

MEETING ABSTRACTS

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# Center for Interdisciplinary Research in Health (CIIS) National Meeting 2023

Lisbon, Portugal. 31 March - 01 April 2023

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The Center for Interdisciplinary Research in Health (CIIS) is the research center of the Universidade Católica Portuguesa (UCP) focused on health care. The Center is organized in five platforms, and distributed in four geographies across Portugal: Lisbon, Porto, Viseu and Sintra (Table 1). The center has currently 155 active researchers and attracted funds exceeding 10M€.

For the first time ever, CIIS has organized a National Event that included researchers from all platforms and disciplines, in a truly interdisciplinary and translational scientific event, counting 117 registered participants and 120 abstracts. The meeting took place at the Faculty of Medicine, in the Sintra campus, on the 31<sup>st</sup> March and 1<sup>st</sup> April 2023. The Scientific Committee of the CIIS National Meeting decided that the theme for the meeting is *Interdisciplinary Health Care*. Rather than clustering researchers by platform or discipline, we decided to create three working sessions that are inclusive to everyone and not restricting the presentations by discipline, being therefore, interdisciplinary. These are: 1 – *Translational Care*; 2 – *Clinical Care*; and 3 – *Community Care*.

The meeting was held in the presence of the Universidade Católica Portuguesa Rector Professor Isabel Capelo Gil, the Vice-Rector Professor Peter Hanenberg, the Director of the CIIS, Professor Marlene Barros, the Director of the Faculty of Medicine, Professor António Almeida and the guest speaker Professor Tomáš Zima, Charles University, Prague, Czech Republic, and hosted by the Deputy Director of the CIIS, Professor Paulo J. G. Bettencourt.

For two days, papers were presented by invited speakers within each session, and posters were presented by CIIS researchers and students, in a highly anticipated poster session. All abstracts were peer-reviewed. To bring further excitement to the poster session, the Meeting Scientific Committee selected the best poster from each platform to receive the Best Poster Award. Finally, the CIIS platform coordinators presented their plans and vision for the future.

Following the success of this meeting, the Scientific Committee of the National Meeting, decided to implement yearly meetings of the Center.

We would like to acknowledge all CIIS members, staff and students that accepted the challenge of participating in this event, presenting their most recent data, sharing their knowledge, and making this truly an interdisciplinary health care event.

We hope this meeting has contributed to share the latest scientific achievements of all members and promoted the beginning of new collaborations for the future, keeping in mind the main goal of improving health care with an interdisciplinary view, to ultimately improve quality of life, with humanity and spirituality at the center of all scientific quests.

## Acknowledgements

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**Table 1 Platforms of the Center for Interdisciplinary Research in Health**

Name	Location	Head
Neurosciences	Lisbon and Porto	Prof. Ana Mineiro
Nursing	Lisbon and Porto	Prof. Paulo Alves
CatólicaMed	Sintra	Prof. Paulo Bettencourt
SalivaTec	Viseu	Prof. Nuno Rosa
Precision Dental Medicine	Viseu	Prof. André Correia



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**Oral Presentations****Day 1 – 31<sup>st</sup> March 2023****O1****- Molecular & Immunological approaches in oral inflammatory diseases: a bridge to precision medicine**Karina Mendes<sup>1,2</sup>, Ana T. P. C. Gomes<sup>1,2</sup>, Marla Pinto<sup>2</sup>, Tiago Marques<sup>1,2</sup>, Maria Correia<sup>1,2</sup>, Nuno Rosa<sup>1,2</sup><sup>1</sup> Universidade Católica Portuguesa, Center for Interdisciplinary Research in Health, Lisboa, Portugal; <sup>2</sup> Universidade Católica Portuguesa, Faculdade de Medicina Dentária, Viseu, Portugal**Correspondence:** Karina Mendes (kmendes@ucp.pt)

BMC Proceedings 2023, 17(9):O1

Oral infections are caused by diverse bacterial, viral and fungal pathogens, which in many cases are associated with a negative impact on patient's QoL. Indeed, infections trigger an immune response to respond effectively to a pathogen that can result in inflammatory diseases within the oral cavity.

In this context, periodontitis, the most common chronic inflammatory disease of human is caused by interactions between periodontopathic bacteria, host immune responses and environmental factors (e.g. smoking), representing a major burden on healthcare. Thus, it is important to gain further insight about molecular mechanisms involved in periodontitis development and progression into different stages (I, II, III and IV) and grades (a, b and c), a new classification scheme proposed in 2018.

Several signaling pathways have been implicated in periodontitis like MAPK Mitogen-activated protein kinases, nuclear factor kappa B (NF- $\kappa$ B), Janus kinase (JAK)-signal transducer and activator of transcription (STAT), TAM receptor tyrosine kinases (RTKs) and the Wnt pathway. However, studies performed in saliva and associating most of these signaling pathways with human periodontitis pathogenesis and severity are limited.

Because of that, its essential to identify and quantify specific biomarkers related to these signaling pathways at distinct stages of periodontitis, as a potential tool to support prognosis and clinical management of periodontitis cases, contributing towards a Predictive, Participatory, Preventive, and Personalized medicine.

In this work, a pilot study including molecular data generated from saliva samples of patients diagnosed at different stages of periodontitis will be presented, inferring about the involvement of specific signaling pathways in human periodontitis progression.

This work has been approved by the Comissão de Ética para a Saúde of Universidade Católica Portuguesa [project CES157 – Estratégias Moleculares e Imunológicas em doenças inflamatórias: a ponte para a Medicina de Precisão (OralPreciseMed)].

**Funding**

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**O2****- Validation of salivary biomarkers for Inflammatory Bowel Disease diagnosis and monitoring**Ana T. P. C. Gomes<sup>1,2</sup>, Pedro Pereira<sup>2</sup>, Rúben Martins<sup>2</sup>, Karina Mendes<sup>1,2</sup>, Maria Correia<sup>1,2</sup>, Nélio Veiga<sup>1,2</sup>, Pedro Lopes<sup>1,2</sup>, Cláudio Rodrigues<sup>3</sup>, Paula Ministro<sup>3</sup>, Nuno Rosa<sup>1,2</sup><sup>1</sup> Universidade Católica Portuguesa, Center for Interdisciplinary Research in Health, Lisboa, Portugal; <sup>2</sup> Universidade Católica Portuguesa, Faculdade de Medicina Dentária, Viseu, Portugal; <sup>3</sup> Department of Gastroenterology, Tondela-Viseu Hospital Centre, Viseu, Portugal**Correspondence:** Ana T. P. C. Gomes (apgomes@ucp.pt)

BMC Proceedings 2023, 17(9):O2

Inflammatory bowel disease (IBD) is a chronic inflammatory disorder of the gastrointestinal tract with a rising incidence worldwide, imposing a considerable burden on health services. IBD etiopathogenesis

of is partly understood and includes both genetic and environmental factors which induce an abnormal immune response. The disease can be present 2 forms: Crohn's disease (localized in the terminal ileum affecting all layers of the intestine) and ulcerative colitis (localized in the rectum and the colon and limited to the mucosa). The guidelines for IBD diagnosis in adults require a comprehensive physical examination and a review of the patient's history. Various tests, including blood tests, stool examination, endoscopy, colonoscopy, biopsies, and imaging studies help exclude other causes and confirm the diagnosis. Colon biopsy and blood samples represent a powerful source of novel biomarkers supporting differential diagnosis. In addition to their potential in diagnosis, novel biomarkers such as miRNAs, inflammatory biomarkers, fecal and mucosal microbiota may play a critical role in predicting therapeutic efficacy as well as disease recurrence and severity.

The identification, quantification and/or validation of biomarkers is primarily performed in tissue, blood and fecal samples but only few studies have been done with saliva, which reflects the same type of biomarkers, allowing a noninvasive sample collection.

In this work, an extensive oral characterization, and the quantification of salivary biomarkers such as calprotectin and total bacterial load from IBD patients recently diagnosed and/or undergoing biological therapy were evaluated. Our preliminary results showed an increased periodontitis predisposition, and an increased salivary calprotectin and total bacterial load in those patients. These results open new perspectives to improve the understanding of the potential of saliva as a powerful tool to evaluate IBD progression/therapeutic success and generates molecular data supporting the use of saliva in diagnosis, prognosis and disease/treatment monitoring towards a Predictive, Preventive, and Personalized medicine.

This work has been approved by the Comissão de Ética para a Saúde of Universidade Católica Portuguesa (project CES133 – Microbioma Oral Humano).

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**O3****- Targeting lysosomal proteases for a host-directed therapy for tuberculosis**David Pires<sup>1,2</sup><sup>1</sup> Universidade Católica Portuguesa, Católica Medical School, Center for Interdisciplinary Research in Health, Rio de Mouro, Sintra, Portugal; <sup>2</sup> Instituto de Investigação do Medicamento - iMed.UlLisboa, Faculdade de Farmácia da Universidade de Lisboa, Lisbon, Portugal**Correspondence:** David Pires (dpires@ucp.pt)

BMC Proceedings 2023, 17(9):O3

Tuberculosis is a disease caused by the bacteria *Mycobacterium tuberculosis* (Mtb) which latently infects one-quarter of the human population and is the leading cause of death by an infectious agent. Contributing to the challenge of this old disease is the lack of (1) an effective vaccine, (2) reliable biomarkers for latent infection, (3) the limited number of effective antimicrobial drugs, (4) a prolonged therapeutical regime, and (5) the evolution of multi-drug resistant strains. This increasingly foments the need for novel therapies that target the bacterial niche or improve the host response, alone and in combination with the current conventional therapy. We have been probing the intracellular niche of Mtb, the macrophage, for how these bacteria survive and replicate inside them while impairing their bactericidal response. In that search, we found that Mtb induces a decrease in the expression of a group of proteolytic enzymes, the cathepsins, that participate in key cellular processes regulating homeostasis, cell death, inflammation, antigen presentation, and microbial killing. Regarding Mtb infection, this downregulation results in improved bacterial survival and replication inside macrophages as well as poor lymphocyte priming

by the infected cells. To address this problem, we have been exploring the different pathways by which cathepsin activity is regulated in our cells. So far, we found three levels of cathepsins regulation that can be manipulated to our advantage: One is by targeting miRNAs to restore cathepsins gene expression; another by targeting cystatins, the natural inhibitors of cathepsins, to restore their activity; and finally, by using saquinavir, a repurposed inhibitor of the HIV protease that unexpectedly improves the activity of some human cathepsins. Together, these strategies were shown to improve the intracellular killing of Mtb by macrophages, as well as enhance the ability of these cells to prime CD4<sup>+</sup> T-lymphocytes and induce their proliferation and IFN $\gamma$  secretion. Our approach suggests a potential host-targeted strategy that can be developed as a complementary therapy to current antibiotics. Human monocytes were isolated from buffy-coats of healthy human donors provided by the National Blood Institute (Instituto Português do Sangue e da Transplantação, IP, Lisbon, Portugal). This study was supported by the grants from National Foundation for Science, FCT (Fundação para a Ciência e Tecnologia), Portugal, PTDC/SAU-INF/28182/2017 and EXPL/SAU-INF/0742/2021.

#### O4

##### - Exploring the biological properties and regenerative potential of biomaterials using cell culture models

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*BMC Proceedings 2023, 17(9):O4*

Life expectancy has improved significantly and, along with the declining birthrate, has contributed to the aging of populations, especially in industrialized countries. Alas, aging is intrinsically associated with the incidence of health problems including bone and tooth loss that require suitable solutions to support the quality of life. To meet these demands, significant research efforts have been undertaken to develop novel biomaterials, both orthopedic and dental implants.

The field of biomaterials for bone tissue engineering is increasingly evolving. The most recent generations of biomaterials have increasingly more activity and interaction with the biological environment and stimulate the regeneration of functional tissue.

Natural polymers and compounds have been combined with each other to improve workability and are strategically integrated with ceramics or bioactive glasses to reinforce the structure of the final system, thus producing composites with a better mechanical performance.

Our research group has been focused on the biological characterization of different added-value materials and composites, namely by evaluating their antimicrobial, biocompatibility, and regenerative properties.

Some of our recent work results allowed us to conclude that marine fungal extracts, as well as sol-gel-derived bioactive glass nanoparticles, have inhibitory effects on the growth of *C. albicans* and *E. faecalis* (main pathogens in persistent root canal infections). Additionally, we have characterized cuttlefish bone powders for endodontic applications.

We are also committed to developing strategies for monitoring cell response to these biomaterials at the molecular level that could be used to follow inflammation and osteoconduction.

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#### Day 2 – 1<sup>st</sup> April 2023

#### O5

##### - Psychological autonomy and central pattern generator activation in a spinal cord injury patient during immersive motor imagery BMI-Driven VR System

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*BMC Proceedings 2023, 17(9):O5*

#### Background

Previous studies demonstrate that motor imagery -based Brain Machine Interface (BMI) and Virtual Reality (VR) rehabilitative training improve neural plasticity in Spinal Cord Injury (SCI) patients even after several years of injury. We have recently described that mentally imagine a walking action within a multimodal highly realistic BMI enhanced the illusory sensation of having a control one's own actions in an SCI patient and generated a self-reported unique pleasurable experience and lower limb movements, even though the patient was not aware of them.

#### Materials and methods

Here, we have analyzed the subjective patient experience with Electroencephalogram (EEG)-based BMI-VR system from qualitative data collected through unstructured interview. Additionally, we have analyzed patterns of lower limb movements in a previously video recorded session to describe their main characteristics.

#### Results

A SCI patient participant gave written informed consent for a protocol approved by the Hospital Senhora da Oliveira Ethics Committee; n° 15/2020. Firstly, a conventional content analysis was used for data analysis which results led to the extraction of four categories for sensations: self-determined acts, those that reflect one's will; acts that are fully endorsed by the self, volition, and retrieval of pre-injury memories. Those categories address the basic psychological need of autonomy reinforced by a sense of integrity personalized into the patient's autobiographical past. Moreover, lower limb movements in one limb were dorsiflexion occurred were compared with surface muscle movements in the opposite limb. Analysis of muscle patterns revealed a pattern of muscle movements that alternated between the two limbs, occurring at ~0.07Hz (i.e., once every 14 seconds). When the patient was placed in the same position, but VR was not used, no movements were generated.

#### Conclusions

Taking together, these results suggest that the use of a BMI combined with highly realistic virtual reality as well as tactile and thermal feedback can produce an experience of psychological autonomy, which is critical and predictive of quality of life, and recruit a central pattern generator that originates gait-like muscle movement patterns.

#### O6

##### - Nutrition in Cancer: into a growing future

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*BMC Proceedings 2023, 17(9):O6*

Muscle wasting and cachexia in cancer, derive from a negative balance of protein and energy caused by various combinations of reduced food intake and metabolic abnormalities. The main features are a strong tendency toward catabolism and a negative protein-energy balance that is difficult to restore. The reversal or prevention of cancer cachexia and muscle wasting represent a major clinical challenge,