CIC biomaGUNE
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

PRESS RELEASE

Detecting antibodies rapidly using nanosensors based on CIC biomaGUNE patented technology

CIC biomaGUNE matures a business project in order to market innovative devices designed to detect respiratory diseases in self-test format

The project, backed by Basque Tek Ventures, presents an *in vitro* diagnostic solution with lower cost reagents and which do not require the use of animals

Donostia-San Sebastian (Basque Country). 9 April, 2024. Self-testing format devices to detect and quantify antibodies have become particularly relevant in recent years due to the implementation of personalized medicine, immune-related diseases or the threats of epidemics and pandemics. The potential of this type of medical tool was more than demonstrated during the COVID-19 pandemic.

However, current *in vitro* diagnostic platforms have certain drawbacks, such as high costs and dependence on animals for reagent production, lack of information beyond positive or negative results, and limited versatility and adaptability for new diseases, given that long, costly protocols have to be implemented, specific reagents need to be developed for each application, etc.

To address the need for easy-to-use diagnostic platforms for infectious diseases and which have the capacity to test for multiple diseases simultaneously, and to uphold the ethical commitment on the use of animals, CIC biomaGUNE is maturing a business project; it is backed by more than 10 years' scientific research, has patented technology and is being led by the Ikerbasque Research Professor Aitziber López-Cortajarena (scientific director of CIC biomaGUNE). The project has been promoted recently by the new Basque Tek Ventures, an initiative aimed at supporting and accompanying the setting up of new technology-based companies; it identifies and prioritizes the technological assets with the greatest potential, supports the creation of high-performance teams and accompanies the launching of the enterprise and its market access.

The technology developed and patented by CIC biomaGUNE is based on the detection of antibodies by means of nanosensors developed by the Biomolecular Nanotechnology group under the direction of Professor Cortajarena. These are designer proteins capable of stabilizing nanomaterials with catalytic or luminescent properties. "Biosensors used in diagnostics comprise a biorecognition element and a transducer element, which provides the signal in the presence of the molecule to be detected. We have managed to develop nanosensors that incorporate the two elements into a single molecule: a specific biorecognition site is built into the design protein with the nanomaterial," explained Professor Cortajarena.

Multiple advantages

This new technology has numerous advantages, since “it overcomes many of the constraints of the technologies currently used, such as reproducibility between different batches, production cost, the time required to generate new reagents, etc.”, said Cortajarena. The design flexibility, detection sensitivity and reagent stability of the technology developed by CIC biomaGUNE have also been highlighted.

“By simply changing the biorecognition element, the nanosensors can be adapted to detect any type of antibody. This means that new nanosensors can be rapidly developed for new needs,” she said. What is more, the fact that nanosensors for different antibodies of interest can be integrated into the same device, “means that it would be possible to simultaneously analyze the presence of different antibodies, i.e., a multiple detection system could be incorporated into the same device”, she added. This “robustly designed, low-cost and easily adaptable system for detecting different antibodies” offers the added advantage that “the reagents are not based on animal-generated antibodies or by means of expensive systems. It is a more ethical and sustainable technology”.

At first, proofs of concept were carried out on respiratory diseases, “because the project was based on the work developed just when the pandemic began, and because we found ourselves up against the need to quickly diagnose infections about which it was not known whether they were viral or bacterial in order to determine how to treat them,” said the professor. So the first point of entry onto the market envisaged the detection of human respiratory infectious diseases (caused by various respiratory viruses, flu, COVID, etc.). But the versatility of this technology goes beyond that because “it allows antibodies of any infectious disease, such as sexually transmitted diseases, or autoimmune diseases or allergies, to be determined. The indications may be very broad”, said Cortajarena.

The antibody detection technology based on these nanosensors developed at CIC biomaGUNE “has been validated at laboratory level. Now we have to move on to the prototyping phase. A pilot study is needed to validate it in a clinical setting”. But in view of the advantages provided by this technology, “we are confident that the industry producing rapid test devices will be interested in it”, said Cortajarena.

About Aitziber López-Cortajarena

Ikerbasque Research Professor Cortajarena has a PhD in Biochemistry from the University of the Basque Country (UPV/EHU) (2002), and worked as an associate scientist in protein design at Yale University until 2009. In 2010 she started her independent research in nanobiotechnology at IMDEA Nanoscience Institute until 2016, when she joined CIC biomaGUNE. She is the author of over 100 scientific papers that have been cited more than 2,900 times, 2 published books and 5 patents.

Her work has been recognized through the Horizon Award of the Royal Society of Chemistry, the Research Excellence Award of the Spanish Royal Society of Chemistry and the Ikerbasque Award for Women’s Track Record in Science. She has been distinguished in the Platform for Women Scientists and Innovators of the Ministry of Science and Innovation. She is Associate Editor of ACS Applied Biomaterials, ACS Publications, and Senior Editor at Protein Science,

Wiley. She is vice-president of the Spanish Society of Biophysics and committee member of the European Biophysical Societies Association and committee member of the International Protein Society. In 2023 she was appointed corresponding academician of the physics and chemistry section of the Royal Academy of Sciences.

The professor has obtained multiple European projects, including an ERC Consolidator Grant (ProNANO), two ERC-Proofs of Concept (NIMM; NanoImaging), an ERA-CoBioTech, four FET-Open projects (e-Prot, ARTIBLED, FairyLights, DeDNAed), and an EIC Pathfinder project (iSenseDNA). Cortajarena has a solid reputation in the field of protein engineering and her group is achieving worldwide recognition due to its contributions that are crucial in the design and development of protein-based hybrids with specific architectures and functionalities.

About CIC biomaGUNE

The Center for Cooperative Research in Biomaterials CIC biomaGUNE, member of the Basque Research and Technology Alliance (BRTA), conducts state-of-the-art research at the interface between Chemistry, Biology and Physics, devoting particular attention to studying the properties of biological nanostructures at the molecular scale and their biomedical applications. It was recognized in 2018 as a “María de Maeztu” Unit of Excellence for meeting requirements of excellence, which are characterized by a high impact and degree of competitiveness in its field of activity on the global scientific stage.