Research response of the European Commission to address the COVID-19 pandemic

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Research & Innovation DG
European Commission
€1 billion H2020 Research actions for COVID-19

• 30 January 2020: 1st Expression of Interest
  18 projects  €48M
  - epidemiology and public health (7p)
  - diagnostics (3p)
  - treatments (6p) antibodies, antivirals, solnatides
  - vaccines (2p) SARS-CoV-2 N DNA, VLP

• 3 March 2020: IMI fast-track call
  8 projects  €72M (+€45M from industry)
  - Diagnostics (5p)
  - Treatments (3) antivirals, CT for TK inhibitor for ARDS

• 19 May 2020: 2nd Expression of Interest
  23 projects  €128M
  - Cohorts (2p)
  - Repurposing of manufacturing for vital medical supplies and equipment (4p)
  - Medical technologies, digital tools and AI to improve surveillance and care (13p)
  - Behavioural, social and economic impacts of the outbreak responses (4p)
>€1 billion H2020 Research actions for COVID-19 (2)

- 13 March 2020 EIC accelerator SME call: 36 projects €166M
  - Testing (3 p)
  - Treatment (22 p)
  - Prevention (5 p) vaccines, disinfectants and data analytics
  - Others (6 p) remote care to patients, QC of coronavirus-related products

- 3 April 2020 EDCTP call for R&I in sub-Saharan Africa: 20 projects € 25M
  - natural history of infection
  - point-of-care diagnostic tests
  - trials of promising products (diagnostics and therapeutics)
  - Validate serological tests and establish biobanks sera
>€1 billion H2020 Research actions for COVID-19 (3)

- **Vaccines**
  - CEPI to extend portfolio of vaccines and global manufacturing capacity €100M
  - Curevac for mRNA vaccine € 75M
- **Clinical and public health response** € 20M
  - Collect convalescent plasma
  - Extension of DisCoVery clinical trial
- **Infrastructures** € 15M
- **EIT HEALTH** 15 projects € 7M
  - biotechnology, diagnostics, digital health and med tech
- **InnovFin Infection Disease Financial Facility** €325M
Animals in H2020 COVID-19 projects

• >100 COVID-19 H2020 projects:
  - +/- €500M

• 10 H2020 COVID-19 projects with animal studies
  - <0.2% of budget to animal studies

• 3 H2020 COVID-19 related projects with Non-Human Primates (all treatments projects)

• 1 project with wild animals (bats and mice) to look into feces for presence of SARS-CoV-2 virus
Alternatives to animals in H2020 COVID-19 projects

- > 10% of projects use alternatives to animal studies
  - Quick results
- Examples:
  - Air-liquid cultures of human airway epithelia
  - Neutralizing antibodies generated with phage display technology
    - Generation of 17 human antibodies selected from pre-pandemic healthy donors binding at SARS-CoV-2 RBD-ACE2 interface
    - Suitable candidates for passive immunotherapy for treatment of COVID-19
  - Supercomputers, AI, and biological processing to screen millions of molecules
    - Screening of 400 000 molecules lead to the identification of Raloxifene (treatment of osteoporosis) as potential effective treatment for COVID-19 patients with mildly symptomatic infection

Bertoglio et al. bioRxiv 2020.06.05.135921
EU support the development of alternatives to animal testing

Last 20 Years

- Annual budget tripled from FP5 to FP6
- Annual budget increased by 50% from FP6 to FP7
- Annual budget remained stable from FP7 to H2020
- Projects on cell systems, tissues- and organs-on-chips increased from FP5 to H2020 and represent now >20% of funding

>200 projects
>

Average Annual budget in €M

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<th>FP5</th>
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<td>11</td>
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>€700M
H2020 projects on alternatives and COVID-19 research

- >75 H2020 projects: > €250M

- Survey to all coordinators (+/- 50% projects already closed) 30 replies

- 11 projects (35%) redirected activities towards COVID-19 research

- 17 projects (55%) contributed through their tools to COVID-19 research
H2020 projects on alternatives & COVID-19 research

- Microfluidic devices with stem cell derived human vascular endothelial cells to model COVID-19 associated thrombus formation and immune cells to model SARS-CoV-2 induced inflammation

- Microphysiological systems that reproduce the minimal functional entity of the brain

- Air–liquid interface cultures of nasal epithelial cells for the study of SARS-CoV-2 pathogenesis, as it corroborates the expression of ACE2 in goblet/secretory cells and ciliated cells
Organoids in H2020 projects & COVID-19 research

- **Small intestinal** organoids
  - SARS-CoV-2 infected enterocytes produce infectious viral particles and trigger a viral response program
- **Liver** spheroids
  - effect of a JAKK inhibitor for treatment
- **Lung** organoids
- **Cardiac** organoids
  - examine cardiac damage
- **Kidney** organoids
  - infected by SARS-CoV-2 can be inhibited by hrsACE2
Other alternatives methods in H2020 projects & COVID-19 research

- Human primary lung cells
  - SARS-CoV-2 prevents burning carbohydrates, resulting in fat build-up inside lung cells, which the virus needs to reproduce. The cholesterol-lowering drug fenofibrate is currently tested
- iPS differentiated into upper airway for infection studies
- AOP linking lung toxicity to lung disease
- Bio coating of SARS-CoV-2 Spike protein for drug and siRNA screening
- Zebrafish larvae for cardiotoxicity of Hydroxychloroquine and other drugs
- Models for distribution of ACE2 in different human tissues and organs
- Mining of shared legacy data on drug safety profiles
Rapid data sharing and analysis: the European COVID-19 Data Platform

- **SARS-CoV-2 Data Hubs**
  - organize the flow of SARS-CoV-2 outbreak sequence data
- **Federated European Genome-phenome Archive**
  - secure controlled access sharing of sensitive patient and research subject data sets
- **COVID-19 Data Portal** ([www.covid19dataportal.org](http://www.covid19dataportal.org))
  - sequence data sharing and access to other SARS-CoV-2 resources
    - Sequences from the virus and hosts (human, mice, NHPs)
    - Gene expression, Proteins, Biochemistry (pathways)
    - Literature > 140 000 papers
Effects of COVID-19 on use of test animals in the EU in 2020

• Were there more or fewer test animals used in 2020? Which species?
  - Annual stats on uses of animals for scientific purposes for year 2020 are provided by the Members States at the end of 2021
  - EU report should be ready by end of 2022

• Were there less animals bred and killed without being used for scientific purposes in 2020?
  - Member States are not required to record/report animals bred, killed and not used in 2020 or 2021
  - The data are mandatory only for 2022
Effect of COVID-19 on test animals beyond 2020

- Is this the opportunity to change the role of test animals in science?

  - Opinions differ between the scientific communities
    - For the “alternative” community => 20% in favor
    - For COVID-19 community => 0% in favor
    - Both communities are strongly against a ban on animal testing (98%)

- The EC organizes a scientific conference “Towards replacement of animals for scientific purposes” in Brussels on 10-11 December 2020
Preliminary conclusions

- EU is a major supporter of research in COVID-19 and “alternatives”
- Several H2020 projects have generated “alternative” tools that were immediately used in the COVID-19 research
- Some H2020 projects have built up a comprehensive set of methods for quickly testing the safety of new drugs, but the tools were not taken up by pharma
- “Alternatives” is not always understood the same way by all communities
- It is not always easy to identify COVID-19 research activities using “alternatives”
  - > 40 different therapeutic monoclonal antibodies under development, the majority of which from mice, but few (for GM-CSF) based on phage display

Need more cross-talks and better information on existing alternative methods
Thank you for your attention

More information
• EU-funded R&I on coronavirus:
  https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/covid-19
Let’s meet at WC11 in 2021!

22-26 August 2021
MECC Maastricht