed a sigmoidal relation to St concentration. The surface characteristics were modified in a better way where more drug molecules can be uploaded to their surface with less amount of St. Therefore, St seemed to be better than silane materials in adjusting the TNTs' surface polarity while the TNT-MgSt preparation method was cheaper, faster, less toxic and easier to be upscaled.

Keywords: Functionalized titanate nanotubes, toxicity, Magnesium stearate, Trichlorooctylsilane, Trichlorooctadycelsilane.

Supervisors:
Sovany Tamas associate professor, University of Szeged, Institute of Pharmaceutical Technology and Regulatory Affairs
Konya Zoltan professor, University of Szeged, Department of Applied and Environmental Chemistry
Géza Regdon jr associate professor, University of Szeged, Institute of Pharmaceutical Technology and Regulatory Affairs

Jean-baptiste Ronat (PhD student), Paris-Saclay University

Development of a stand-alone transportable clinical bacteriology laboratory for low-resource settings by Médecins Sans Frontières: a peculiar PhD project

Antimicrobial resistance (AMR) represents a high burden for healthcare systems all over the world, in particular in low- and middle- income countries (LMICs). Médecins Sans Frontières (MSF) is a humanitarian organization that offers care mainly in LMICs, where many patients are treated for invasive bacterial infections without microbiological documentation and in settings with increasing or unknown AMR prevalence. Clinical bacteriology laboratories (CBL) provide clinically important information to assist clinicians in proper antibiotic treatment and to control the spread of AMR. However, the use of CBLs in LMICs poses numerous problems, including procurement constraints, product stability and availability of qualified personnel. To tackle these problems, MSF proposed, among other strategies, to develop a stand-alone, transportable laboratory adapted to LMICs constraints; the “Mini-Lab”.
The Mini-Lab uses simple and affordable culture-based microbiological techniques focusing on diagnostic of bloodstream infections (BIS) and antibiotic susceptibility testing (AST). The development of the Mini-Lab is based on a framework of six building-blocks identified for implementing CBLs in LMICs, around which market and landscape analyses were conducted. The product choice was done mainly among commercially-available solutions, customized if needed, and then validated in partner laboratories. These solutions were then integrated into a fully-functional laboratory, currently under evaluation in MSF hospitals settings.
In this presentation, we will give first a brief overview on the Mini-Lab development process, then we will focus on describing its components and their specifications, highlighting how these solutions try to respond to the most common limitations encountered in LMICs. In addition, we will present key performance studies conducted in European laboratories to validate Mini-Lab reagents, and preliminary data of the first field evaluation done in MSF Hospital in Haiti.

Keywords: AMR, CBL, MSF, Mini-Lab, LMICs

Supervisor:
Naas Thierry, EA 7361 (UPSud) - Structure, dynamique, fonction et expression de béta-lactamases à large spectre, CHU de Bicêtre, 78 rue du Général Leclerc, 94275 Le Kremlin-Bicêtre, UPSaclay - Faculté Jean Monnet (Droit Economie Gestion)

Fakhara Sabir (PhD student), Faculty of Pharmacy, University of Szeged

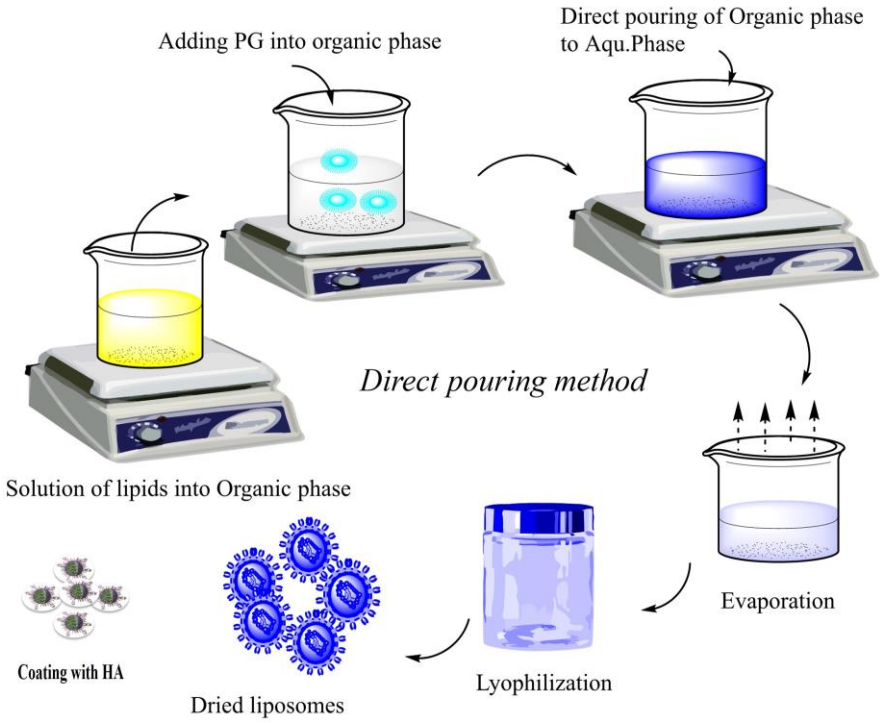
Steps toward the treatment of glioblastoma with coated liposomes: n-propylgallate containing hyaluronic acid stabilized product developed by means of QbD methodology

Nose-to-brain delivery has been proposed as a direct simple and non-invasive approach to target the brain via the circumvention of the blood-brain barrier. This route could be a major breakthrough in the treatment of glioblastoma multiforme. This study aimed to develop hyaluronic acid-coated liposomes with high drug encapsulation, increased permeation and residence time for direct targeted delivery to the brain. The Risk Assessment (RA) strategy was used for the development of optimized liposomes encapsulated with *n*-propyl gallate for nose-to-brain delivery. Physiochemical characterization, *in vitro* release, permeability and accelerated stability studies were performed for the optimized liposomal formulation. The optimized formulation resulted in encapsulation efficiency of 90 ± 3.6 % and average hydrodynamic diameter of 167.9 ± 3.5 nm with PDI 0.129 ± 0.002 and zeta potential of -33.9 ± 5.8 along with coating. Similarly, *in vitro* release study showed 75% and 60% release of drug from uncoated and coated liposomes within 24 hours, *in vitro* permeability study of coated liposomes showed 420 ug/cm^2 within 60 min and accelerated stability studies showed significantly improved properties of the target product. It can be concluded that the implementation of this methodology can promote the development of the rationalized coated liposomal formulation for nose-to-brain delivery.

Keywords: direct pouring method, liposomes, glioblastoma, quality by design, risk assessment

Grant support: This study was supported by the Ministry of Human Capacities, Hungary (Grant 20391-3/2018/FEKUSTRAT) and by the National Research, Development and Innovation Office, Hungary (GINOP 2.3.2-15-2016-00060) projects.

Supervisor:
Ildikó Csóka professor, University of Szeged, Faculty of Pharmacy, Institute of Pharmaceutical Technology and Regulatory Affairs, H-6720 Szeged, Eötvös u. 6, Hungary



Sofia Santos (PhD student), Faculty of Engineering from University of Porto, University of Porto

Application of catalytic reduction process for inorganic species removal formed during ozonation of organic contaminants

Organic and inorganic pollutants can cause serious damage to human health being essential the development of techniques that allow their removal.
Ozone is widely used oxidant applied in water treatment for organic contaminants degradation. The low capacity for organic matter mineralization results in the accumulation of organic and inorganic by-products which are not likely to be eliminated through oxidative processes requiring the implementation of other techniques [1,2].
Nitrate presence in water have raised several concerns. Catalytic reduction is a promising alternative for nitrate removal consisting in the reduction of nitrate to nitrogen, over bimetallic catalysts, in the presence of a reducing agent. The formation of nitrite as intermediate and ammonium as by-product are the process limitations [3,4].
The objective of this work is to develop an integrated process that allows simultaneous elimination of organic and inorganic compounds in waters. Degradation of 4-Nitrobenzaldehyde (model pollutant) was performed through ozonation; the final solution of ozone treatment was forwarded for catalytic reduction process in order to promote the elimination of nitrate formed during the previous oxidation treatment.
Obtained results for the integrated treatment (in batch) show that nitrate reduction efficiency depends on the amount of organic matter present in solution after 4-NBA ozonation (Figure 1). 1%Pd-1%Cu/CNT catalyst was considered for nitrate catalytic reduction experiments and the results show an evident deactivation of the catalyst for the experiments with higher organic matter concentration. The efficiency of the integrated process is dependent on the amount of organic matter in solution being important the optimization of the mechanism.

Keywords: Ozonation, Catalytic reduction, Integrated treatment, Bimetallic catalysts

Supervisors:
Olívia Salomé Gonçalves Pinto Soares research fellow, Supervisor
Manuel Fernando Ribeiro Pereira professor, Co-supervisor
Carla Alexandra Orge research fellow, Co-supervisor

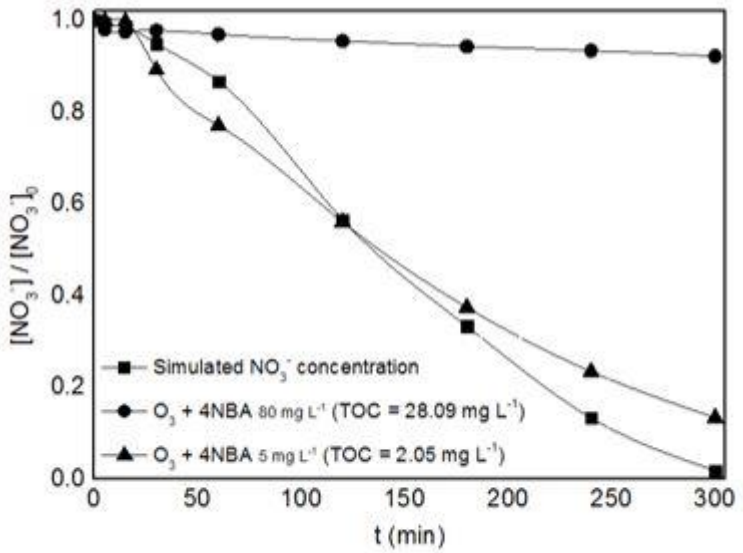


Figure 1 - Nitrate removal over 1%Pd-1%Cu/CNT catalyst.

Shantanu Sharma (PhD student), Faculty of Medicine, Lund University

Early Life Factors in Relation to adult skin autofluorescence of Advanced Glycation End (AGE) products in a Swedish Cohort

Introduction: Skin autofluorescence (SF), a non-invasive technique to measure Advanced Glycation End (AGE) products, is elevated in patients with diabetes and associated with its complications. We aimed at assessing the association of birth weight (BW), birth length (BL), and small for gestational age (SGA) with adult SF-AGE in a Swedish cohort.
Methods: We examined data of 1192 young individuals born in Sweden in 1973 or later, who had information obtained in Malmö Offspring Study (started in 2013). The birth details of these individuals were obtained from the national Swedish Medical Birth Register. Birth variables (BW, BL) were log-transformed, and SF-AGE was dichotomized into tertiles. Regression analysis was done to calculate the association of early life factors and SF-AGE tertiles. The strength and precision of the association were measured as odds ratio (OR) and 95% confidence interval (CI). SGA was defined as – 2Standard Deviation (SD) of BW for gestational age.
Results: There were 623 (52%) women and 569 (48%) men. The mean age of the participants was 28.7 (SD: 6.8) years. BL was negatively associated with the highest SF-AGE tertile, OR 0.03 (95%CI: 0.002-0.53; p=0.01). The association of BL with SF-AGE was consistent even after adjustment for age and gender. Adults born SGA had two times the odds of belonging to the highest SF-AGE than those born normal for gestational age, OR 2.3 (95%CI: 1.1-4.9; p=0.03).
Conclusions: Early life factors' associations with elevated SF-AGE indicate the future risk of diabetes and its complications in subjects born short or small for gestational age.

Keywords: Pregnancy, Fetal Growth Retardation, Cohort Studies, Diabetes Mellitus

Supervisor:
Peter M Nilsson professor, Lund University

Hala Shalhoub (PhD student), Paris-Saclay University

Gut microbiota-derived products as sensitizers to anticancer drugs against hepatocellular carcinoma

Hepatocellular carcinoma (HCC) is the most common primary liver malignancy that is characterized by poor prognosis. The resistance of HCC to conventional treatments called for the need to a new therapeutic agents and strategies to treat HCC patients. Recent studies showed that environmental factors such as diet plays role in anticancer efficacy through modulating the gut microbiome composition. Through their secreted products, microbiome could either induce anticancer drug resistance or synergize with the drug to induce tumor death. Autophagy was shown to play a duel role in cancer depending on the developmental stage of cancer, the cancer type and cancer microenvironment. Depending on its classification whether a tumor suppressor or a pro-tumor, autophagy was considered as a therapeutic target in cancer treatment. Many studies showed that the simultaneous induction and blocking of autophagy at late stages induces cancer cell death. In our study, we used a combination between the microbial derived product butyrate (Bu) and the lysosomotropic agent chloroquine (CQ) to induce hepatocellular carcinoma cell death. Butyrate is a four carbon small chain fatty acid (SCFA) produced in the large intestine lumen with a histone deacetylase inhibitor activity. Butyrate was shown to induce autophagy in several types of cells. Chloroquine is an autophagy blocker and an FDA approved and well tolerated by human anti-malarial drug. Chloroquine and its derivatives were used in many clinical and pre-clinical studies alone or as an enhancer for radiotherapy and chemotherapy or in combination with anti-tumor molecules in cancer treatment. The combination Bu/CQ was shown to induce cell death in six liver cancer cell line including 4 hepatocellular carcinomas and 2 cholangiocarcinoma with no effect on human primary hepatocytes. In vitro studies using Huh-7 cells showed that the combination Bu/CQ is inducing apoptotic cell death represented by increase in caspase 3 cleavage and PARP cleavage. Cell death was shown to be associated with autophagosomes accumulation, ROS levels increase and lysosomes alteration represented by lysosome membrane permeabilization and cathepsin D release into the cytosol. As a conclusion, gut microbiome can be modulated through diets to enhance cancer drugs efficacy.

Supervisor:
Jamila Faivre, U1193 INSERM UPSaclay - Faculté de medecine

Viacheslav Shcherbakov[1], Sergey A. Denisov[1], Khashayar Ghandi[2], Mehran Mostafavi[1]

[1]Institute de Chimie Physique (ICP), CNRS/Université Paris-Saclay, 91405 Orsay, France

[2]Department of Chemistry, University of Guelph, 50 Stone Road East, Guelph ON, N1G 2W1

The role of gold nanoparticles catalytic activity in the explanation of the radiosensitizing effect

The radiosensitizing effect of gold nanoparticles (AuNPs) has been demonstrated in many in vivo and in vitro studies.[1] The main explanation of such phenomena was dose enhancement due to higher energy absorption per unit of mass by gold compared to water or soft tissue. But this is valid only for keV energy and requires a relatively high concentration of gold. Eventually, after the accumulation of a significant amount of data, it became clear that simple dose enhancement cannot explain experimental results.

There is much evidence that AuNPs increase reactive oxygen species (ROS) production,[2] but there is no clear explanation of how AuNPs can produce ROS. Moreover, ROS are always measured indirectly, usually using fluorescent dyes, but gold nanoparticles catalytic activity has never been considered in the chemical reactions occurring in the transformation of initial sacrificial molecule to a detectable fluorescent product.

In our work we studied catalytic activity of 20 nm AuNPs in the oxidation of organic radical produced by reaction of acetanilide with ●OH radical under gamma radiation. We found that the presence of AuNPs decreases the number of products and increases their formation yields, while consumption of acetanilide stays the same. We also studied the oxidation of dihydroethidium, a fluorescent dye commonly used to detect superoxide radical (O2•-). We found that in the presence of AuNPs dihydroethidium is oxidized by oxygen to ethidium only, which is not a specific product reaction with O2•-.

Our results show that the reported in the literature statement on higher ROS production in the presence of AuNPs is erroneous. An increase in the production of certain oxidation products due to gold catalytic activity was misinterpreted as the overproduction of ROS. Based on these results we propose a new insight of AuNPs role in radiosensitization.

[1] S. Her, D. A. Jaffray, C. Allen, Adv. Drug Deliv. Rev. 2017, 109, 84.

[2] D. Howard, S. Sebastian, Q. V. C. Le, B. Thierry, I. Kempson, Int. J. Mol. Sci. 2020, 21.

Supervisor:

Mostafavi Mehran, Institut de Chimie Physique, UPSaclay - Faculté Pharmacie

Nádia Silva (MSc student), Faculty of Sciences, University of Porto

α-MSH reestablishes homeodynamics of obese adipose tissue by modulating cellular stress responses.

In obesity, improper remodeling of AT disrupts metabolic and redox dynamics; whereupon stress responses and cellular repair mechanisms become severely compromised.
The melanocortin system has been recognized to have several modulatory effects on energy metabolism in the AT. Indeed, a previous study by our group demonstrated that peripheral administration of the melanocortin alpha-melanocyte stimulating hormone (α-MSH) in obese mice induced the loss of body weight and fat mass, while improving the glycaemic and lipid profile. Hence, the present work attempts to comprehend if the overall metabolic improvement observed can be in part related with the modulation of stress-signalling pathways and autophagy mechanisms.
To do so, diet-induced obese C57BL/6 mice were intraperitoneally injected with α-MSH (150μg/kg/day) or saline solution (control group) for 2 weeks. Then, inguinal White AT (ingWAT) was collected and analyzed for ER-stress, oxidative stress, autophagy, and biomolecule damage biomarkers; though qPCR and Western-blotting techniques. Lipid peroxidation and protein carbonylation were accessed using TBARS method and oxyblot, respectively.
The present study shows that α-MSH attenuates both PERK and IRE1α pathway in ingWAT of obese mice. Furthermore, α-MSH diminishes the expression of antioxidant enzyme SOD2 and the phosphorylation of NF-κB transcription factor. Expression of autophagy-related genes *(LAMP2, LIPA* and *LpL)* and proteins (LAMP1, ATG16L1β) were also attenuated. Remarkably, modulatory effects of α-MSH in obese ingWAT are reflected by the significant reduction of oxidized lipids and proteins.
Thus, a novel therapeutic role for α-MSH is highlighted in this study, attending its positive effect against obesity-induced impairment of cellular homeodynamics in ingWAT.

Keywords: Obesity, adipose tissue, melanocortins, cellular homeodynamics, ER stress, autophagy, oxidative stress

Grant support: FCT/MEC (PIDDAC) and FEDER–Fundo Europeu de Desenvolvimento Regional, COMPETE 2020–Programa Operacional Competitividade e Internacionalização (PTDC/BIM-MET/2123/2014); Adriana Rodrigues is supported by FCT (SFRH/BPD/92868/2013 and DL57/2016/CP1355/CT009).

Supervisors:
Adriana Raquel Rodrigues Junior Researcher
Alexandra Maria Gouveia Assistant Professor, Department of Biomedicine, Unit of Experimental Biology, Faculty of Medicine (FMUP); Ageing & Stress Group, I3S - Institute for Molecular and Cell Biology (IBMC); Faculty of Nutrition and Food Sciences, University of Porto.

Daniel Silva (PhD student), Faculty of Psychology and Educational Sciences of the University of Porto, University of Porto

Work and health in road transport sector: how to address professional drivers' health issues in the design of the future automated vehicles?

The work activity in road transport is depicted as one of the less favourable in terms of working conditions, disseminated by just-in-time delivery methods, tight driving schedules and insufficient rest, which leads to a context of work intensification in the sector. These conditions have exposed professional drivers to a range of work-related risks, impairing both their physical and mental health. At the same time, the nature of work in the sector is being reconfigured by automation. In fact, a new European paradigm called the "Mobility of the Future" has emerged, in which automated vehicles (AV) could offer opportunities for safer, more productive, and sustainable transport. How to guarantee the working conditions and their health hazards are considered in the design of AVs? Which intensified work demands should be addressed by the new automated driving solutions? Our research is addressing these questions. A quantitative analysis through INSAT (Work and Health Survey) with a sample of 336 Portuguese drivers was conducted. The results showed that workers experienced significant health problems: headache, back pain, musculoskeletal disorders, anxiety, and fatigue. Certain working conditions were associated with these health complaints by drivers: extended schedules; or dealing with tension situations with passengers and other road users. Debating these work-related health issues in the public arena is crucial when transport is crossing a "period of transition". Could automated driving be a "silver bullet"? Or will it give rise to new sources of work intensification and to new costs for workers' health?

Keywords: work activity, health, automated driving

Grant support: This work was supported by the FCT - Portuguese Foundation for Science and Technology under Grant SFRH/BD/139135/2018; and by the Centre for Psychology at University of Porto under Grant FCT UIDB/00050/2020.

Supervisor:
Liliana Cunha professor, Faculty of Psychology and Educational Sciences of the University of Porto; and Centre for Psychology at University of Porto.

Duarte Silva (BSc student), Faculty of Engineering, University of Porto
Sérgio Oliveira (BSc student), Faculty of Engineering, University of Porto

Predicting outdoor thermal comfort/discomfort to prevent environmental illnesses.

Background: Extreme temperatures and weather events are increasingly common, emerging as a critical public health issue. The difficulty in assessing outdoor thermal conditions is that the climatic variables are more diverse than in indoor settings. SET*, PMV and PET are the most broadly used indices for outdoor assessments. In the present study, is reviewed the enforcement of these indices to different types of outdoor conditions.
Methods: The microclimatic station measured environmental parameters of two urban spaces in a city. Each place was assessed over solar load and shadow. For all participants **(n=40)** were assessed individuals (height, weight, age, gender) and behavioral characteristics (physical activity, clothing insulation and sun/shade location). PMV, PET, SET* indices were calculated and related to subjective responses, regarding thermal sensation (Ava), thermal perception (Per) and preference (Pre).
Results: It was expected that indices based on body thermal equation (i.e.SET and PET) were the most accurate, but the best performance was found between PMV and PET **0.86 (p-value>0.001)**. The highest correlation coefficients **0.68 (p-value>0.01)** were observed between PET and Per and PMV and Ava, what means that PMV and PET are the best to predict outdoor thermal sensation. The results also reveal the need to improve the information of the entrance parameters, the prediction in solar load (…) and windy environments (…).
Conclusions: Acclimatization, continuous exposure and heterogeneity of the environment should be assessed to improve the predicting capability of indices. Further research about the outdoor thermal assessment is required to plan and prevent morbidity and mortality among the population adequately.

Keywords: Microclimatic Station, PMV, SET, PET, health issues, outdoor settings , indoor settings, acclimatization, thermal assessment, thermal comfort, environmental illnesses.*

Supervisor:
Joana Cristina Cardoso Guedes associate professor, Faculty of Engineering of Porto University

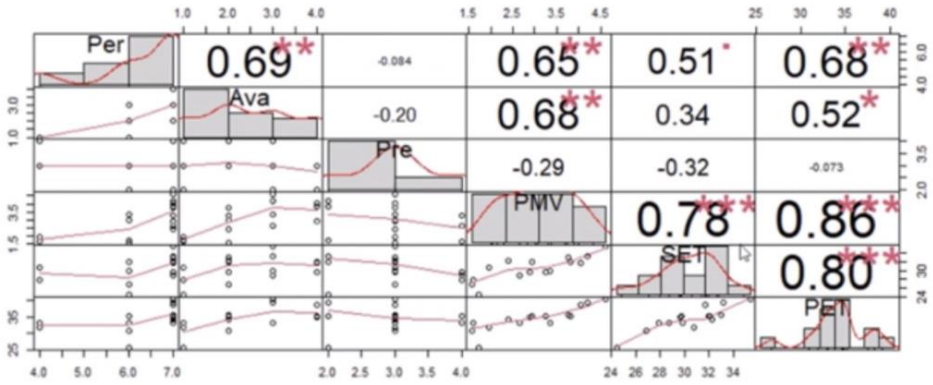


*Figura 1- Significance level is associated to a symbol : p-values(0, 0.001, 0.01, 0.05, 0.1, 1) <=> symbols("***", "**", "*", ".", " ")*

Ricardo Soares (BSc student), Faculdade de Ciências, University of Porto

Effects of high Zn concentrations on Solanum lycopersicum L.'s nitrogen and GSH metabolism

The element zinc, an essential micronutrient, can be toxic to plants at high levels. The aim of this study was to evaluate the response of tomato plants to high levels of zinc at various concentrations and exposure periods, focusing on nitrogen assimilation, reduced glutathione (GSH) production and regeneration. Data was collected on glutamine synthetase (GS) encoding genes mRNA's accumulation and nitrate reductase (NR), glutathione reductase (GR), guaiacol peroxidase (POD) and γ-glutamyl-cysteine synthetase (γ-ECS) activities. An increase in NR's activity in roots accompanied with a decrease in shoots, suggests a strong uptake and assimilation of inorganic nitrogen. In roots, Zn shifted the mode of GSH production by the plant from de novo synthesis to its recycling, as γ-ECS' activity diminished, while GR's increased with the different GS isoenzymes having various behaviors depending on the treatment. In shoots, regarding GSH, its de novo synthesis was not affected by the Zn concentrations supplied, however, its recycling was induced by the shock treatment with Zn and H2O2 oxidative stress was intensified by Zn levels in shoots due to a compromised POD activity.

Keywords: Zinc, nitrogen metabolism, reduced glutathione

Supervisor:
Armando Jorge Gomes Teixeira associate professor, GreenUPorto - Plant Stress Lab, Departamento de Biologia da Faculdade de Ciências da Universidade do Porto

Marta Sousa (MSc student), Faculty of Sciences, University of Porto

Metabarcoding vs Microscope Approaches to Study Arctic Eukaryotic Microbiome

Climate change is affecting the Arctic Ocean through the decrease of the sea ice extent and thickness. As sea ice gets thinner and with the replacement of multi-year ice (MYI) with first-year ice (FYI), the dynamics of phytoplankton and primary productivity has been changing. In our ongoing research we proceed with a comprehensive comparison between the 18S metabarcoding approach, using next generation sequencing techniques (NGS), and the classic microscope cell identification. Our aim, is to study the biogeographic patterns of Arctic phytoplankton diversity and distribution along two oceanographic transects in the Marginal Ice Zone (MIZ) around Svalbard. Microbial phytoplankton samples were concentrated on board through filtration, during an Arctic oceanographic campaign, led by Norwegian Polar Institute (NPI), and sent to CIIMAR (Portugal, Porto) for following environmental DNA extraction and metabarcoding analysis. Microscope phytoplankton counts and identification were performed on board in fresh samples, then preserved samples were also later analysed at IO PAN labs (Sopot, Poland). Results revealed that the Eukaryotic data set comprises highly complex and diverse protists community structure, with a marked biogeographic pattern of the protists communities along the Svalbard Marginal Ice Zone with strong links identified between protists communities distribution and environmental gradients along the transects. This research is relevant to fill critical gaps concerning the evaluation of the response of the changing eukaryotic microbiome in response to climate change impacts.

Keywords: Climate Change; Protists biogeography; Arctic; 18S Metabarcoding; Microscopy;

Grant support: Portuguese Polar Program (PROPOLAR); Norwegian Polar Institute (MOSJ monitoring program; The Portuguese Science and Technology Foundation (FCT) funded this study through NITROLIMIT project (PTDC/CTA AMB/ 30997 2017)

Supervisors:
CATARINA MARIA PINTO MORA PINTO DE MAGALHÃES senior research fellow, Researcher of CIIMAR, invited assistant professor at University of Porto and member of the coordination committee of Portuguese Polar Program.
MARIA PAOLA TOMASINO senior research fellow, Researcher of CIIMAR

Réka Eszter Szabó (ME student), Faculty of Pharmacy, University of Szeged

Isolation of antibacterial phenolic compounds from Camelina microcarpa

Introduction: Antibiotic resistance is one of the biggest public health challenges of our time. Therefore, it is important to find new drugs that can be used in the battle against harmful microbes. Research on natural compounds contributes to these discoveries. Brassicaceae species are indigenous for the temperate climate. The phytochemical and pharmacological investigation of plants belonging to Brassicaceae started in 2015 at the Department of Pharmacognosy, University of Szeged. That time antibacterial effects of 13 plant species were investigated. In case of *Camelina microcarpa* Andrz. (littlepod false flax), chloroform and *n*-hexane extracts showed significant antibacterial effect against eight bacteria. Before our work, only two glucosinolates were identified from seeds of *C. microcarpa*. Aim of our study was the phytochemical investigation of aerial parts of this plant to find antibacterial compounds.
Methods: The concentrated methanol extract of dried plant material was subjected to solvent-solvent partition with chloroform. The chloroform-soluble phase was fractionated on polyamide column. Fraction eluted using 40% methanol was subjected to vacuum column chromatography on silica gel. Subfractions were purified with HPLC and preparative layer chromatography to yield two pure compounds. The structure elucidation was carried out by means of MS and NMR spectroscopy, and polarimetry.
Results: As a result of the first phytochemical investigations on aerial parts of *C. microcarpa*, syringaresinol and vanillin were obtained. These compounds had not been identified from the plant before. The antibacterial effect of compounds was tested on eight bacteria, and they expressed moderate effect compared to antibacterial drug used in clinical practice.

Keywords: Camelina microcarpa, chromatography, HPLC, NMR, syringaresinol, vanillin, antibacterial compounds

Supervisors:
Dóra Rédei PhD assistant professor
Boglárka Csupor-Löffler PhD expert, PharMagist Bt.

Csilla Szebenyi (PhD student), Faculty of Science and Informatics, University of Szeged

Investigate the relevance of cotH genes in the pathogenicity of Mucor circinelloides

The fact, that CotH3 of *Rhizopus* mediates fungal invasion of host cells during mucormycosis have pointed out the importance of the CotH protein family in connection with the virulence. Thus, our research is mainly focused on the extensive analysis of the gene family and the clarification of their role in the virulence of *Mucor*. We attempted to perform the functional analysis of the CotH proteins, which involved tracking the phenotypic alterations of genetically stable *cotH* mutants.
Five putative spore-coat genes (i.e. *cotH1-6)* were disrupted in *M. circinelloides* by an *in vitro* plasmid-free CRISPR/Cas9 method. To identify on- and off-target mutation in an edited fungus, whole-genome sequencing was also performed. Lack of the appropriate transcripts was proven by qRT-PCR. Growth ability of the mutants under different conditions (anaerobic environment, cell wall stressors, hydrogen peroxide) were examined. Spore surface morphology was imaged with scanning electron microscopy and the inner spore structure was investigated by transmission electron microscopy. The phagocytic assay was performed with the standard macrophage-like cell line J774.16. Pathogenicity of the mutants was examined in *Drosophila melanogaster, Galleria mellonella* and a murine model of mucormycosis.
Cell wall stressors affected differently the *cotH* mutants. The *cotH3* and *cotH4* mutant strains exhibited reduced virulence in murine model, while the *cotH4* and *cotH5* mutants showed reduced virulence in *D. melanogaster* model. Deletion of some of the *cotH* genes resulted in variances in the structure of the inner spore coat, differences in spore size distribution, fungal growth and sporulation.

Keywords: CRISPR, CotH protein family, pathogenicity, Mucor

Grant support: This study was supported by the "Lendület" Grant of the Hungarian Academy of Sciences (LP2016-8/2016), the NKFI project K131796.

Supervisors:
Prof. Dr. Tamás Papp associate professor, MTA-SZTE "Lendület" Fungal Pathogenicity Mechanisms Research Group, Közép fasor 52., H-6726 S, University of Szeged, Faculty of Science and Informatics, Department of Microbiology, Közép fasor 52., H-6726 Szeged, Hungaryzeged, Hungary
Dr. Gábor Nagy assistant research fellow, MTA-SZTE "Lendület" Fungal Pathogenicity Mechanisms Research Group, Közép fasor 52., H-6726 S, University of Szeged, Faculty of Science and Informatics, Department of Microbiology, Közép fasor 52., H-6726 Szeged, Hungaryzeged, Hungary

Cristina Teixeira (PhD student), Faculty of Engineer, University of Porto

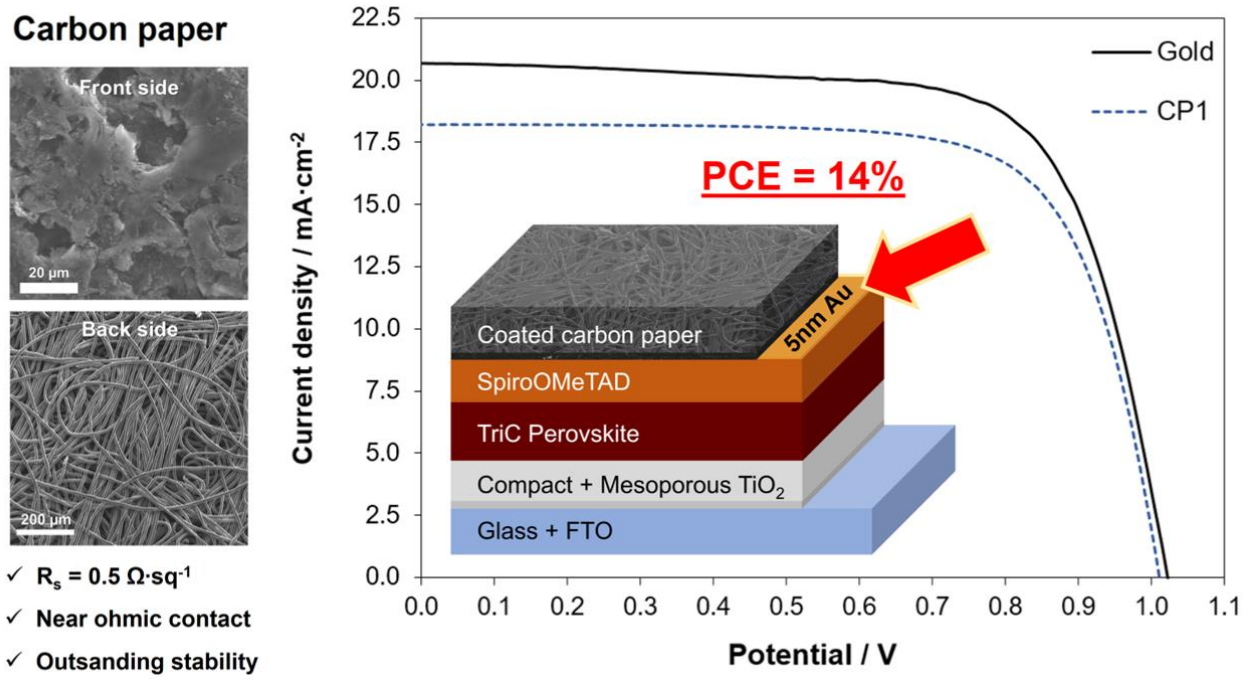
Easy processing carbon paper electrode for highly efficient perovskite solar cells

Achieving high-efficient, cost effective, easy processing and versatile solar cells has always been a challenge for the scientific community. Perovskite solar cells (PSC) are a very attractive candidate to fulfill all these requirements and is marching ahead in the emerging photovoltaic power conversion efficiency race. However, there are still limitations hindering its commercialization, as the expensive and highly thermally unstable back-contact made of gold. Carbon-based materials have already proved to be an excellent candidate to be used as back-contact. In this work, the gold back-contact was replaced by a carbon paper (CP). To the best of the authors' knowledge, this material was never used as back-contact in a PSC.
A thorough study was done into 3 different CPs for identifying the ideal features for their application as back-contact in a PSC. By simply pressing the CP against the device's hole extraction layer, a maximum power conversion efficiency (PCE) of 12.9% was achieved, which corresponds to 89% of the PCE obtained with the typical gold back-contact. Besides having a much simpler and cheaper application method, the proximity between the CP and noble metal electrical resistivity, together with CP's malleability, high mechanical resistivity, great chemical stability and low cost make this material an excellent option for flexible and large-scale photovoltaic applications. Furthermore, a PCE and relative PCE was further improved to 13.9% and 91% through this interfacial contact optimization – depositing a thin gold layer. We deduced that a PCE over 19% would be conceivable if standard cells reach a PCE of 20%.

Keywords: perovskite solar cells, back-contact

Grant support: FCT (SFRH/BD/148194/2019; IF/01331/2015). ERDF (NORTE-01-0145-FEDER-028966; POCI-01-0247-FEDER-017796; POCI-01-0145-FEDER-006939 (LEPABE - UID/EQU/00511/2013); NORTE-01-0145-FEDER-000005 – LEPABE-2-ECO-INNOVATION).

Supervisors:
Luísa Andrade professor, LEPABE - Laboratory for Process Engineering, Environment, Biotechnology and Energy
Adélio Mendes professor, LEPABE - Laboratory for Process Engineering, Environment, Biotechnology and Energy



André Torres-Pinto (PhD student), Faculty of Engineering, University of Porto

Graphitic carbon nitride: a promising solution for water treatment

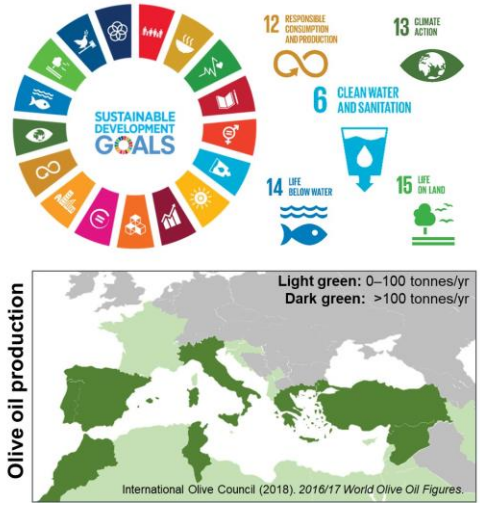
The global water crisis is hindering healthy human endurance and societal development. Water treatment is crucial for a sustainable balance between society and the environment. The industry must treat its wastewaters adequately as they are particularly rich in potentially hazardous compounds. The United Nations recognised the crisis and led to the establishment of the Sustainable Development Goals (SDGs) in 2015. A significant cause of water pollution is the inadequate release of organic contaminants to the environment. In particular, olive mill wastewaters (OMWW) are considered as hazard to environmental sustainability in the Mediterranean region.

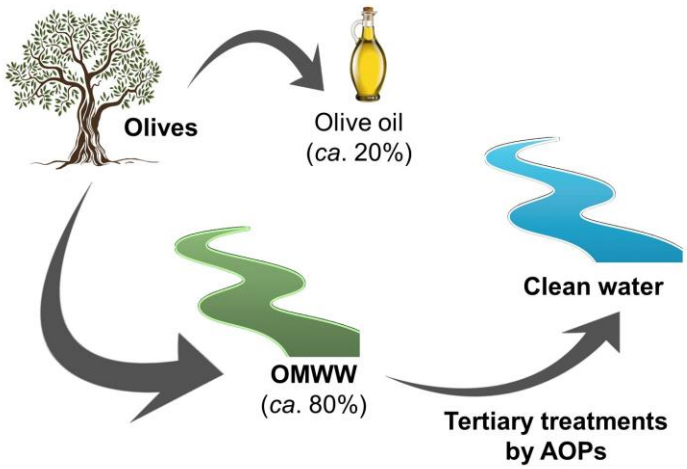
Advanced oxidation processes (AOPs) represent an efficient, low cost and safe solution for the removal of recalcitrant compounds present in OMWW. In particular, heterogeneous photocatalysis with graphitic carbon nitride (GCN) activated by visible light using LEDs has been proven to be efficient in the degradation of several organic pollutants. In this study, we investigated the use of GCN, prepared by a thermal treatment method, in the photocatalytic degradation of phenolic compounds often present in OMWW. We explored the simultaneous *in situ* evolution of hydrogen peroxide (H_2O_2) as a mean to enhance pollutant degradation. Moreover, the improvement of the mineralisation process was sought with the addition of iron to mimic photo-Fenton-like conditions. An impact superior than 20% in mineralisation was observed with relatively low dosages of iron ions (according to Portugal's legislation) and under natural pH, which could enable a greater ease on the discharge of treated liquid effluents.

Keywords: Olive mill wastewaters, carbon nitride, photocatalysis, contaminants, water treatment, pollutant degradation, photo-Fenton

Grant support: Projects SFRH/BD/143487/2019 (funded by FCT/MCTES), NORTE-01-0145-FEDER-031049 (funded through FCT/MCTES and by FEDER through NORTE2020) and Base Funding UIDB/50020/2020 of the Associate Laboratory LSRE-LCM (funded through FCT/MCTES).

Supervisors:
Adrián Manuel Tavares da Silva Assistant Professor
Cláudia Sofia Castro Gomes da Silva Assistant Researcher, LSRE-LCM, University of Porto
Joaquim Luís Bernardes Martins de Faria associate professor, LSRE-LCM, University of Porto





Réka Tóth (PhD student), Faculty of Medicine, University of Szeged

Cerebral edema induces simultaneous depolarization in response to anoxia

Spreading depolarizations (SD) associated with cerebral ischemia cause cytotoxic edema and promote lesion progression. We observed a yet unidentified type of depolarization, involving a sizeable cortical volume simultaneously (simultaneous depolarization, SiD) in a rodent model of cerebral ischemia/anoxia. We have proposed that SiD is a result of neuronal hyperexcitability linked to the pathological swelling of astrocytes.
To confirm our hypothesis, 350 µm thick cortical brains slices were obtained from Wistar rats (n=10), and incubated in artificial cerebrospinal fluid (aCSF). Tissue edema was produced in some slices by the superfusion of a hypoosmotic medium (HM). SiD was triggered with transient anoxia. Depolarization-related changes in tissue white light reflectance were captured with a CCD camera, or local field potential was acquired with a glass capillary microelectrode. Astrocyte swelling was verified with Golgi-Cox staining and electron microscopy. Na-K-Cl-cotransporters were blocked by Bumetanide (1 mM), and aquaporin-4 by TGN-020 (100 µM).
An SD occurred in response to HM introduction (propagation velocity: 3.06±0.61 mm/min), followed by permanent swelling of cortical astrocytes. A subsequent SiD emerged in response to anoxia in HM but not is aCSF, and incorporated the tissue previously involved in SD propagation. Administration of Bumetanid+TGN-020 decreased the duration of SDs (Bumetanide+TGN-020 vs. control 77.37±36.41 vs.131.63±41.14 s) and blocked the onset of SiD.
Our results draw attention to the significance of the astrocyte buffer system in the prevention of lesion growth related to SDs. We suggest that pharmacological inhibition of cytotoxic edema is central to the prevention of lesion progression in cerebrovascular diseases.

Keywords: spreading depolarization, cytotoxic edema, astrocyte

Grant support: PD128821, GINOP-2.3.2-15-2016-00048, EFOP-3.6.1-16-2016-00008, SZTA (EMMI, TSZ:34232-3/2016/INTFIN), UNKP-18-2-I-SZTE-120

Supervisors:
Dr. Eszter Farkas associate professor, University of Szeged, Faculty of Medicine, Institute of Medical Physics and Informatics
Dr. Ákos Menyhárt research fellow, University of Szeged, Faculty of Medicine, Institute of Medical Physics and Informatics

Tayfun Tümtürk (PhD student), Doctoral School of Law and Political Sciences, University of Szeged

COVID-19, digital freedoms and transparency

Introduction: The SARS COV-2 virus has contaminated several million people around the world. To fight this pandemic, most of the states in the world have adopted extraordinary measures, including containment for their populations, and tracing the chains of contamination measures. The latter has been assisted by mobile phone applications too. However, these contact tracing applications sometimes tend to menace the privacy of data subjects.

In this research, some above-mentioned mobile applications are analyzed to provide a summary of the challenges and recommendations.

Method: We collected the information about the applications from their websites and when it is needed, we contacted with the developers too.

To find out whether they are privacy-friendly, we examined:

1. On which protocol they are built
2. What technology they use (Bluetooth or GPS) to detect the users who have been exposed to COVID-19
3. Which data storage model they adopted (Centralized, decentralized or hybrid)

And to come to a conclusion about the effectivity of the apps, we examined also the percentage of number of downloads in the population.

Results and Conclusion

The results of our research reveal that the persisting challenges with some contact tracing apps are:

1. Lack of an impact assessment required by the GDPR art. 35
2.
3. Adoption of the GPS technology
4. Interoperability problems within the EU countries such as lack of different language options

In conclusion, for an effective and privacy-friendly contact tracing the above-mentioned challenges should be resolved.

Keywords: SARS COV-2, COVID-19, contact tracing, mobile application, privacy, freedom, digital, transparency

Supervisor:
Julien ROSSI senior lecturer, supervisor

Máté Vadovics (PhD student), Faculty of Science and Informatics, University of Szeged
Balázs Szücs (BSc student), Faculty of Science and Informatics, University of Szeged

Investigation of the effects of oral candidiasis on the progression of oral squamous cell carcinoma

Oral squamous cell carcinoma (OSCC) is a serious health issue worldwide. In 2018, more than 350 000 new oral cancer cases were registered and approx. 170 000 deaths could be attributed to lip, oral cavity associated malformations (WHO, International Agency of Research for Cancer). OSCC treatment is problematic and highly associated with oral candidiasis. Oral candidiasis in tumor carrier patients is usually considered to be the consequence of the tumor therapy.
Our aim was to investigate how fungal infections may influence tumor development and progression.
To investigate the effects of *Candida* cells on the progression of OSCC we used two cell lines. For our experiments we used heat-killed and live *Candida albicans* (SC5314) and *Candida parapsilosis* (CLIB214) in *in vitro* and *in vivo* experimental model systems.
Our results indicated that live *Candida albicans* stimulus significantly induces the total matrix metalloproteinase activity (one of the most characteristic features of tumor invasiveness) after 24 hours treatment relative to the untreated control. Metabolomic analysis results revealed that the presence of *C. albicans* significantly increased the production of two previously confirmed oncometabolites: aspartic acid and succinic acid. Furthermore, transcriptomic data analysis results also revealed alterations in pro-tumor progression pathways as well as in the expression of OSCC invasion marker genes. In order to examine the metastasis promoting effect of *Candida* cells on OSCC *in vivo*, we established a novel murine tumor model. Over-expression of p63 (OSCC poor prognostic marker) was detected in fungi-invaded OSCC tissues compared to the untreated control (OSCC alone).

Keywords: Candida, oral squamous cell carcinoma

Supervisor:
Attila Gácser professor, University of Szeged, Faculty of Science and Informatics, Department of Microbiology

Ildikó Varga, Faculty of Health Science and Social Studies, Department of Physiotherapy, University of Szeged

Effect of different music styles on heart rate during and after running

Introduction: Several previous studies have shown that music has the ability to change the physiological parameters of somatic functions. Our aim was to investigate the effect of different styles of music on heart rate values during running, and pulse regeneration after the run in the recovery phase.
Methods: The subjects had to run 5 km, in their own speed in total of six times. During the six running occasions and after the runs in the recovery phase, 3 different music styles (pop, hard rock, classical music) were applied to test the heart rate of the participants. Therefore, the participants had to perform the 5 km running twice with each style. Additionally, a running and a recovery phase without music was applied as a control test. The music was selected based on a set number of beats per minute: 110-140 BPM for pop, 120-160 BPM for hard rock and 100-120 BPM for classical music style. Changes in heart rate during the runs were recorded by a sensor on the chest strap (Polar H7), which was saved on the smartphone by the Polar Beat app. After the runs, blood pressure and pulse regeneration were measured by a blood pressure monitor (Omron M2) in every 3 minutes for a total of three times.
Results: There was no significant difference between the average heart rate values in different style of music during the runs. During running, the average of the highest heart rate values were detected (187,5±9,0) with pop music and the average of the lowest heart rate values were detected with classical music (179,77±7,1). As for the pulse regeneration in the recovery phase, the greatest decrease (close to 22 %) was detected when the subject listened to classical music and no music (control test). In case of listening to pop music in the recovery phase, the pulse regeneration was the less meaningful, the average number of beats was significantly lower than in case of listening the other music styles ($p<0,001$).
Conclusion: Our results raises the possibility that listening to music during physical activity can significantly change important physiological parameters like heart rate. Furthermore, classical music can accelerate the pulse regeneration, which effect can be utilized during or after hobby and professional sport activities.

Supervisors:

Regina Finta PhD, University of Szeged Faculty of Health Science and Social Studies, Department of Physiotherapy
Zita Petrovszki Hajdúné PhD, University of Szeged Gyula Juhász Teacher Traning Institute of Physical Education and Sports Science

Pedro Simão Vaz de Salvador (ME student), Faculty of Medicine, University of Porto
Glória Conceição (PhD student), Faculty of Medicine, University of Porto
Inês Falcão-Pires (PhD student), Faculty of Medicine, University of Porto

The role of Urocortin-2 in Heart Failure with Preserved Ejection Fraction

Introduction: Current treatment options of HFpEF are limited, so evaluation of therapies in experimental models of HFpEF with metabolic syndrome is needed. Urocortin 2 (Ucn2) is a cardioprotective peptide. In animal models and humans with HF with reduced ejection fraction (HFrEF), Ucn2 has showed favorable effects on left ventricle (LV) function, as well as on neurohumoral and renal parameters.
Aims: We studied the role of the Ucn2/CRHR2 system in the pathophysiology of HFpEF, and evaluated the efficacy of Ucn2 as a novel therapeutic strategy in this disease.
Methods: Either Ucn2 (15 µg/Kg/day, subcutaneously) or vehicle were administered to lean and obese ZSF1 rats aged 18 to 30 weeks (6-7 animals/group). Animals were tested for oxygen consumption under maximum effort (VO2max), oral glucose tolerance and insulin resistance, and samples were collected after 12 weeks of treatment. Temporal evolution of cardiac (dys)function was assessed by echocardiography.
Results: mRNA expression of Ucn2 and CRHR2 is decreased in LV from ZSF1 obese rats compared to ZSF1 lean, correlating to LV structure and diastolic function. Although Ucn-2 did not attenuate the body weight gain and the impaired exercise capacity in experimental HFpEF, it improved glucose tolerance in ZSF1 obese rats. By echocardiography, we demonstrated that there are no differences in the ejection fraction between groups and that the Ucn-2 therapy attenuated LV mass in ZSF1-Obese animals compared to non-treated group. No differences were observed in E/E´.
Conclusion: This study suggests that chronic administration of Ucn2 could be beneficial in patients with HFpEF, attenuating LV remodelling and metabolic syndrome.

Keywords: heart failure, urocortin, preserved ejection fraction

Supervisors:
Carmen Dulce da Silveira Brás Silva Ribeiro college professor, Department of Physiology and Cardiothoracic Surgery, Faculty of Medicine, University of Porto, Alameda Professor Hernâni Monteiro, Porto 4200-319, Portugal; Faculty of Nutrition and Food Sciences, University of Porto, Porto, Portugal.
Rui Miguel da Costa Adão research fellow, Department of Physiology and Cardiothoracic Surgery, Faculty of Medicine, University of Porto, Alameda Professor Hernâni Monteiro, Porto 4200-319, Portugal
Joaquim Adelino Correia Ferreira Leite Moreira college professor, Department of Physiology and Cardiothoracic Surgery, Faculty of Medicine, University of Porto, Alameda Professor Hernâni Monteiro, Porto 4200-319, Portugal.

Bianka Végh (BSc student), Faculty of Health Sciences and Social Studies, University of Szeged

Body conscious - here at the present-moment Subtitle: The relationship between mindful attention awareness and body exercise

Introduction: We are hardly able to become present moment- and body conscious as well at the same time, due to todays sedentary lifestyle. The present study's aim is to survey how we can have an effect on the present moment- and body conscious with an appropriate movement- and mindfulness threapy.
Methods: The present study was based on a program, which was completed by 28 women, divided in two groups: intervention (N=16) ans a control group (N=12), mean age of the subjects was 29,03 (SE=11,846). The intervention work lasted for 11 weeks, during this time the intervention group took part in high intensity intervall training and mindfulness technics, while the control group only did their previously selected workout. Subjects were asked to complete an online questionnare before and after the program. Moreover, the intervention group was mesured by a functional movement scale.
Data processing was made by Microsoft Excel 2010 and Statistic13 and analysed by independent and dependent T-test ($p<0,05$).
Results: The body- absorption and awareness, the interoceptive- and present moment awareness and the challange-skill balance metadimension of flow reached the significant level ($p=0,009$-$0,000$). Furthermore, at the beginning, the control group had significantly higher score at the present moment awareness and the exessive idnetification questionnare ($p=0,03$-$0,018$), compared to the invention group.
Conclusion: The combined use of physical training and mindfulness technics provides the clients with significant improvement in more dimension, which has positive affects on mental and physical health.

Keywords: body conscious, present moment awareness, mindfulness, flow, high intensity intervall training

Supervisors:
Babicz Tamás practical studies assistant
Lobanov-Budai Éva assistant lecturer, Szegeti Tudomány Egyetem

Jehan Waeytens,[1,2] Ariane Deniset-Besseau,[2] Alexandre Dazzi,[2] Vincent Raussens[1]
[1]Structure et Fonction des Membranes Biologiques (SFMB), Faculté des Sciences, Université libre de Bruxelles (ULB), CP 206/02, Boulevard du Triomphe, 1050 Bruxelles, Belgique
[2] Laboratoire de Chimie Physique (LCP), CNRS UMR 8000, Université Paris-Sud, Université Paris-Saclay, 91405 Orsay, France

How to investigate isolated amyloid fibrils at the nanoscale: IR nanospectroscopy challenges and prospects

Alzheimer's disease (AD) is the most prevalent form of dementia. It's characterized by fibrillar amyloid deposits in extra neuronal spaces. These amyloid plaques are composed essentially of the amyloid β peptide (Aβ). Aβ is also associated to early onset AD and cerebral amyloid angiopathy due to point mutations in the peptide. This polymorphism of Aβ is apparently reflected in the adopted structures and these structures are intrinsically related to its toxicity. Therefore, a better understanding of aggregated structures of the peptide and its variants is important in the study of AD and associated pathologies.
Due to their transitory and/or insoluble states, the commonly used structural high-resolution methods are not suitable for the study of these aggregated forms. Infrared spectroscopy is therefore an exquisite tool to study these different aggregated species. Nevertheless, in attenuated total reflection Fourier transform infrared (ATR-FTIR), it is difficult if not impossible to discriminate the different aggregated structures present in this sample. The recent coupling of infrared spectroscopy with atomic force microscopy (AFM-IR) [1] overcomes the weak spatial resolution of the usual infrared spectroscopy and achieve a resolution of ten nanometers, the size of amyloid fibrils. The AFM-IR allows us recording spectrum on different aggregated amyloid species (oligomers, isolated fibrils or amorphous aggregates) selected thank to the AFM [2]. The ability of studying the structure and the shape of aggregated species can improve in the future the detection of biomarkers characteristic of Alzheimer's disease and lead to a better understanding of the polymorphism of amyloids proteins.

[1] Dazzi, A.; Prater, C. B., AFM-IR: Technology and Applications in Nanoscale Infrared Spectroscopy and Chemical Imaging. *Chemical Reviews* 2017, *117* (7), 5146-5173;
[2] Waeytens, J.; Van Hemelryck, V.; Deniset-Besseau, A.; Ruysschaert, J.-M.; Dazzi, A.; Raussens, V., Characterization by Nano-Infrared Spectroscopy of Individual Aggregated Species of Amyloid Proteins. *Molecules* 2020, *25* (12), 2899.

Supervisor:
Alexandre Dazzi, Institut de Chimie Physique, UPSaclay - Faculté des Sciences

Sally Yaacoub (PhD student), Faculty of Medicine (EDSP), Paris-Saclay University

Trend of antibiotic consumption and its association with influenza-like illnesses in France between 2004-2017

Introduction: France has had one of the highest antibiotic consumption in the European Union (EU). We aim to analyze data from 2004-2017 to describe the trend of the overall antibiotic consumption in the community and hospital sectors of France, compare this consumption to the antibiotic consumption of other EU countries and understand its association with the incidence of influenza-like illnesses in the community sector of France.
Methods: This is an observational study using the annual drug sales in France and antibiotic consumption in EU countries for antibacterials for systemic use (J01). We reported the consumption as defined daily doses (DDD) per 1000 inhabitant per day (DID) in descriptive and graphical formats. We conducted two multiple linear regression models for the overall antibiotic consumption and of penicillins (J01C) in the community with the variables time and incidence of influenza-like illnesses.
Results: The total consumption of antibiotics in France significantly increased from 29.6 DIDs in 2004 to 31.4 DIDs in 2017 (ρ=0.647, pvalue<0.05), where the community sector accounted for its majority (93%). France had a higher antibiotic consumption than that of other EU countries. In addition, J01C group was the most consumed antibiotic group (57.7%). The consumption in the community was graphically correlated to the incidence of influenza-like illnesses. The logistic regression models show that this consumption is statistically associated with time and influenza-like illnesses.
Conclusion: We conclude that the antibiotic consumption in France remains high. It might be beneficial to reinforce the proper use of antibiotics for respiratory illnesses.

Keywords: antibacterials, respiratory tract infections, antibiotic consumption

Supervisor:
Patrick Maison professor, Direction de la Surveillance, ANSM, F-93100 Saint Denis, France ; IST-PE, CHIC, F-94000 Créteil, France, EA 7379 EpidermE, Université Paris-Est Créteil, UPEC, Créteil, F-94010, France

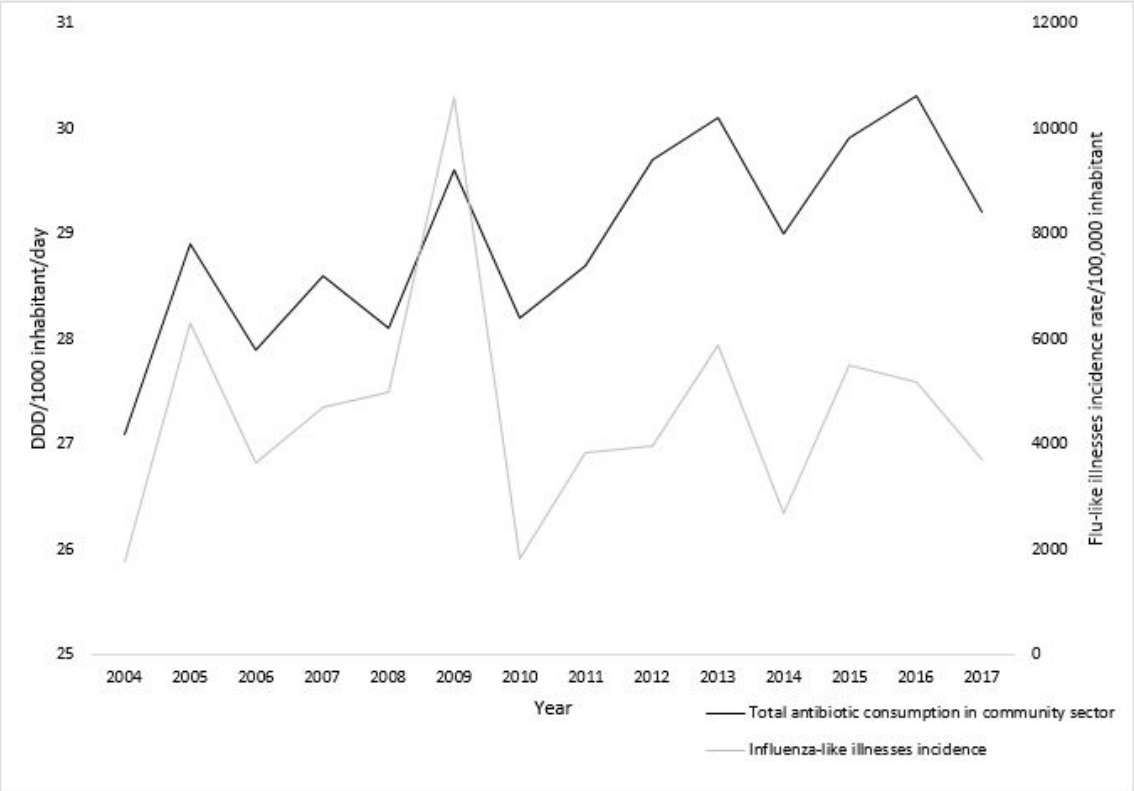


Figure 3. Antibiotic consumption for all the antibiotic classes and incidence of influenza-like illnesses per 100,000 inhabitant in the community sector in France over the period 2004-2017.