**FET Consultation - template FET Flagships**

**About you**

The Institute of Neurological Sciences (ISN) of the National Research Council (CNR) includes the main site in Cosenza, and the two branches in Catanzaro and Catania. The primary mission of the ISN is to advance the understanding of neurological disorders by means of a high quality and interdisciplinary approach. The ISN is a center of excellence where clinical services and research activities thrive together. In addition to fostering innovative research and spreading of scientific knowledge, the ISN develops advanced diagnostic testing and cutting-edge biotechnologies.

**What is the challenge and the vision?**

The worldwide trend in healthcare is to deliver a personalised medicine. Over the last decade, enormous progress has been made on recording the health state of an individual patient down to the molecular level of gene activity and genomic information. However, the hope to use all this information for personalized medicine that is to tailor medical treatment to the needs of an individual, remains largely unfulfilled. Moreover, the conventional diagnostic techniques are time-consuming and require centralized laboratories, experienced personnel and bulky equipment. To tackle this challenge, there is a strong need of cutting-edge diagnostic techniques that provide faster, more accurate and more comprehensive diagnoses of diseases. To this regard, the micro- and nanoscale technologies for biology have achieved spectacular progress as an enabling technology to drive long-term sustainability, opening new opportunities and providing powerful tools in the fields such as genomics, proteomics, molecular diagnostics, and high throughput screening. These microscale biosensors promise a low-cost, rapid, and simple-to-operate analytical tools for applications in a variety of common medical conditions and can be used to develop more portable devices for point-of-care applications. Despite the impressive number of publications on biosensors in the diagnostics field, the commercialisation of this technology is feasible only minimally in the near future. This can partially be due to the need to prove the stability and reliability of the biosensors

The overall objective of the action is to develop a biosensor device able to perform multiple tests on a small sample volume in a variety of clinical settings, to give out the diagnosis of some diseases in one single test and, simultaneously the information on the therapy to follow. This will be achieved by exploiting breakthroughs at the confluences of bio-, micro- and nano- technologies to create a low-cost non-invasive intelligent diagnostic system. The rationale for the proposed research is that once developed, the genomic test will represent a potential support to diagnosis and to predict the efficacy of therapeutic treatment and will allow a relevant advancement towards the concretization of a medicine more personalized, with lower collateral effects for the patients and lower costs for the health.

**Why is it good for Europe?**

The central challenge of modern medicine is the stratification of patients, based on novel biomarkers, and the classification of patients into subgroups with different combinations of disease-perturbed networks. There is a strong consensus that the innovation applied to biosensor and nano-technologies enable a personalised medicine offering a different approach to current medical practice. Providing many different medical solutions both for therapeutics and diagnostics, the nanotechnology-based methods have already a huge impact on healthcare. In particular, there are many health areas that are potentially impacted, some of which include: disease management and monitoring, therapeutic intervention, preventative medicine, medical information, medical information and short-term feedback. The innovation technologies can, moreover, driver the economic progress helping to cut costs, improve products and open new markets.

The research initiative proposed fits perfectly with the research plan explored by European Commission. In the field of personalised medicine, the EU supports collaborative projects between key healthcare players, such as university, the pharmaceutical industry, small and medium-sized enterprises (SMEs), research institute, and patient organisations. Under Horizon 2020, in particular, have been started projects on new ideas for radically new future technologies, inspired on cutting-edge science.

**What would it take to do it?**

The introduction of nanotechnologies into medical applications requires extraordinary effort and time to allow the pooling of resources and greater collaboration between the public-private sectors and small and medium-sized enterprises. The high-skilled personnel, the excellent research, education, industry, render the Europe able to compete in research and innovation at a global level. However, in a situation of constant technological change and innovation, the acquisition of higher and new skills would be the proper response to remain competitive. To this regard, the collaboration in scientific and technological research and development, will help to bring a broader set of skills, more effective services and products. To simplify the process of designing and testing new technologies, the ISN, thanks to its expertise in the genomic sector, can help the industry to be better equipped to bring safe and effective medical devices to market more quickly and at a lower cost. At the same time, the collaboration with the industry will allow ISN to exchange and share knowledge, experiences, know-how and expertise and achieve their concrete goals in a more efficient way.

Specifically, the ISN action will contribute significantly to the identification of a low cost technological system-solution useful in biology and medical research for diagnosis and screening of several human diseases. The innovative device has the potential to lead advances in a broad range of industrial sectors relevant also for the European economy.

In this context the contribution of expertise from the public sector and the private sector, through a process of integration of the whole supply chain, enable the mobilization of scientific and technical resources to develop a range of new technologies that meet the needs of patients/citizens, being able to contain, at the same time, the overall cost of health care system.

To this regard, the ISN research unit of Catania participates in the Sicily Technologic District Micro and Nano systems and in the National Technology Cluster “Alisei” for Life Sciences. In these projects, the ISN is actively involved in technology transfer, developing and validation of innovative diagnostic biosensors for qualitative and quantitative genetic analysis with personalized medicine applications.

The strong background and expertise acquired and consolidated in the identification of genomic biomarkers for research and diagnostic applications renders the ISN able to meet the needs of biotechnologic, pharmaceutical and semiconductor companies.