***"*Development of a regional network of laboratories for systems biology approaches in human diseases (BISIMANE)"**

The Project has been co-financed by the Apulia Region in the amount of € 113.000 assigned to CARSO Consortium for the duration of 24 months. Total cost of the project €. 2.410.560,00.

Partners:

- University of Bari
- University of Foggia
- CARSO Consortium
- C.N.R.

Participating companies:

- Apuliabiotech S.c.r.l.
- Extrasolution S.r.l.

Results

CONSTITUTION OF THE LABORATORY NETWORK

Integrated approaches to Cellular Biology can be developed in a network constituted by:

1. The **Biobank** dedicated to the collection of biological samples (cells, tissues, blood, biological fluids) and connected with a database which contains demographic data and clinical and laboratory findings, in cryptic format and documented by informed consent signed by patients who are the source of biological samples. Medical doctors and biologists will partecipate in the collection and storage of samples and in the management of the Biobank.

2. The **Genomic and Transcriptomic** platform consists of high-through-put technologies which are used for studies on gene polymorphisms in the human genome (genome wide association studies, GWAS) and gene expression in peripheral blood circulating cells and/or in tissue in different human pathological disorders. This platform may be used for other purposes in agriculture and zootechny using the samples of specific biobanks. Molecular Biologists, Biostaticians and Bioinformaticians will partecipate in the management of this platform and in the development of obtained results.

3. The **Proteomic Platform** includes differential in gel electrophoresis (DIGE) and mass spectrometry (SELDI-TOF/MS e MALDI-TOF/MS). Chemists, Molecular Biologists, Bioinformatics are skilled in the use of this technological platform in the study and analysis of protein expression profiles of several biological samples. Furthermore, protein identification study and characterization of protein post translational modifications are also performed.

4. The **Metabolomic Platform** is represented by the Proton Nuclear Magnetic Resonance (NMR) spectrometry dedicated to the studies of metabolites in biological fluid samples like serum, urine, synovial and cerebrospinal fluid.

5. **Laboratory of Biostatistics and Bioinformatics** for the study of systems biology that seeks to link all the data coming from the platforms in order to study and understand the physiological processes of our body and the different pathological processes that are involved in different diseases.

DEVELOPMENT OF THE LABORATORY NETWORK

1. The BISIMANE project aims to join the present biobanks, working in the Department of Emergency and Organ Transplant (DETO), with the **centralized Biobank**. Only very few public structures have well organized biobanks for the collection of biological materials in Italy. In most cases the biological material is stored by single groups of researchers, using simple resources (refrigerators and liquid nitrogen containers).

These simple systems of collections are lack specialized staff and there are insufficient funds to ensure the high quality and safe storage of samples and their distribution. In addition, they are not supported by a computerized system for the management of data. Our aim is to standardize, optimize and guarantee high-level of quality and safety of biological sample storage.

2) The **Genomic and Transcriptomic Platform**, will be allocated for the first time in the DETO of Bari University, for performing studies on gene polymorphisms, already done by some researchers of the DETO in other institutions of the North Italy. Studies on the gene expression in cells and tissues will be also carried out by the researchers of the partner institutions partners who have been involved in this field for some years ago.

3)The Up-Grade of the **Proteomic Platform**, located in the Interdepartimental Center Bioagromed of Foggia University, will improve the protein profile expression studies of biological samples (serum, urine, saliva, cell culture medium and cell extracts) and will increase the confidence of the obtained results.

4)The up-grade of the **Metabolomic Platform**, located in CARSO Consortium (Valenzano, Bari), is represented by a multinuclear and multidimensional NMR spectroscopy, which develops spectroscopical patterns of metabolites in various biological fluids.

5)The composition in Apulia, for the first time, of an **integrated systems biology laboratory** will promote and foster multidisciplinary research between researchers working in strategic sectors of Medicine and Surgery, Molecular Genetics, Biology, Biostatistics and Bioinformatics, Biochemistry, with goal of better understanding the genetic and genomic basis of complex diseases. The integrated approach to biology is direct to the study of connections, mutuals variations and dynamics between the parties. To achieve these ambitious goals requires the use of modern efficient technologies, which are able to analyze the mutations, the levels of expression and its protein products to tens of thousands of genes simultaneously. These technologies allow to obtain a fingerprint at the cellular and molecular state of tissue and provide a unique opportunity to address the problem of diagnosis, prognosis and treatment of complex diseases such as cancer from the point of view of quantity rather than quality.

In conclusion, the **Regional Network of Omics Laboratories,** based on **high throughput technology platforms,**
will have the collaboration of many researchers on the territory of Puglia. Correlations between different omics like genomics, proteomics and metabolomics in the field of human health. Will be studied in addition, the development of a laboratory of Systems Biology will design in silico models that will be validated in experimental in vitro and in vivo models. Today, this topic is of considerable interest for the European Union, which has included it in the 7th Framework Programme.

The same network technology can provide information of high scientific content in food and livestock because the assets gene (DNA and RNA) with its products (proteins and metabolites) is also present in plants and animals.