



Funded by
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New information to achieve an increasingly predictive and personalized medicine. This is the aim of HERVCOV, the research project that brings together researchers from 5 different EU countries, and is investigating a protein discovered in severe COVID-19 patients.

1) What issue does the HERVCOV Project address?

COVID-19 is a disease caused by SARS-CoV-2 virus, and the high frequency of its long-term complications are now a major health problem worldwide.

Due to the significant heterogeneity of COVID-19, there is a need for biomarkers that can identify individuals predisposed to develop severe forms of the disease, while also considering its long-term complications, and that can drive treatment options moving closer toward personalized medicine.

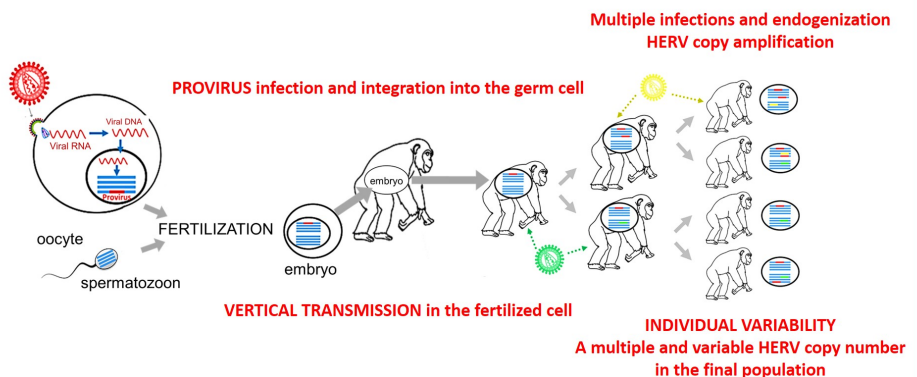
Scientific evidences have shown that SARS-CoV-2 causes the activation of a particular human endogenous retrovirus identified as HERV-W.

2) What are Human Endogenous Retroviruses (HERVs)?

Endogenous Retroviruses are gene sequences derived from ancestral infections by exogenous Retroviruses that have infected germ line cells, integrating into the genome of various species including primates and humans.

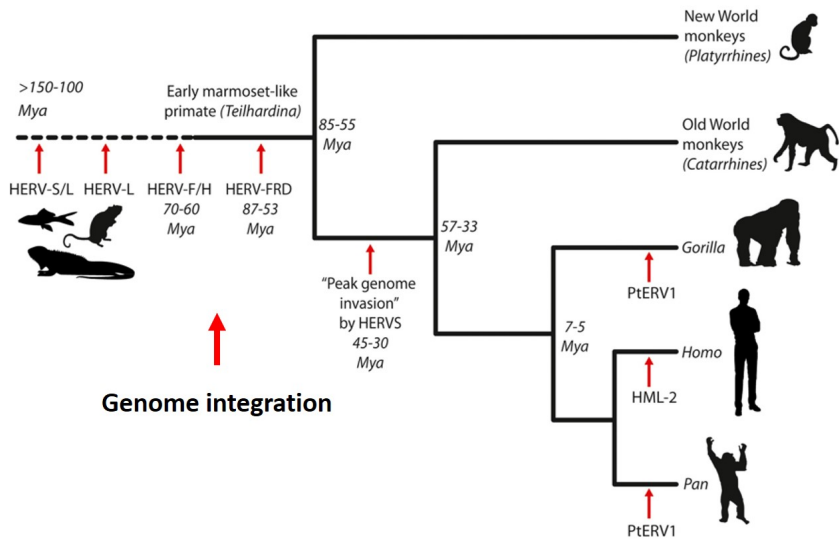
Under certain conditions, some copies of HERVs can be activated, particularly the sequences encoding the HERV-W and HERV-K family envelope proteins, as a result of modification of epigenetic control or direct transcriptional activation.

Retroviral endogenization in the genome of species



Levet 2019 et al (modified)

The endogenous retroviruses: evolution with the animals' genomes



Contribution to the complexity and physiological functions of evolved species

3) What does the HERVCOV project focus on?

Since 2019, more than 600 million SARS-CoV-2 infections have been recorded, causing more than 6.5 million deaths worldwide (<https://coronavirus.jhu.edu/map.html>).

Although at this stage of the pandemic the most severe symptoms appear to be alleviated, several studies have shown long-term effects in cured patients, affecting the nervous, gastrointestinal, cardiovascular and even mental health systems.

The HERVCOV project could offer important insights into further diseases by studying host responses in different scenarios. With these studies, a greater understanding of risk factors, interpretation of symptoms, progression of different diseases, and clinical outcomes in relation to individual characteristics could be ensured in the near future, with implications within the health care system.

The identification of critical factors and the related immunological response of the individual will also lead to specific therapeutic interventions and vaccination plans.

4) What is the scientific basis of the project and our hypothesis?

The interaction between exogenous (SARS-CoV-2) and endogenous (HERV) viruses may contribute to the abnormal inflammatory response observed in COVID-19 patients.

COVID-19-associated symptoms develop only in a certain percentage of patients infected with SARS-CoV-2 as a result of their susceptibility to allow SARS-CoV-2-induced HERV-W ENV activation in critical cell types. Recent data obtained by consortium research groups have shown that the HERV-W ENV protein is highly expressed in the lymphocytes of COVID-19 patients and correlates with inflammatory markers and respiratory outcome of the disease, strongly suggesting the role of HERVs in the pathogenesis of COVID-19.

In addition, HERV-W protein has been found in glial cells of the brain of COVID-19 patients...

5) What are the main objectives of the project?

Over 5 years, the specific goals of HERVCOV will be:

1. To analyze the cellular and molecular mechanism of SARS-CoV-2-induced HERV activation;
2. Determine biomarkers to discriminate biochemical profiles associated with COVID-19 for individualized medicine.
3. Define the panel of HERV-associated biomarkers to enable patient stratification, diagnostic guideline setting, and prognosis of COVID-19.

Diagnostic and predictive panels derived from our basic research and subsequent assessments of HERV-associated biomarkers may define new markers in precision medicine-based therapeutic strategies leading to individualized medical treatment in COVID-19. This will lead to a new awareness toward one's health and a revision of the relationship with the physician. medical decision support will also be established based on personalized patient studies.

6) Which research groups participate in this study?

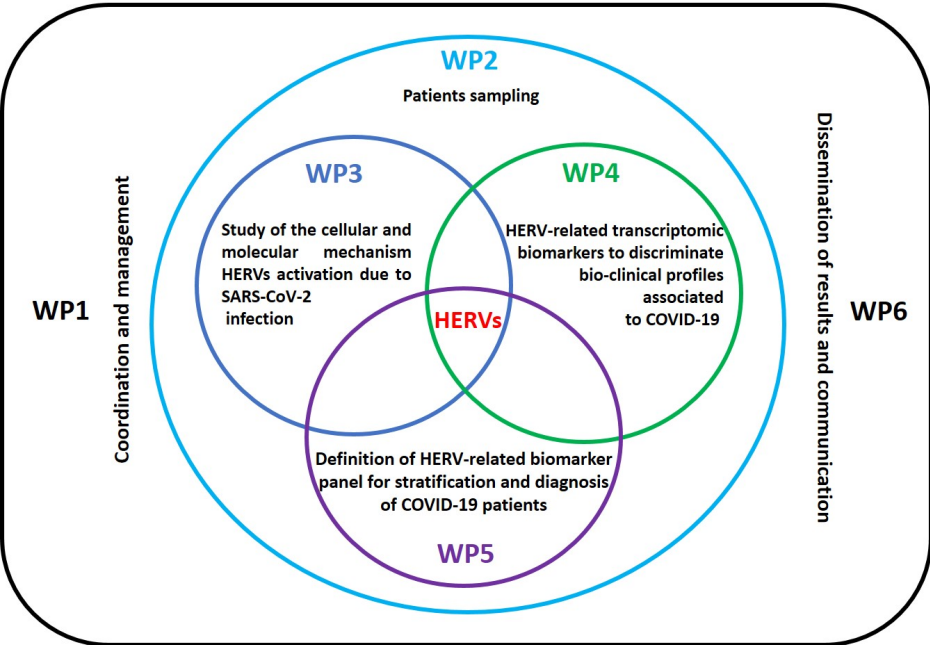
The HERVCOV project will be carried out through close collaboration among 9 groups from 5 different European countries, with complementary expertise, who share the common goal of understanding the role of HERVs in the pathogenesis of COVID-19 and associated POST COVID-19 manifestations and developing a panel of biomarkers to enable targeted therapy in patients.



The project, coordinated by the Institut National de la Santé et de la Recherche Médicale (France), involves not only the Chair of Microbiology and Clinical Microbiology, Department of Experimental Medicine University of Rome Tor Vergata (UNITOV) for research, and the Frascati Scienza Association (FS) for the dissemination part, also the Ethniko Kai Kapodistriako Panepistimio Athinon (Greece), Instituto Aragonés de Ciencias de la Salud (Spain), Fundación Agencia Aragonesa para la Investigación y el Desarrollo (Spain), Geneuro Innovation Sas (France), Inserm Transfert (France), and Klinicki Bolnicki Centar Rijeka (Croatia).

The consortium consists of a strong, interdisciplinary and balanced group with a wide range of expertise in infectious diseases, immunology, transcriptomics, proteomics, statistical analysis and bioinformatics, biobanking, as well as public health, epidemiology and primary care of COVID-19 patients.

Relationship of WP (Working Package) involved in the HERVCOV project



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