The research potential of the EUROCHAMP-2020 community on the COVID-19 outbreak

EUROCHAMP-2020 infrastructure gathers together the European Atmospheric Simulation chambers, which are all equipped with up-to-date instruments for detecting the fate and behaviour of various pollutants and particles.

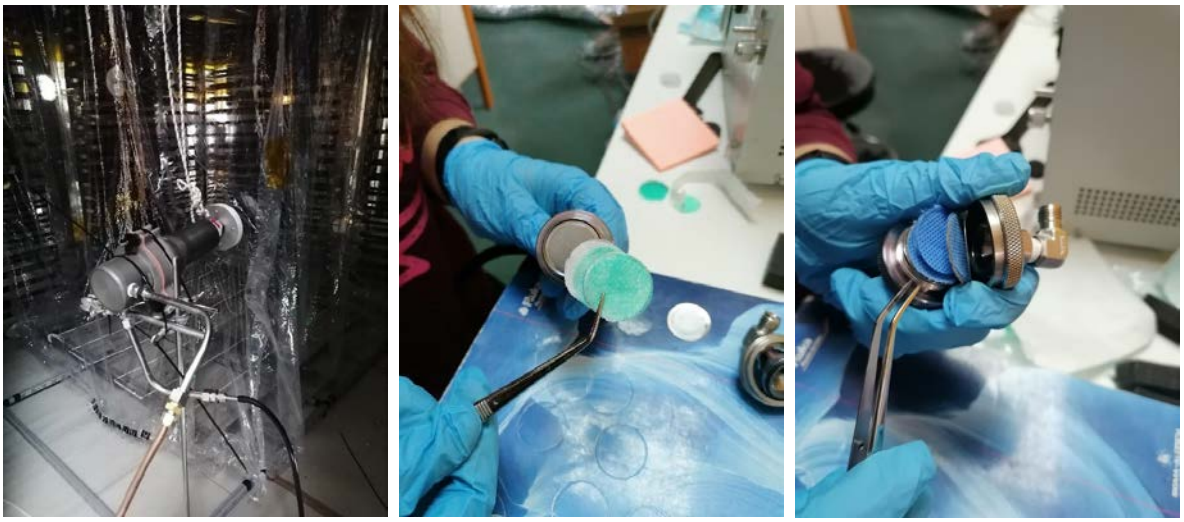
According to current evidence, COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes, with an emerging question about the possibility of airborne transmission. In both cases, the virus seems to be conveyed by particles. Humans, therefore, need to protect themselves and understand the fate of infected droplets. These questions fall within the scope and skills developed in EUROCHAMP-2020.

Understanding the fate of droplets can be investigated by some simulation chambers. One important research question which can be addressed using chambers is the testing of the virus' resilience in the atmosphere and on specific surfaces.

The chamber dedicated for such studies is the Italian simulation chamber ChAMBRe, developed by INFN (Istituto Nazionale di Fisica Nucleare): the chamber is specialised in the study of bioaerosols, in particular on the survival of pathogens in the air or on surfaces. In the current situation, the chamber can be used to study the times and ways of survival of COVID in the air. Even though the chamber is still not equipped with biosafety class-2 infrastructure and the scientists who operate it are not yet trained to manage really dangerous microorganisms, it could be used by trained groups with the proper expertise, who could propose suitable experiments (eg. working with weakened viruses, bringing mobile protection devices...). The use of simulation chambers by external research groups is possible through the Trans-National Access programme (TNA).

The COVID-19 outbreak has also revealed, at European scale, the urgent need of providing masks to hospitals and citizens. The measurement capacity built by EUROCHAMP is, in this specific crisis, fully adapted to support all actions in testing masks and other medical equipment being currently produced all over Europe. Several facilities (CNRS-IRCELYON, FORTH, KIT) are now providing support to public agencies and companies, to test such equipment. Thanks to the instrumentation and know-how available, it is possible to measure the retention efficiency for well-defined particles (as a function of their size) to ensure that the masks suit their purpose.

On this particular subject, a specific example of the utility of simulation chambers is the work performed at the Institute of the Chemical Engineering of the Foundation for Research and Technology Hellas (FORTH) in Patras, Greece. Several FORTH teams are collaborating to construct and test several materials and designs for high performance face masks to be used by the medical personnel. The testing (measurement of the penetration efficiency of particles in the 20-600 nm size range) is performed using the FORTH-ASC simulation chamber, thus allowing fast and accurate tests of the filtration efficiency due to the stability of the aerosol in the reactor.



Testing filtration efficiency of materials for mask production to help protect the medical and broader community in FORTH, Patras.