DESIGN OF PHOTO-OPTIMISATION OF PHOTOSENSITIZER FOR HUMAN HEALTH AND FOOD SECURITY APPLICATION OF "HOW LIGHT CAN SAVE LIVES"

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ABSTRACT:

Cancer and antimicrobial resistance account for two of the greatest threats of human health nowadays.[1] Their efficient confrontation is of utmost importance, but also constitute a major challenge. To meet these expectations, a variety of active compounds have been developed and among them, tetrapyrrolic photosensitizers (PS) are the ones who stand out as the most promising. This is due to their redox chemistry and their established applications in photodynamic therapy (PDT) as well as in photo-antimicrobial chemo-therapy (PACT). Despite their potentials, there are still a lot of unanswered questions that need to be addressed and training still lack large fragments in this field. To overcome these scientific barriers, the EJD POLYTHEA project aims to develop an integrated and multidisciplinary approach of PDT through the implementation of 10 parallel multidisciplinary PhD research projects.

4 years :

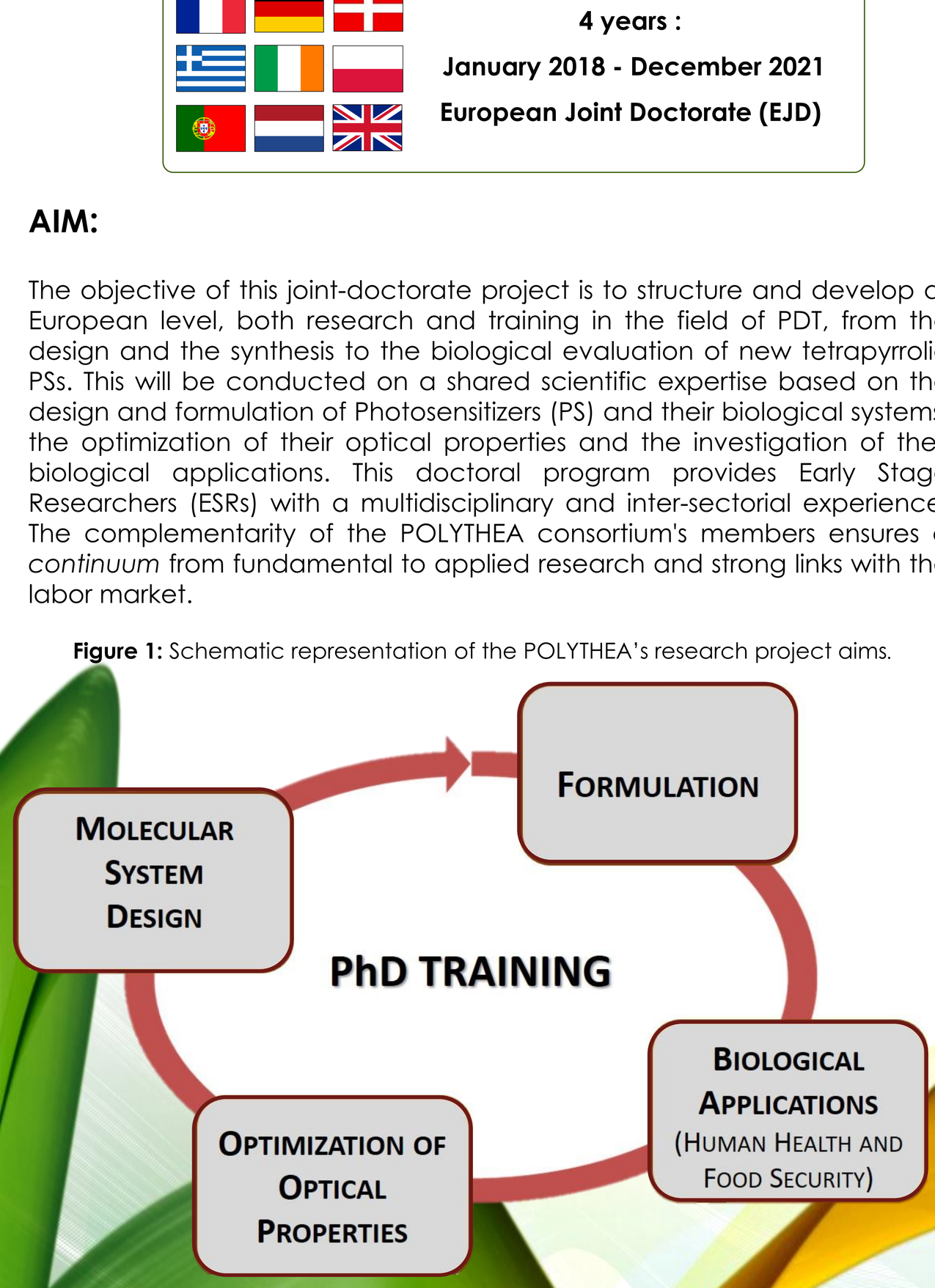
January 2018 - December 2021

European Joint Doctorate (EJD)

AIM:

The objective of this joint-doctorate project is to structure and develop at European level, both research and training in the field of PDT, from the design and the synthesis to the biological evaluation of new tetrapyrrolic PSs. This will be conducted on a shared scientific expertise based on the design and formulation of Photosensitizers (PS) and their biological systems, the optimization of their optical properties and the investigation of their biological applications. This doctoral program provides Early Stage Researchers (ESRs) with a multidisciplinary and inter-sectorial experience. The complementarity of the POLYTHEA consortium's members ensures a *continuum* from fundamental to applied research and strong links with the labor market.

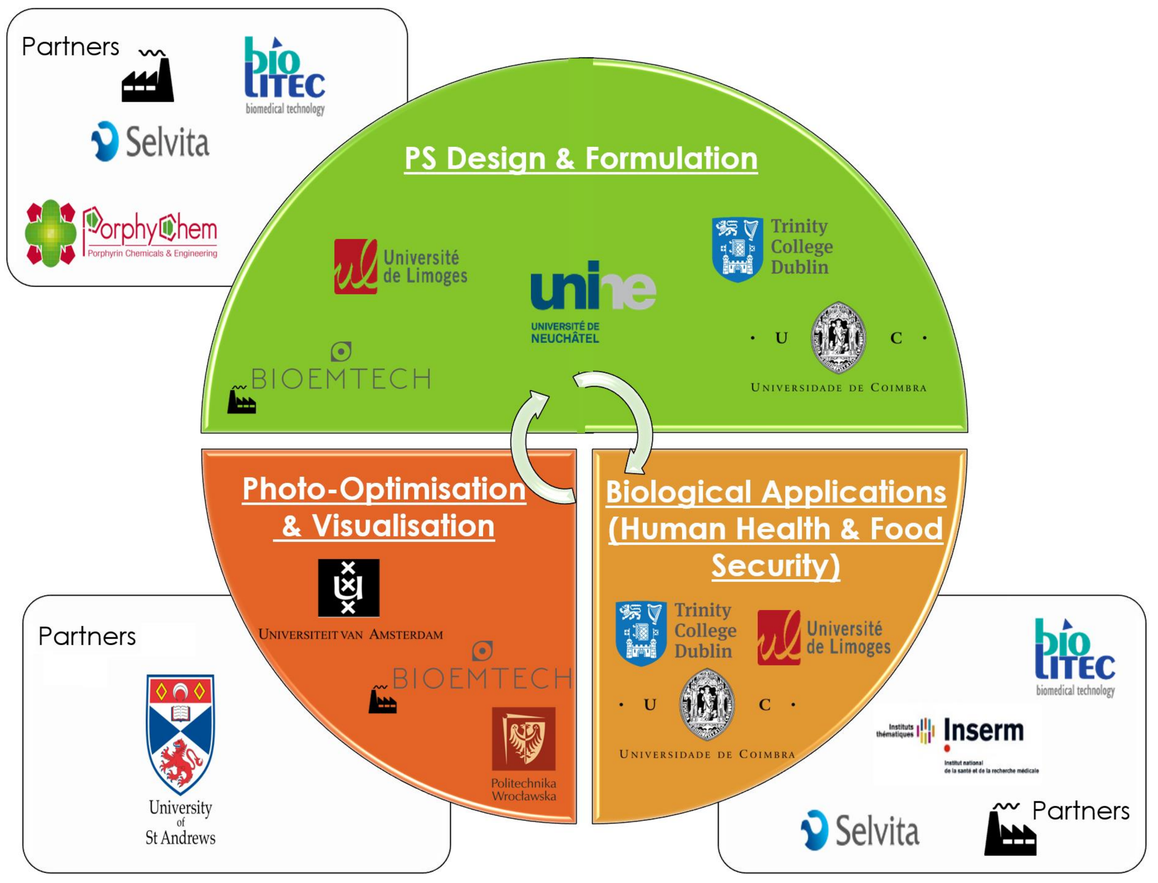
Figure 1: Schematic representation of the POLYTHEA's research project aims.



HOW:

The research methodology in POLYTHEA is based on a dichotomy between fundamental and applied research on a multidisciplinary approach. The POLYTHEA research is focused on tetrapyrrolic photosensitizer design for therapeutic applications. Three scientific areas are emphasized; chemical structure and optical properties, pharmacokinetics and biodistribution, and applications, within a joint doctorate structure gathering 10 individual ESRs. Their research projects are developed and conducted in parallel covering all disciplinary aspects involved in PDT. Under these conditions, POLYTHEA ensures not only further insight into structure-activities relationship and photochemical and biological mechanisms involved, but also allows exploring real potential applications and provides a common background on PDT to the ESRs making them more valuable employees and effective at problem-solving.

Figure 2: Schematic representation of the complementarity of POLYTHEA's consortium and partners.



The final goal of POLYTHEA is to develop (i) new tetrapyrrolic PS for various types of PDT including anti-cancer, anti-bacterial, anti-inflammatory and immune-activating application, improving their photophysical and biological properties; and (ii) innovative bio-inspired drug carriers or supports.

The role of BIOEMTECH is to study *in vivo* the distribution of PS, as well as assess the possible therapeutic effect, using our expertise and facilities in *in vivo* molecular imaging.

REFERENCES:

W. H. Organisation, https://www.who.int/).

ACKNOWLEDGMENTS:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie Grant Agreement n°764837.

BIOEMTECH is presenting this work on behalf of the POLYTHEA consortium.