BIO4DIA: Early detection and monitoring of metabolic progression of type 2 diabetes

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Abstract

According to the latest International Diabetes Federation 2015 report, the total health expenditure with type 2 diabetes (T2D) spent globally was of 673 billion USD in 2015 and it expected that this effort increases up to 802 billion in 2040. Additionally, patients experienced a series of complications, ranging from eye, cardiovascular, and kidney disease as well as pregnancy complications, nerve damage, foot infections and impaired regeneration [1-4]. Based on the most recent research in this area the cornerstone of treatment of T2D is the adoption of a healthy diet, increased physical activity and maintenance of a normal body weight and those are modifiable risk factors [5-9].

Actually, the large investment in T2D research allowed the identification of biomarkers that can be used to describe the progression of a sub-clinical stage to a clinical stage of diabetes and some biomarkers have been described with predictive potential value to differentiate between progressors/non-progressors [10-12].

Nevertheless, there is no technology at the present moment, that could be used at bed side and that could be rapidly and easily used by clinicians to monitoring their high-risk patients and also that could be sensitive, precise and cost effective. So, smaller, faster (one-step), and cheaper devices are highly desired for replacing the time-consuming and expensive laboratory-analytical methods. Biosensors meet these criteria. The idea behind the present proposal is to develop a point-of-care (POC) device for the measurement of biomarkers with predictive potential value to differentiate high risk individuals between progressors/non-progressors [13-17].

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This new perspective would benefit all the interested parties: Patients would benefit from better medical care in a personalized medicine perspective; Clinicians would benefit from a rapid, accurate, sensitive, low cost and easy-to-use tool for diagnosis and monitoring; Global health would benefit specially in those cases were early detection could reverse de course of the disease, decreasing the direct and indirect costs associated to that.

The BIO4DIA research team has know-how in the field (ADPD the reference institution for Diabetes health care in Portugal, Biomark/P.PORTO a leading institution for biomarkers research and biosensor development) and the working conditions to develop a prototype of POC device to measure T2D biomarkers (Technology readiness levels at stage 3/4), with future Patent submission.

To achieve these outcomes the project will take into account the following stages: 1) the reference values adjusted for the Portuguese population of the selected biomarkers must be clearly identified; 2) The biorecognition element of the biosensor must be selected in a way that allows the high-selective and accurate for the proper measurement of the selected biomarker; 3) The prototype should be submitted to a pre-test in a clinical environment.

This project is being developed with the collaboration of academic institutions that have the opportunity to involve both researchers and students from different BSc, MSc and PhD backgrounds that are taught in house: BSc in Medical Biotechnology; Biomedical Engineering, Chemical Engineering, MSc in Computation and Medical Instrumentation, Chemical Engineering and Health Biochemistry and from the PhD in Biotechnology (col. with Vigo University/Spain). The clinical community of APDP have the opportunity to involve several health professionals such doctors from several specialities regarding Diabetes and their complications, nurses and health technicians.

Finally, the BIO4DIA team is committed in prevention of T2D. Regarding this topic, it is intended to develop several workshops and health education programs. APDP has a School of Diabetes with programmes for both professional and general publics for diabetes education in Lisbon and Oporto.

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Keywords

Type 2 Diabetes; Early Diagnosis Biomarkers; Point of Care.

Acknowledgments. Authors acknowledge the funding entities. The project was supported by SAICT-POL/24325/2016. Carla Luís was supported by a scholarship with the reference SAICT2016/FEDER/BIO4DIA/BTI.