

COMMENTARY

EATRIS: providing the right tools, at the right time, for vaccine development in a pandemic

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As society continues to take its first cautious steps out of the COVID-19 pandemic, researchers, including vaccine developers, continue to reflect on the challenges that they faced and overcame together during the last 2 years and the improvements necessary for better pandemic preparedness in future. Now more than ever, the world is recognizing the importance of vaccines, and the European Research Infrastructure for Translational Medicine (EATRIS) and its infrastructure partners across Europe and beyond have strived to accelerate promising candidates through the R&D pipeline, by offering innovative services to vaccine developers in academic and industry settings.

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Removing traditional boundaries to accessing key technologies in a fast and efficient manner has been central to our approach to facilitating best practice vaccine development. Combining critical preclinical and

clinical services and expertise including regulatory guidance, across EATRIS and different research infrastructures, and providing rapid access to these resources, has always been a key strategy for EU research

infrastructures. The ability of individual and combined research infrastructures to provide the right tools for vaccine developers has proved essential in the face of this recent global health emergency and will be even more so for future pandemics.

EATRIS COVID-19 RESEARCH FORUM

EATRIS's core mission is to accelerate the translation of promising scientific discoveries into benefits for patients [1–5]. Its focus is to undertake and facilitate activities that bridge the innovation gap between the lab and the clinic by offering services and expertise to increase the chances of cutting-edge research successfully reaching the patients that need it most. From the very start of the pandemic, our EATRIS community, composed of researchers from over 120 university medical centers and research facilities across 14 EU countries, placed themselves and their expertise at the forefront of the COVID-19 fight.

The immediate question for EATRIS was how best to support them and capitalize on their activities for advancing research in the field? Our first task was closely monitoring the efforts undertaken by our EATRIS members to create a comprehensive but by no means exhaustive list of relevant activities that they engaged in and, additionally, the essential services they could provide for COVID-19 research for vaccine and anti-viral developers. EATRIS sites across Europe began populating this list of available COVID-19 resources and their relevant activities, such as ongoing clinical trials, and made it publicly available on the EATRIS website to internal and external researchers.

The aim of this activity was simple – to support researchers in their vaccine, therapeutic or diagnostic development, with the best possible technologies, research tools, and expertise. As the list grew, these institutions formed the EATRIS COVID-19 Research

Forum, where any service requests or need for specific expertise from academia, industry, or governmental group related to COVID-19, including vaccine development tools and regulatory guidance, matched specifically within this group. To expedite the process, the need for contracting and facilitation fees was removed, and both client and service provider were connected within 48 hours. This rapid response COVID-19 service was developed into an online platform where all resources and activities could be shared, in addition to relevant news items and resources of interest to the COVID-19 researcher such as data portals, and relevant animal models and their availability.

Central to this list of resources was and continues to be a world-class, broad range of consolidated know-how and resources across our Institutions that support the vaccine and immunotherapy developer. This includes a dynamic and harmonized flow of knowledge and expertise joining standardized, validated, and innovative technologies for the investigation, characterization, and monitoring of the immune and inflammatory network and responses in vaccine and therapeutic development. This includes critical immune monitoring and profiling services for the vaccine developer at various developmental stages including:

- ▶ Systems-level characterization of immune cells in human tissues
- ▶ Epigenetics of immune cells
- ▶ Access to tissues explant models to evaluate the role of individual immune subsets against infectious diseases and to characterize viral isolates
- ▶ Functional studies of pathogenicity of genetic variants
- ▶ Virus neutralization testing
- ▶ Immune profiling in different animal models
- ▶ Virus-specific immune responses
- ▶ Quantification of immunological subsets.

This knowledge and service provision continues to strive to meet the needs of biotechnology companies, the pharmaceutical industry, and the academic research community developing vaccine candidates. In addition to listing these must-have technologies and services, the forum included funding calls, publications, and open research service requests to which members could apply or respond. By the end of 2020, the EATRIS Covid-19 Research Forum consisted of over 90 active researchers across 43 institutions from 14 EU countries. Although similar supportive initiatives exist across different networks and infrastructures, the simplicity and flexibility of this forum, including a willingness to support each other in a fast and efficient manner, was a hallmark of its success and continues to drive its utility.

As a direct result of the EATRIS COVID-19 Research Forum Group, over 50 projects have been facilitated within this group to date. The establishment of the EATRIS COVID-19 Research Forum Group in 2020 represents a strong example of how our network of institutions within the infrastructure can pool their resources together to create an efficient

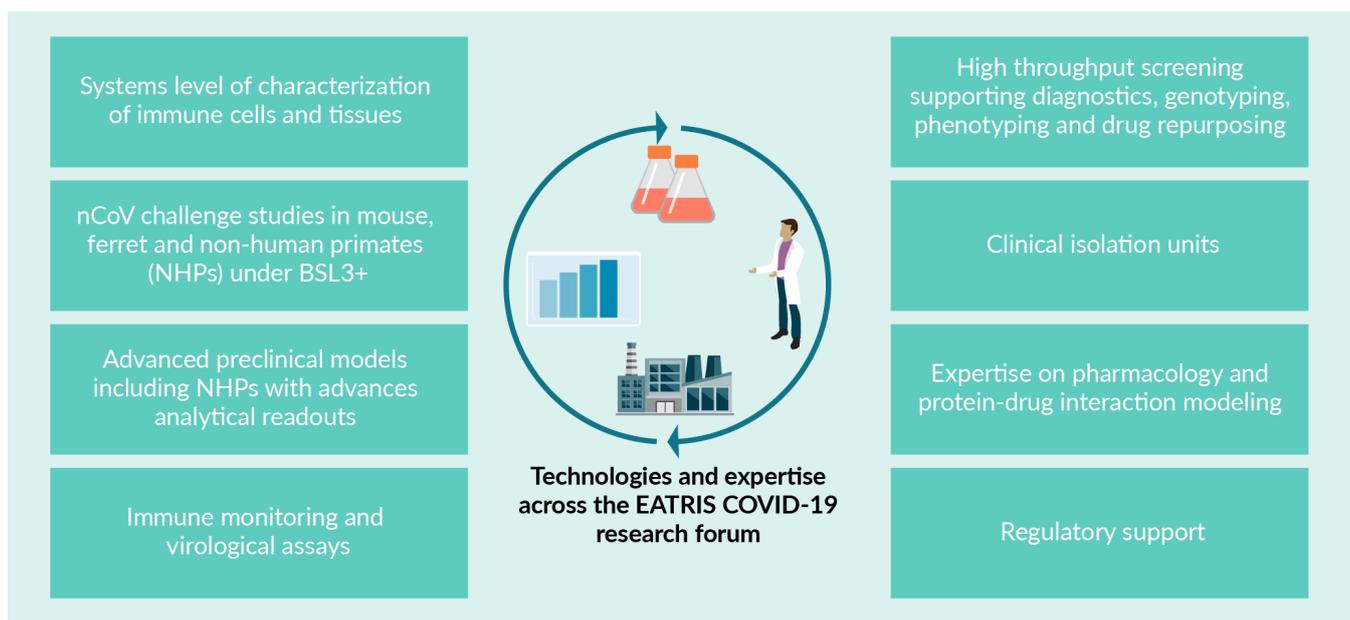
array of must-have services for novel vaccine and therapy development in a time of urgent need. As a result, we must look ahead with a strong commitment to further improving this initiative, with the single aim of supporting our researchers and other infectious disease experts to the best of our abilities. A sample of these resources, including preclinical and clinical tools, are listed in **Figure 1** and continue to prove essential in facilitating vaccine development.

COMBINING TOOLS & EXPERTISE ACROSS RESEARCH INFRASTRUCTURES

EATRIS’s mission is highly complementary to several other research infrastructures, including those of the European Clinical Research Infrastructure Network (ECRIN), and the European Research Infrastructure for Biobanking (BBMRI). The COVID-19 Fast Response Service was established at the start of the pandemic and is still an active output of our strategy, representing a coordinated and accelerated procedure for researchers to access

► **FIGURE 1**

Core technologies and expertise across the EATRIS COVID-19 research forum.



the academic facilities, services, and resources of the three medical research infrastructures [6]. This example of research infrastructures working together under the umbrella of the European Alliance of Medical Research Infrastructures (“EU-AMRI”) allows vaccine developers to draw on resources, including pre-clinical and clinical tools and expertise, where and when needed through one access point. Similarly, TRANSVAC [7], an EU-funded project of which EATRIS is a partner with several other infrastructures and leading vaccine developing institutions across the EU, has a central aim to accelerate vaccine candidates across the R&D pipeline, by offering services to vaccine developers in academic and industry settings. Researchers developing vaccine candidates against COVID-19 and other infectious diseases have benefitted and continue to benefit from TRANSVAC services, including non-clinical in vivo models, adjuvant formulation, clinical trial and regulatory support, and others. Future calls for vaccine development services are due in the coming months, which developers can continue to apply for through the TRANSVAC website.

Different research infrastructures bring their own resources and expertise to vaccine development where available and have all offered their own valuable programs to facilitate vaccine development during this pandemic [8]. Real benefit, however, is provided to vaccine and therapy developers, when relevant biomedical research infrastructures combine their catalogs of preclinical and clinical tools. This offers the vaccine developer the entire spectrum of technologies they require to further develop their innovative vaccine candidates.

EATRIS is now working together with multiple research infrastructures, including over 154 partners across 34 countries, which has assembled the largest and most diverse research- and service-providing instrument to study infectious diseases in Europe. This project, “Integrated Services for Infectious Disease Outbreak Research” (ISIDORE) was granted funding of 21 million Euros under the Horizon Europe funding program and launched on February 24, 2022. It aims to improve

Europe’s global service and research capacities in the face of a future pandemic. ISIDORE is an interdisciplinary project coordinated by ERINHA (the Research Infrastructure dedicated to the study of high-consequence emerging and re-emerging pathogens) and brings together all key European life-sciences research infrastructures and networks, as well as those in the social sciences [9]. The Consortium brings together infrastructure partners under the umbrella of 17 different partners (Figure 2), including 14 research infrastructures. Collectively, the vaccine developer can access upon application, free services provided from each of these infrastructures which covers the entire pipeline of vaccine development.

The ambition of ISIDORE is to provide fast access to these cutting-edge resources to scientific user communities for supporting their evidence-based development or adoption of countermeasures. This platform is designed to be further expanded to include infrastructures from across the globe to combine strengths and to help remove the gaps in the translational science pipeline to support diagnostic, therapeutic, and vaccine development during a global health emergency. ISIDORE will contribute to Europe’s readiness for any epidemic-prone pathogen through a global, integrated, and preparedness-driven approach. It will provide free of charge access to innovative resources and services to scientific user communities for supporting their research projects in the field of infectious diseases.

PANDEMIC PREPAREDNESS: LESSONS LEARNED FROM ACROSS THE GLOBE

Learning from what has worked and what has not in supporting vaccine developers during this pandemic is an ongoing mission for research infrastructures such as EATRIS. Taking knowledge from collaborators across the globe also highlights again the lessons not learned from previous pandemics, including, for example, issues in open and

real-time sharing of precompetitive data. This remained a major roadblock to rapid and efficient vaccine and therapy development for COVID-19. Building flexible infrastructures to provide the right tools and expertise when needed and providing the funding at the right time also remained a major challenge in the present pandemic. This commentary piece has outlined some of the initiatives that aimed to overcome this – in particular, accessing the right preclinical tools – but more work is clearly needed.

Translation Together is a unique collaboration of leading translational research organizations from around the world including Ad-Mare Bioinnovations (Canada), LifeArc (UK), NCATS (US), TIA (Australia), Fiocruz (Brazil), AMED (Japan), and EATRIS (Europe). In early 2022, the partners of Translation Together published an article in Nature Reviews Drug Discovery [10], reflecting on successes

and challenges in regional COVID-19 pandemic responses and proposing five priorities to improve preparedness for future pandemics. In this publication, we draw on experiences and lessons learned in the COVID-19 pandemic to propose actions to improve the preparedness of the translational research community for future public health crises and to improve global health [10]. The take-home message remains clear: providing the right tools for efficient vaccine development programs needs the right infrastructures that can provide innovative, essential technologies and services in the most flexible manner. Achieving this goal represents a formidable opponent to any infectious disease pandemic we may face in the future. In particular, having a fast and effective system for vaccine development that can respond to the challenge of new, emerging variants in the present or future infectious disease pandemics. In addition, building flexible

► FIGURE 2

ISIDORe consortium partners.



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funding schemes to promote access to these services such as the goal of ISIDORE, is also key to making accessible, emergency funds available to accommodate the global health priority of that time. With important lessons learned and new initiatives implemented, research infrastructures have clearly shown that they represent an essential player in accelerated vaccine development. A lot has been done, but there is much more to do.

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AUTHORSHIP & CONFLICT OF INTEREST

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