

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 31st March and 1st 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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P3

- Development of a new mRNA vaccine platform for tuberculosis

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Background

Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (*M.tb*), is the first cause of death by an infectious disease worldwide, killed 1.6 million people in 2021. Bacillus Calmette-Guerin (BCG) is the only approved vaccine for TB to date. However, while BCG is effective in preventing severe forms in children, its efficacy in adults is inconsistent and it does not prevent transmission, highlighting the need for new vaccine development [1]. The recent success of COVID-19 vaccines raised the interest for mRNA-based vaccines, as they are effective, safe and easy to produce. This project aims to develop a new mRNA vaccine platform for TB, based on mRNA coding for antigenic peptides from BCG and *M.tb* identified by immunopeptidomics [2], and formulated with a patented technology of lipid nanoemulsions (NE) (WO2019138139A1), adapted for efficient intracellular delivery of mRNA [3].

Materials and methods

We tested different prototypes of NE-mRNA formulations, coding for EGFP, *in vitro*. Human alveolar basal epithelial cells (A549), human monocyte cells (THP-1), and primary human monocyte-derived macrophages, were transfected with NE-mRNA formulations. Transfection efficiency was assessed by measuring the percentage of transfected cells, and the intensity of GFP fluorescence. The cytotoxicity of the formulations was evaluated using AlamarBlue, and by 7-AAD viability staining.

Results

In vitro preliminary data using EGFP-mRNA-NE formulations indicate that NE formulations can efficiently deliver mRNA and induce expression of the encoded protein in different cell types, with low cytotoxicity.

Conclusions

The NE technology presented here is safe, stable, and can efficiently deliver mRNA to various cell types. Selected NE formulations will be used as a carrier for a new vaccine candidate against TB, based on mRNA encoding relevant antigenic peptides. These will be tested in mice for safety, immunogenicity, efficacy and dose optimization in order to generate an effective and sustained humoral and cellular immune response against TB. The mRNA vaccines are rapid and relatively simple to produce. The vaccine platform described here could be adapted to develop vaccines against other infectious diseases, particularly to quickly respond to emerging pathogens.

Ethical statement

Human monocyte-derived macrophages were obtained from buffy-coats of healthy donors provided by the national blood institute (Instituto Português do Sangue e da Transplantação, Lisbon, Portugal).

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P4

- Implementation of a pre-Good Laboratory Practice management system for academic research

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The implementation of quality control procedures, at an academic laboratory, relies on a system that flows information to scientists, staff, and students in a clear and accountable manner.

The organization and implementation of new methodologies, in a new laboratory, implies the definition of a work culture and structure from inception to completion. Establishing and maintaining a new work philosophy is demanding and requires constant and close supervision of all laboratory actions. Particularly, when the methods are innovative and require a significant change of work culture from users.

By establishing a system that standardizes common laboratory protocols to facilitate training while simultaneously tracking progress, we successfully implemented a pre-Good Laboratory Practices (pre-GLP) facility at the Faculty of Medicine of the Universidade Católica Portuguesa (FM).

The pre-GLP system is an adaptation of the system adopted by the Jenner Institute, University of Oxford. Briefly, the new users are trained on Standard Operations Procedures (SOP), provided by a competent user. Once training is successfully completed, the user is approved and qualified as competent user. All training actions are recorded in the researcher's internal record. The internal records are internally verified by the laboratory manager, and laboratory director, and externally audited.

The SOPs are regularly updated and improved to reflect any significant updates on procedures, equipment, and reagents. Updated SOP's are reassessed and follow the pipeline of approval. Implementation of this laboratory management system is a step forward in quality assurance and standardization of methodologies towards good laboratorial practices, increased health, and safety, and quality data production.

Finally, the implementation of this quality assurance method at the FM, provides an additional layer of health and safety protection for users, simultaneously assuring reproducibility and reliability of protocols across the campus.

P5

- Mass spectrometry-based identification of peptides presented by major histocompatibility complex in macrophages

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Immunopeptidomics is a field of research that has progressed in the last years due to advances in sophisticated analytical techniques based on mass spectrometry and bioinformatics. The ability to identify molecules to the extent of a single ion led to a step forward in immunopeptidomics. Mass spectrometry enables the identification of thousands of peptide sequences in a single sample, thus providing large-scale reliable information. The immunopeptidome is the entire