



Abstracts Book

# IX WORKSHOP IINFACTS

## "BREAKING THE BOUNDARIES BETWEEN THE RESEARCH LINES"

CANCER RESEARCH  
ORAL DISEASES  
PSYCHOLOGY & HEALTH  
DRUG RESEARCH

18 JUL'2019





## Welcome

### Welcome to the **IX Workshop IINFACTS**

The IX IINFACTS Workshop is part of the IINFACTS knowledge transfer and valorization activities and as in previous editions, this event aims to disseminate within the scientific community of CESPU the work that is being developed in the R&D unit. It is also intended to promote discussion between researchers from the different research lines of the IINFACTS and, thus, to enhance future cooperation / collaboration among members.

We wish you a beneficial event.

The Organising Committee,

Hassan Bousbaa, José Carlos Rocha, Maria Elizabeth Tiritan, Teresa Pinho, Patrícia Silva, Virgínia Gonçalves, Rosária Dias, Luísa Sousa, Maria Ferreira, Joseph Karam, Sofia Baptista, Viviana Redondo e Tânia Boavista



# Scientific Program



**IX WORKSHOP IINFACTS**  
"BREAKING THE BOUNDARIES BETWEEN  
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CANCER RESEARCH / ORAL DISEASES  
PSYCHOLOGY & HEALTH / DRUG RESEARCH



CESPU  
CENTRO DE ESTUDOS E INVESTIGAÇÃO



CESPU  
INSTITUTO UNIVERSITÁRIO  
DE CIÊNCIAS DA SAÚDE



CESPU  
INSTITUTO POLITÉCNICO  
DE SAÚDE DO NORTE

## Opening Session

- 09:00 António Almeida Dias (CA CESPU)  
Jorge Proença (Reitor IUCS)  
Raquel Esteves (Diretora ESSVS)  
Hassan Bousbaa (Diretor IINFACTS)

## Session I

- 10:00 Orthodontic tooth movement: biomechanics involved on aligners appliances. *Teresa Pinho, Luís Monteiro, Susana Coimbra & Vera Almeida*
- 10:20 Biological assessment of debris from oral implants. *Hassan Bousbaa, Bruno Sarmento & Primavera Santos*
- 10:40 Discussion

## Coffee Break

## Session II

- 11:30 Fisioterapia: um novo paradigma. *João Paulo Venâncio & Gabriela Brochado*
- 11:40 Research Group for Artificial Intelligence and Health. *José Neves*
- 11:50 Visualizing Networks. *Francisco Restivo*
- 12:20 Discussion

## Lunch

## Session III

- 14:30 Comparative study of the abuse and genotoxic potential deriving from sub-chronic exposure to therapeutic doses of tramadol and tapentadol. *Ricardo Dinis, Juliana Faria & Teresa Magalhães*
- 14:50 Chiral derivatives of xanthenes and flavonoids: synthesis and biological activity evaluation. *Elizabeth Tiritan, Odília Queirós & Cristina Coelho*
- 15:10 Disease, Emotion and Wellbeing: Regulated Organization of Action. *José Carlos Rocha, Ana Teixeira & Maria Paço*
- 15:30 Discussion

## Coffee Break

## Session IV

- 16:20 The Reform of Primary Health Care: impacts and changes for health professionals. *Maria de Lurdes Teixeira, Isabel Araújo, Nuno Araújo & Clara Simões*
- 16:30 Discussion
- 16:40 Concluding remarks and critical analysis of the general functioning of IINFACTS and its research lines. *Research Line Leaders & IINFACTS Director*



# CONTENTS

Orthodontic tooth movement: biomechanics involved on aligners appliances .....	1
Biological assessment of debris from oral implants .....	2
Fisioterapia: Um Novo Paradigma. ....	3
Research Group for Artificial Intelligence and Health .....	4
Visualizing Networks.....	5
Comparative study of the abuse and genotoxic potential deriving from sub-chronic exposure to therapeutic doses of tramadol and tapentadol .....	6
Chiral derivatives of xanthenes and flavonoids: synthesis and biological activity evaluation .....	8
DEBORA Disease, Emotion and Wellbeing: Regulated Organization of Action.....	9
The Reform of Primary Health Care: impacts and changes for health professionals ...	10







## **Orthodontic tooth movement: biomechanics involved on aligners appliances**

**Teresa Pinho (PI), Susana Coimbra (Co-PI), Vera Almeida (Co-PI) e Luís Monteiro (Co-PI)**

This presentation will have the participation of 4 research lines. We will focus on the biomechanics of clear aligners (CA) technique. We aim to understand the biomechanics involved in orthodontic tooth movement and to evaluate the possible effect of vibration and PBM on the acceleration of orthodontic tooth movement. We also intend to verify the performance of mastication, pain pressure threshold in chewing muscles, and the incidence of Temporomandibular Disorders (TMDs), when using current orthodontic treatments such as CA in healthy individuals, without any previous signs or symptoms of TMDs.

Tooth movement involves both remodeling and modeling of bone, which requires a coordinated action from osteoclasts and osteoblasts in response to mechanical loading. Moreover, inflammatory mediators are released after mechanical stimulus or injury, triggering the biologic process associated with orthodontic tooth movement (OTM). It seems that when vibratory stimuli increase OTM, some signaling pathways are activated, with several pro-inflammatory mediators being released, namely interleukin (IL)-1 $\beta$  [1]. In the initial stage of orthodontic treatment, IL-1 $\beta$  is produced by osteoclasts in response to mechanical stress, and in the later stages is secreted by macrophages, accumulating in compressed areas. We aim to evaluate IL-1 $\beta$  levels in gingival crevicular fluid (by using enzyme-linked immunosorbent assay (ELISA), after the use of non-invasive methods, such as photobiomodulation and vibration, in order to investigate the role of this cytokine in OTM.

Temporomandibular disorders (TMD) are hypothesized as a possible consequence resulting from an orthodontic treatment. These disorders are conceptualized as multifactorial conditions associated to several psychosocial comorbidities as depression, anxiety, health anxiety, somatization and trauma, among others. A recent cognitive and behavioral model of psychological flexibility includes a process-oriented approach applied to several psychological and health disorders. In order to explore the role of this model and its dimensions in TMD a preliminary study was conducted analyzing the psychometric properties of two instruments: Chronic Pain Acceptance Questionnaire (CPAQ-8) and the Psychological Inflexibility in Pain Scale (PIPS) in a Portuguese sample of patients with TMD and pain. Additionally, the psychopathological comorbidity (somatization, psychological distress, generalized anxiety, depression and traumatic symptomatology) and psychological flexibility and pain acceptance will be also evaluated when using current orthodontic treatments such as CA and compared with healthy individuals, without any previous signs or symptoms of TMDs.

**Acknowledgments:** This work is supported by IINFACTS-CESPU under the grant "OrthoAlign-PI-4RL-IINFACTS-2019: Orthodontic tooth movement: biomechanics involved on aligners appliances".

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## Biological assessment of debris from oral implants

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Dental implants and orthodontic mini-implants manufactured from titanium and stainless-steel alloys are routinely used in clinical practice [1]. Most orthodontic mini-implants are manufactured from Titanium alloy (Ti6Al4V) or stainless-steel alloys although several constituent elements of these alloys reveal a mutagenic or carcinogenic potential [2]. The aim of the present study is to carry out an in vitro cytotoxic analysis in order to assess the biological safety of particles released from titanium alloys and stainless-steel orthodontic mini-implants. During the first year of the project, these particles will be characterized in terms of size and morphology, and their cytotoxic effect analyzed in terms of cell viability and permeability. During the second year, the particles will be characterized in terms of cellular internalization mechanism and genotoxicity potential. It is expected that this study will contribute to clarify whether titanium wear-derived particles released in the oral environment are associated with harmful side effects in the human body.

**Acknowledgments:** This work is supported by CESPU – Cooperativa de Ensino Superior Politécnico e Universitário under the grant “IMPLDEBRIS-PL-3RL IIFACTS-2019”.

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## **Fisioterapia: Um Novo Paradigma.**

**João Paulo Venância, Gabriela Brochado**



## Research Group for Artificial Intelligence and Health

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Sustainability is a vast concern, or should be, and presents challenges stemming from interactions between the natural and human-developed spheres across temporal and spatial scales. This has motivated computer science researchers to apply their trade to environmental and societal sustainability challenges. Indeed, interdisciplinary multi-investigator research teams are focusing on cross-cutting issues such as optimization, dynamic modeling, big data, machine learning and citizen science. These methods are applied to sustainability challenges, including Health, Nature Conservation, Poverty Reduction, Renewable Energy, just to name a few. Undeniably, the ability of AI planning and search technologies to consider many possible futures is a cognitive capability that would greatly benefit human problem solving and decision-making. In particular, the motivation and ability to explore the space of consequences of technology (e.g., [1]) and policy interventions is little studied, but unanticipated consequences are not necessarily unanticipatable consequences [2].

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## Visualizing Networks

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Networks are everywhere, from the internet, to social networks, to scientific publications, and to the genetic networks that determine our biological existence [1] [3]. With the emergence of big data, networks with hundreds or thousands of millions of nodes are available digitally, and allow information search and knowledge discovery at unprecedented levels.

On the other side, results are to be made visually available, since we know that vision is the most effective channel for information acquisition.

In this short presentation, the basics for understanding multimodal networks will be presented and some examples will be demonstrated.

Today, we have immense computing resources, and the biggest challenge for researchers in any area is to be able to formalize their problems into a language that machines can understand. The talk addresses this objective.

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## Comparative study of the abuse and genotoxic potential deriving from sub-chronic exposure to therapeutic doses of tramadol and tapentadol

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Tramadol and tapentadol are synthetic opioid analgesics widely used in the treatment of moderate to severe forms of pain, including cancer, musculoskeletal and neuropathic affections, both in acute and chronic settings [1, 2]. Their mechanism of action combines mu-opioid receptor agonism and neurotransmitter reuptake inhibition, acting synergistically to optimize analgesia and minimize side effects [1, 2]. However, adverse reactions, including serotonin syndrome (SS), respiratory depression and fatal intoxications, have been reported, and their abuse potential has not been fully established [1, 2]. Since they are frequently used in a chronic context, often concomitantly with other drugs, the evaluation of their abuse, genotoxic and carcinogenic potential becomes relevant. "Ecstasy" (MDMA) is a recreational abuse drug that leads to serotonin-related anxiogenic and addictive behavior and neurotoxicity [3, 4]. Combined use of tramadol and MDMA has been found to be frequent [5]. Their co-administration may increase the risk of SS, given the increased risk of 5-HT accumulation in the central nervous system. In turn, in spite of tapentadol minimal serotonergic activity, SS has been suggested as a possible death cause following its co-administration with selective serotonin reuptake inhibitors (SSRIs) [6, 7]. The research team has previously shown increased oxidative stress biomarkers in Wistar rat metabolizing and target organs, following acute exposure to therapeutic doses of tramadol and tapentadol [8, 9]. Increased oxidative stress indicates both toxicological and carcinogenic potential [10]. In this context, 8-hydroxy-2'-deoxyguanosine (8-OHdG), an important oxidative stress biomarker and predictor for carcinogenesis promotion and progression [10], has been found to increase in mice brains upon exposure to opioids such as heroin [11]. The present study aims to evaluate the abuse potential of therapeutic doses of both opioids, sub-chronically administered to Wistar rats. Abuse- and anxiety-oriented behavioral studies, including conditioned place preference studies, will be performed upon intraperitoneal injection with tramadol, tapentadol, in single or combined administrations with naloxone (a mu-opioid antagonist), fluoxetine (a SSRI), and MDMA. Combined administrations will allow the clarification of the contribution of the opioid and non-opioid components of tramadol and tapentadol mechanism of action to the abuse potential elicited by therapeutic doses of both opioids. In addition, their putative genotoxic and carcinogenic effect will be assessed by quantifying 8-OHdG levels in the same animals. The study of the toxicological, carcinogenic and behavioral alterations associated with the long-term use of these opioids is particularly relevant for tapentadol, given its shorter market history [1, 2].

**Acknowledgments:** This work is supported by CESPU – Cooperativa de Ensino Superior Politécnico e Universitário, under the grant "AbuGenoToxTraTap-PI-3RRL-IINFACTS-2019"

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## Chiral derivatives of xanthenes and flavonoids: synthesis and biological activity evaluation

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Xanthone derivatives and flavonoids demonstrated great potential in diverse biological activities [1,2]. They are interesting chemical building blocks for preparation of new derivatives with association with chiral moieties allowing to enlarge the chemical diversity and to explore the role of the molecular stereochemistry [3].

This work aim to synthesize a new library of chiral derivatives of xanthenes (CDXs) and flavonoids (CDFs) by coupling to enantiomerically pure amino alcohols, amines, proteinogenic amino esters and amino acids. Diverse biological activities of the CDXs and CDFs will be evaluated comprising, anti-inflammatory, anti-infective and antitumor. Anti-infective activity will be evaluated in different microorganisms, including different bacterial species and the protozoan parasites. Antimicrobial activity will also include bacterial species of the oral cavity and the potency of these compounds to inhibit the biofilm formation in biomaterials and dental composites.

Resistance to treatment associated with cancer therapy is often caused by the expression of efflux pumps in cancer cells, we will determine if these compounds are P-glycoprotein (Pgp) substrates, by using a MDR1-transformant yeast as host. Furthermore, their effectiveness on tumor cells will be studied through high-throughput assays of viability. As the bioenergetic deregulation is one of the emergent cancer hallmarks, their effect on metabolic parameters like lactate and glucose will also be assessed.

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## **DEBORA Disease, Emotion and Wellbeing: Regulated Organization of Action**

**José Rocha<sup>1\*</sup>, Ana Teixeira<sup>1</sup>, Maria Paço<sup>1</sup>**

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The emotional mediated processes between negative-life-events and the actions enabling a positive outcome can prevent serious problems and promote happiness in societies. This pathway has been used to overcome the most challenging wellbeing difficulties, with known extreme consequences in health, considered today the most powerful modifiable disease risk factors, with known effects on relationships and economical productivity impairment. This knowledge expanded largely on last years and opened the way for new organised approaches, fine-tuned to address very specific predictors.

To act we need to know exactly the best options, there is a concomitant premise of understanding the underlying factors, never disclosed nor measured. New possible candidate variables to produce such extreme positive effect are being measured and studied. Some are absolutely new instruments, like Post-Loss Growth Scale, some have been developed in other languages and need to be adapted, like the Psychological Inflexibility in Pain Questionnaire. We present this rational, methodology and a set of preliminary results related to applications on Mental, Dermatological and Oral Health contexts.

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## The Reform of Primary Health Care: impacts and changes for health professionals

Teixeira, L.<sup>1\*</sup>, Araújo, I.<sup>2</sup>, Araújo, N.,<sup>3</sup> Simões, C.<sup>4</sup>

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Introduction: Primary Health Care (PHC) is considered, in all national and international directives, as the basis for care delivery systems and determinants for improving the health of populations. In Portugal, the biggest reform of this sector began in 2005, leading to a profound reconfiguration of structures and organizational models. Among the new units created, the Family Health Unit (FHU), the main novelty of the reform, represents a new organizational model, a new methodology for working and attendance to the citizen and the population.

As this is a central issue for the (re) definition of policies and for the evaluation of the reform process, there are still few studies that analyze the impacts and scope of the changes introduced. Given this importance, we chose the reform and its impacts for study object, analyzed by a triangulated methodology.

Objective: To know, from the perspective of health professionals, physicians and nurses, what the perception of PHC reform is.

Methodology: Triangulated methodology: Semi-structured interviews, n = 20 (participants, physicians and nurses to practice in FHU for more than 3 years); Inquiry by questionnaire, n = 370 (health professionals, doctors and nurses and to practice in FHU for more than 3 years). Integrated in Clusters of Health Centers of the northern region of Portugal.

Results: Quantitative methodology studies revealed a considerably high level of satisfaction with the reform (72.8% said they were satisfied or very satisfied), with only a minority of 10% showing dissatisfaction or very dissatisfaction. The factors of dissatisfaction were related with the infrastructures, equipment, transport resources and surplus users.

The main problems identified were accessibility, IT systems and technologies, and these are also the main sources of problems. Contractualization, the basis of the FHU organizational model, is considered as a stimulus to performance and motivation, however, it is also said that modified the relationship with the user, making it more impersonal and mediated by technological means. The qualitative methodology studies looked at the reform as a gradual, sustained and organized process that aimed to bridge the inequalities of access to PHC.

It was also considered a revolution in PHCs, with good evolutionary milestones, namely organizational and quality of care, providing better care, population surveillance and overall satisfaction.

Conclusion: An in-depth understanding of the impacts of the reform resulted in a positive level of satisfaction, significant changes in the models of care and relationship with users and an increase in the motivation of the professionals.

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