STRENGTHENING INFRASTRUCTURE AND EQUIPMENT FOR RESEARCH ON INFECTIOUS DISEASES AND EMERGING EPIDEMICS

Foundation for the Promotion of Health and Biomedical Research (FISABIO).

Programa Operativo de la Comunidad Valenciana

Fondo Europeo de Desarrollo Regional
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Presentation

In the last fifteen years, there has been a major advance in the technological development of data storage and analysis systems for genomic analysis, including sequencing of microorganisms. These studies have multiple applications in the field of health research for the identification of what originates and develops a disease, the identification of mutations or alterations of its genetic material and the complete sequencing of the microorganisms for the generation of vaccines. The ability to quickly and effectively prevent and combat infectious and epidemic processes that may arise in the Valencian Community depends to a large extent on the knowledge of the microorganisms that cause them.

Within the administration of the Valencian Community, one of the areas of research that is promoted directly from the Department of Universal Health and Public Health, is research in Public Health and within it, the area of epidemiology. That is why in the Generalitat it has been considered important to invest in infrastructures that strengthen the research laboratories in Public Health, whose management is currently carried out by the Foundation for the Promotion of Health and Biomedical Research (FISABIO).

The project presented as Good Practice has been promoted by the Department of Universal Health and Public Health and managed by FISABIO for the improvement and strengthening of research infrastructures in infectious diseases and emerging epidemics. The investment made is EUR 1,285,481, of which 50% (EUR 642,741) have been co-financed by the Regional Operational Programme European Regional Development Fund (ERDF) of the Valencian Community 2014-2020.

There are more than 40 referral hospital centers throughout Spain that send samples of genetic material extraction (RNA) from patients diagnosed with COVID-19 for FISABIO laboratories to perform a rapid sequencing and optimal management of their results.
The following are the arguments that make this project a good practice according to the criteria defined:

1. The project has been appropriately disseminated among beneficiaries, potential beneficiaries and the general public.

In fulfilment of the communication obligations, all the infrastructures acquired for research in this strategy have been duly labelled, and on the website of FISABIO Foundation, their acquisition and funding has been disseminated with funds from the Operational Programme ERDF 2014-2020.
On web pages

http://www.san.gva.es/web/dgree/fondos-feder

http://gacetamedica.com/investigacion/la-universidad-de-valencia-obtiene-los-tres-primeros-genomas-del-sars-cov2-en-espana/

In addition, when a press release has been published concerning research carried out with these technological infrastructures, ERDF funding has been mentioned, as has been done in the journals of scientists where the findings obtained from the research carried out with the aforementioned equipment have
Los grupos formados por personal investigador especializado en virología, epidemiología y bioinformática han determinado que una de las cepas analizadas está relacionada con otras cepas europeas (Italia, Alemania, Luxemburgo, Francia, Países Bajos, etc.). «El siguiente paso será analizar secuencias de más muestras de pacientes de los hospitales de la Comunitat Valenciana para poder comparar las variaciones entre ellas y con las cadenas de transmisión «trazadas» por el personal sanitario en epidemiología», explica Fernando Marín.

El análisis de genomas virales permite monitorear las vías por las cuales ha entrado el virus a esta comunidad y cómo se transmite en estos momentos, lo que ayuda a las autoridades sanitarias a tomar decisiones mejor la expansión del virus en este territorio, aseguran desde la universidad valenciana.

Además, la secuenciación del genoma del virus permite conocer las mutaciones que ha experimentado desde que comenzó la epidemia y la conclusión a la que se ha llegado después del análisis realizado en que, hasta ahora, no se ha encontrado ninguna mutación asociada a una mayor virulencia, letalidad, o alguna propiedad interesante desde el punto de vista clínico.


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[https://twitter.com/GVAfisabio/status/1269940856506761219/photo/1](https://twitter.com/GVAfisabio/status/1269940856506761219/photo/1)

La visita continúa con el investigador @fgonzalef y en el servicio @ngs_fisabio junto a @gidauria, @llucinthesky y @Francinopal, equipo que secuenció por primera vez el #genoma del SARS-CoV-2 en España #SanidadComValFEDER
2. The project incorporates innovative elements

The availability of these high-tech infrastructures gives the Valencian Community enormous possibilities in public health research and its relationship with infectious viral and bacterial diseases, epidemic outbreaks, etc., which have so far not been possible in our territory; studies that are needed to generate advances in health policies and improve current health care benefits.

In this respect, the incorporation of the infrastructures co-financed by the ERDF has meant that the laboratory has expanded its portfolio of services, becoming the only laboratory at national level capable of carrying out certain sequencing at an appropriate time ratio. By way of example, if a sequencing machine allowed up to 96 sequences per week, now with the new infrastructures it is possible to achieve 688, that is, about seven times more weekly sequences. It should be noted that the samples have been sequenced through MinIOn, a third generation sequencer from Oxford Nanopore Technologies that has been acquired with the help of ERDF funds along with other state-of-the-art equipment.

The techniques for the knowledge of the complete genome have other applications as evidenced by the genomic epidemiology studies of SARS-CoV-2 in Spain, in which the Sequencing and Bioinformatics Service and the group of Molecular Epidemiology of FISABIO have been precursors and leaders in the sequencing of genomes of the virus, thanks to this same infrastructure. In particular, the sequencing team allowed the implementation of whole genome sequencing bacteria and hepatitis viruses, enteroviruses, influenza and several respiratory viruses.

3. Adequacy of the results achieved with the objectives

Thanks to the contribution of the ERDF funds, the Valencian Community’s capacity to respond to epidemic outbreaks has multiplied, as demonstrated by SARS-CoV-2. In fact, most of the positive cases of hospitals in the Valencian Community are being sequenced in the sequencing and bioinformatics service of FISABIO and as a result we are the Autonomous Community that has more epidemiological information about the onset, progress and development of infection in its territory. This will be of great help in the study of outbreaks of the disease and in the study of modifications of the virus against possible vaccines and antiviral treatments.
Of the 15,000 samples committed to be sequenced, in which more than 40 hospitals and research centers from all over Spain participate, more than half will be sequenced by FISABIO. In fact, it has so far sequenced **70.25 %** of all samples throughout Spain.

4. **Contribution to solving a identified problem or weakness**

The emergence of a pandemic such as the SARS-CoV-2 derivative requires a rapid and effective scientific response and more when the number of people affected and deceased is significant. Efforts to know the causative virus, its forms of transmission and the possible mutation associated with greater virulence, lethality, or some clinically interesting property, are indispensable in order to fight the pandemic and prevent new outbreaks.

The research carried out by FISABIO with the new sequencers that have allowed the discovery and analysis of viral genomes will contribute to understanding the ways through which the virus has entered our territory and how it is transmitted, which will help the health authorities to control the spread of the virus much better.

One of the actions that is being carried out based on the existence of these infrastructures in research in epidemiology, is the implementation of a **network of information on** the pathogenic microorganisms identified in the different health centers of the Valencian Community.

5. **High level of coverage of the target population**

Although, as mentioned above, the infrastructures are located in the **laboratories** managed by the FISABIO foundation, the potential beneficiaries of this strategy are 100 % of the population of the Valencian Community, given that the results of these research are those that will be transferred to epidemiological prevention, rapid response of the health authorities in case of epidemic outbreaks, generation of vaccines more effective, and in general, in everything that is related to the Public Health of Valencia.

Thanks to the ERDF contribution, the FISABIO laboratory has become the only laboratory at national level capable of carrying out certain types of sequencing rapidly, in particular SARS-CoV-2, which is responsible for COVID-19. Obtaining the complete genome sequencing allows us to know the virus, identify it quickly and accurately, study the virulence of mutations, identify the transmission mechanisms within the population and ultimately, the generation of vaccines.

Although FISABIO’s laboratories focus the reference centre, within this strategy, and in parallel with the strengthening of research infrastructures in the area, the FISABIO Foundation is carrying out a series of **training activities in the health centers of the Valencian Community** that will allow the analysis of the pathogen to be accelerated in all the geographical areas of our territory, and consequently the response to it, in the event of a rapid outbreak of epidemic that must be combated.

6. **Consideration of horizontal criteria of equal opportunities, non-discrimination and environmental sustainability**

The project respects the principles of equality, non-discrimination and environmental sustainability, as its results will be aimed at men and women alike throughout the territory of the Valencian Community, and without any impact on the environment.

In particular, the project presented is part of the strategies implemented by the **IV Health Plan of the Valencian Community 2016-2020**, which constitutes a reference point and road map for the development of public health policies with the aim of improving the level of health and reducing the level of health inequality of the entire Valencian population, especially the most vulnerable persons such as children, the elderly, women victims of gender-based violence and persons with functional disabilities.
7. Synergies with other policies or instruments of public intervention.

This project is related to other strategies at the global, national and regional levels.

**The One Health Strategy** is a global strategy that advocates that human and animal health are interdependent and linked to the ecosystems in which they coexist. As the World Health Organisation explains: “Many microbes affect both animals and humans when they live in the same ecosystem. The efforts of only one sector cannot prevent or eliminate the problem.”

Based on the national strategy, the project is in line with the 2030 Agenda for Sustainable Development proposed by the UN, specifically Goal 3. Health and Well-being, and within this, the 3. B R & D VACCINES AND ESSENTIAL MEDICINES whose goal is “Support the research and development activities of vaccines and drugs for communicable and non-communicable diseases.”

At the regional level, on the one hand, the IV Health Plan of the Valencian Community 2016-2020, in its objective “Decrease the incidence of communicable diseases under surveillance.”

Finally, this project is also included in the Intelligent Specialisation Strategy for Research and Innovation in the Valencian Community (RIS3-CV). Measure 13 promotes research into infectious diseases and emerging epidemics at both individual and population levels, as well as the establishment of the necessary infrastructures or the improvement of existing ones for this purpose. It includes research on vaccines against such agents and support for research projects in these areas.
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