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COVIPA und CORAERO Join Forces

Two large scale Helmholtz projects finish their work – Need for action remains!

The COVID-19 pandemic highlighted the necessity of researching the detection, transmission, epidemiology and pathogenesis of airborne viruses as well as induced and natural immunity against these pathogens. [COVIPA](#) and [CORAERO](#)—two large-scale Helmholtz research projects, with over seven Helmholtz centres and four university partners—have produced comprehensive data on respiratory diseases in epidemic, pandemic, and endemic settings. Using these insights into sustainable public-health measures is crucial to improve pandemic preparedness in the future.

[COVIPA](#) and [CORAERO](#) have delivered insights on respiratory-virus transmission, determinants of immune protection, pathogenesis, early severity prediction, and public-acceptance patterns. Yet structural gaps remain in transforming this knowledge into sustainable measures for better preparedness against future pandemics and to take advantage of technology developments made by these two consortia. Immediate actions, including sustained preparedness investment, and targeted mitigation technologies are required to establish Helmholtz as a cornerstone of a German pandemic preparedness network.

Key Findings

PREVENTION

Vaccine development and biosafety infrastructure

Development of a novel vaccine platform suitable for immunization against a broad range of pathogens.

Implication: Biosafety level 3 and 4 facilities suitable to work with in vitro and in vivo (animal) systems are at the core of research on emerging pathogens and need long-term support coordinated across states.

Harmful (co-)exposures and inactivation

Environmental bioaerosols, such as pollen, increase susceptibility to respiratory viruses.

First observation of how coronaviruses adsorb to surfaces and can denature under light within milliseconds.

Properties of respiratory droplets and their dispersion in trains, airplanes, and in classrooms.

Implication: Need for air quality mitigation (filtration, pollen monitoring) and interdisciplinary research on exposure control. Need for UV, visible and in general photocatalytic surfaces disinfection technologies to curb endemic transmission.

High-throughput sequencing, bioinformatics, (novel) pathogen genomics

Pathogen genomic sequencing from a wide variety of clinical and environmental samples identified previously unknown pathogens.

Novel bioinformatics tool established to analyze large-scale datasets and enabling predictive algorithms for spill-over risks of known and hitherto unknown viruses into the human population.

Implication: Enables novel approaches to predict zoonotic risks to increase pandemic preparedness. Underlines the necessity to invest in technical and human resources as well as long-term surveillance strategies.

MANAGEMENT

Early predictors of disease severity

Specific biomarkers and physiological signals identified immediately after diagnosis in non-hospitalized patients that can predict need for hospitalization.

Implication: Enables rapid triage tools, reducing hospital overload during future pandemics.

Immunological determinants of COVID-19 disease severity

Decisive role of the different arms of the immune response in controlling infection and disease severity.

Similarity of immune determinants to infections with other airborne pathogens of pandemic potential

Implication: Highlights the need for (a) comparative studies on the immune control of airborne pathogens of pandemic potential and (b) setting up patient cohort frameworks that can be flexibly deployed to quickly adapt to research questions and emergency conditions.

Development of novel technologies

Testing of lab robots showed the potential for automatization of repetitive manual labour, also under non-routine conditions and suitable in high-biosafety laboratories.

Implication: Enables novel ways of automatization that circumvents the need for novel expensive equipment and reduces the need for human labour.

Public acceptance for preventive measures & new technologies

Trust levels, risk perception, and willingness to adopt vary across demographic groups.

Implication: Highlights need for targeted science communication, participatory approaches, and socio technical integration to improve compliance.



Need for Action

- Need for a framework that can be deployed to flexibly carry out both large and small cohort studies, for example for predicting hospitalization risks in future pandemics with other pathogens.
- Need to develop air quality and air disinfection and purification devices in view of present and future epidemic, pandemic, and endemic risks with other pathogens.
- Importance of understanding trust and acceptance of preventative behaviours especially in the general public and mitigation technologies
- Existing funding instruments proved slow and bureaucratic during COVID-19 pandemic, delaying critical research and deployment and preventing a necessary rapid response.

What can Helmholtz do?

Based on the finding of the projects, Helmholtz can take an active role in terms of long-term pandemic preparedness and quick reactions to future emergency situations.

- ❑ **Secure long-term preparedness investment:** Allocate stable resources for research and for the development of relevant clinical measures such as broad-spectrum antiviral drugs and novel prophylactic vaccines. Identify scientific infrastructures and networks for coordination across institutions (e.g. Netzwerk Universitätsmedizin NUM, e.g. to conduct clinical trials). Establish a pandemic preparedness network.
- ❑ **Deploy mitigation technologies:** Scale up UV-based air and surface treatment systems that exploit the denaturation mechanisms of viruses as demonstrated by CORAERO.
- ❑ **Build public trust:** Mobilize ongoing HGF citizen-science activities, socio-technical integration, and transparent science communication to raise acceptance of preventive tools and potential measures.
- ❑ **Accelerated pandemic funding in emergency situations:** Create rapid-response grant mechanisms that can be activated immediately for urgent research needs including administrative support.

Further Reading

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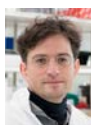
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