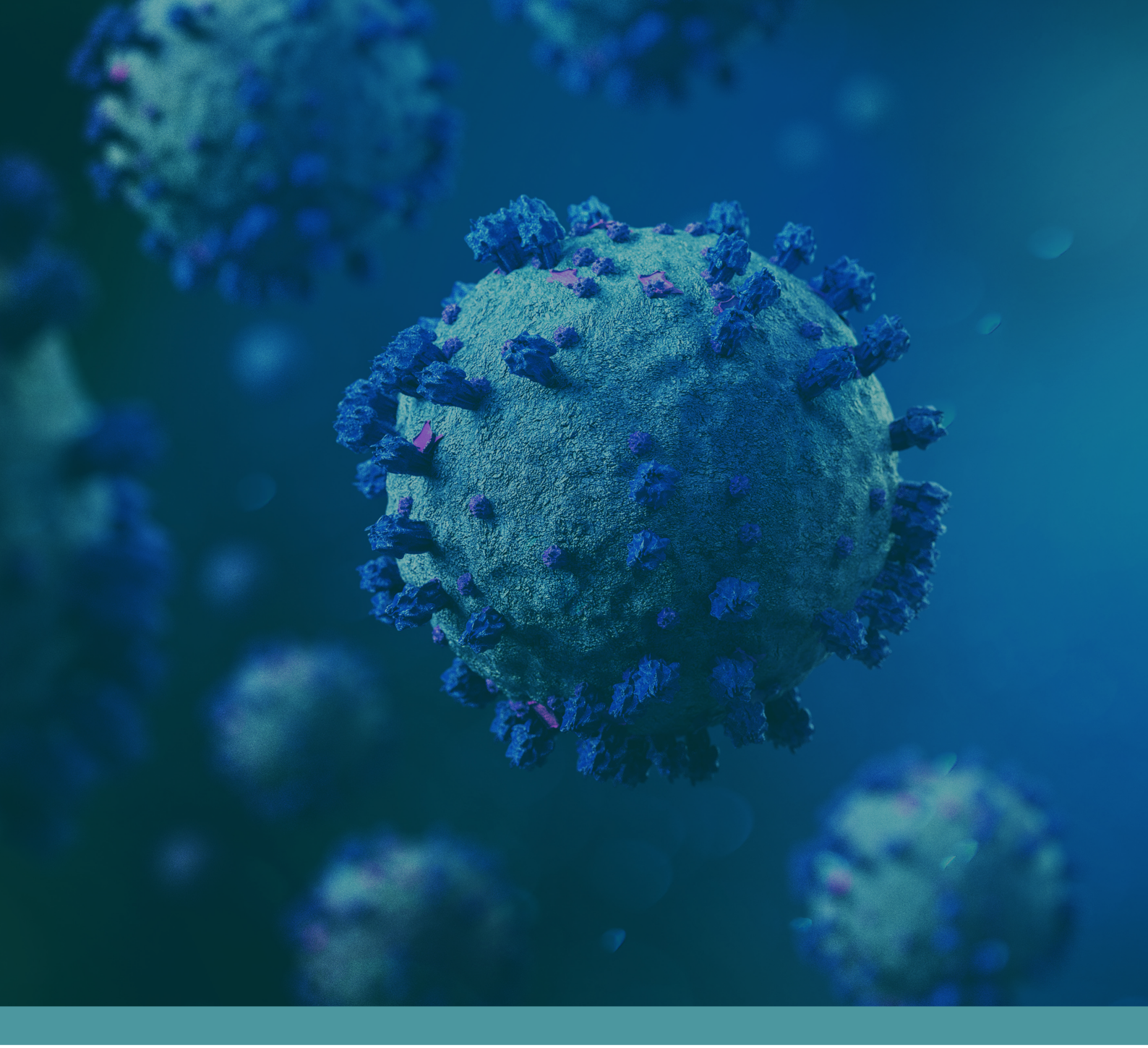

SciLifeLab COVID-19 efforts:

REFLECTIONS FROM 2020 AND LESSONS FOR THE FUTURE

SciLifeLab

SciLifeLab COVID-19 efforts – reflections from 2020 and lessons for the future

During the COVID-19 pandemic, the role of SciLifeLab as a national hub for Life Science researchers and infrastructure was leveraged in the work to fight the pandemic. This document presents an overview of the actions taken and the difficulties that were exposed. We also address the lessons learned and how we take these into account in an effort to build better pandemic preparedness in the future, as part of the national task assigned to SciLifeLab for the years 2021-2024.

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SUMMARY

SciLifeLab's role in the pandemic in 2020:

SciLifeLab had the capacity to act quickly and with broad national outreach, due to its role as a national infrastructure organization with strong links to the national research community and by receiving dedicated funding from Knut and Alice Wallenberg Foundation (KAW).

COVID-19 actions taken in 2020

- Set up of clinical virus diagnostics, Engstrand facility (Karolinska Institutet (KI))
- Development of high sensitivity and specificity serology test, Hober/Nilsson (KTH Royal Institute of Technology)
- Set up of longitudinal sampling and biobanking of COVID-19 patient samples for analysis of disease pathogenesis, Hans Gustaf Ljunggren (KI)
- Set up of a BSL3 facility for research on COVID-19 (Biomedicum, KI)
- Set up of a national team-science research program on COVID-19 funded by KAW
- Creation of a national COVID-19 Data portal
- SciLifeLab infrastructure prioritized COVID-19 research projects

Challenges that limited the opportunities:

- Access to patient samples for research (in the beginning of the pandemic)
- Sharing of biobanked patient samples and data
- Regulatory and legal hurdles when engaged with healthcare

SciLifeLab plans going forward

We have defined 8 primary focus areas for SciLifeLab towards future work in pandemic laboratory preparedness (listed below and described shortly in the last section on "Reflections looking ahead: focus areas").

SciLifeLab shall:

1. Focus on research support – research is needed during pandemics
2. Support and coordinate team-science efforts during pandemics
3. Support techniques and technology development important for the study of pandemic pathogens and their effects
4. Operate nationally and in collaboration with other research infrastructures
5. Work to facilitate the flow of patient samples to its infrastructure platforms
6. Support data management, sharing and open publication during pandemics
7. Support training in pandemic laboratory preparedness
8. Make a permanent investment in pandemic laboratory preparedness within SciLifeLab

SciLifeLab COVID-19 Research Infrastructure actions in 2020

To meet global crises, such as a new pandemic, time is of essence. SciLifeLab had a unique capacity, due to its organisation and role as a national infrastructure with links to a national research community, to act quickly and with broad national outreach upon receiving funding from KAW. SciLifeLab redirected all of its relevant technological expertise and infrastructure towards COVID-19 work and utilized its extensive national and international network for coordinated collective efforts. The work was led by SciLifeLab's management group (MG), with support from operations office, enabling an agile task-focused structure with quick decisions processes.

Key success factors for quick actions by SciLifeLab were:

- Funding from KAW – substantial resources were rapidly allocated together with a clear mandate
- SciLifeLab as national research infrastructure with competence, networks and organization in place could act quickly
- Authorization for universities, issued rapidly by the government, to assist in COVID-19 related actions such as clinical diagnostics.

SciLifeLab resources, technology and knowledge that were mobilized to meet the new challenge:

1. Equipment, facilities and expertise were available, these could flexibly be reorganized and refocussed towards COVID-19 efforts:
   - *SciLifeLab infrastructure was instructed to prioritize COVID-19 research (communicated by email March 20, 2020 to all Infrastructure Heads and Directors and followed up by emails, web page info and survey).*
   - *Lars Engstrand's lab at KI shifted focus to virus testing*
   - *Peter Nilsson's and Sophia Hober's labs, KTH, shifted focus to serology*
   - *SciLifeLab Data Centre launched the National COVID-19 Data Portal (on June 3, 2020, as the first national portal in Europe linked to the European COVID-19 data platform coordinated by EMBL-EBI), as well as provided collaborative data tools and support.*
   - *SciLifeLab admin/Operations Office (OO)/MG coordinates grant calls, launching of national research program, communication, funding etc.*

2. SciLifeLab as national research infrastructure had the unique possibility to rapidly launch a national research program addressing COVID-19. This was enabled by external funding from KAW and by allocating national

SciLifeLab funding for the coordination of the program and its defined research areas, to facilitate novel collaborations and provide a link to the SciLifeLab infrastructure and management. If funding had been delivered to individual PIs without coordination, and without linking to biobanks and the data centre, the impact would have not been as great.

3. Relevant contacts to authorities, regions, internationally etc. provided means to coordinate activities (eg. for virus diagnostics the National Coordination Group was assembled, through Genomic Medicine Sweden (GMS) network and Per Sikora/Lars Engstrand, and had their first meeting just days after the KAW funding ("nationell projektkoordineringsgrupp med representanter från mikrobiologiska laboratorier vid universitetssjukhusen, Folkhälsomyndigheten, SciLifeLab och GMS") and equipment and reagents were secured rapidly (eg. Engstrand's China collaboration).

REGULATORY CHALLENGES for academic research infrastructures to serve as diagnostic labs

The collaborative spirit and tireless work by a large number of individuals wanting to contribute as much they could to meet this crisis resulted in many great efforts. The chain of events in 2020 were special in the sense that the hospitals and clinical laboratories were not prepared to handle the COVID-19 diagnostics in the beginning. Hence, academic labs were requested to contribute. This may probably not be the case in the future, but the challenges met should be documented to make us better prepared for the future. Here, we aim to highlight challenges that were experienced and how they were solved, when possible.

1. Mandate for diagnostics

The technology/ equipment and competence are often available within academic labs and research infrastructures; however, they lack a mandate to perform healthcare diagnostics. SciLifeLab is a national *research* infrastructure that is organizationally a collaboration between universities, thus lacking mandate to perform diagnostics.

2020: *The issue was solved by a rapidly processed temporary government authorization for the universities to perform diagnostics, allowing large-scale virus testing/ diagnostics within KI/ SciLifeLab (National Pandemic Centre/ Engstrand) and KTH/ SciLifeLab (Large scale serology/ Nilsson & Hober) to meet the urgent need for increased testing capacity, as well as disease monitoring (prevalence), in particular in the early part of the pandemic.*

2. Regulatory requirements for diagnostics

For diagnostic lab activities to be pursued, regulatory requirements need to be met, such as:

- The person responsible for the lab process needs to be a clinician taking the medical responsibility for the accuracy of the diagnostics
- The lab needs to be IVO registered
- The technology and test equipment needs to meet the regulatory requirements and be certified (CE marked)
- The data connection to the different LIMS systems in the healthcare regions was initially a big challenge

At the National Pandemic Centre the regulatory challenge was solved by Lars Engstrand becoming chief physician at Karolinska University Hospital to be medically responsible for the lab process. The IVO registration of the lab was

processed in record time. At the Nilsson/Hober lab this was solved by operating as a research effort with ethical permit and defined collaborators (FoHM, KS, Danderyd hospital and a few others) within the scope of the project. In other words, this laboratory did not enter the "clinical laboratory service space" to provide routine clinical diagnostics and thus did not need to prioritize which groups to test or set up logistics for testing and patient reporting etc.

3. Stakeholder coordination and logistic challenges for academic research infrastructures to serve as diagnostic labs

During the pandemic, particularly in the beginning, the communication and division of tasks and mandates between stakeholders were not very clear (Government, FoHM, Regions, Universities, research infra etc.) and getting all the permissions, legal and practical clearance, and a go-ahead to start diagnostic work in the academia was slowed for weeks, even though all the requirements were met.

Intensive efforts and much time and resources were dedicated to solving questions around logistics of samples, orders, reporting results and particularly how an academic research laboratory could feed data into the hospital Laboratory Information Systems (LIMS).

For example, during the Spring 2020 there was capacity at the National Pandemic Centre to run large volumes of patient samples, but the facility was under-used as the samples were not reaching the lab from the different healthcare regions. This was partly due to unclear issues concerning cost refunding, biobank agreements and diversified regional decisions and guidelines. The National Pandemic Centre set up LIMS system in the lab to keep track of samples, but also the required links to hospital IT systems. In addition, direct sampling from patients as well as reporting the results back to the patients directly was started. This was initially not considered, since hospitals were entirely focussing on routine hospital laboratory operations and requested that all data from samples was reported via the hospital LIMS systems. Karlsson & Novak Medical AB and 1177 (direkttest.se) were used for (self)sampling and logistics. Thus, the pandemic situation showed the importance of direct reporting of virus testing results to patients.

IDENTIFIED RESOURCE NEEDS to be addressed paving way for better pandemic laboratory preparedness

Large research efforts are needed during a pandemic with a "new" virus like SARS-CoV-2 in order to get deep knowledge of the virus and the disease in a short time, develop new diagnostic methods, treatments, vaccines and to learn how to best block transmission in the population. SciLifeLab has to be able to quickly change focus to pandemic research and studies of infectious diseases in the next pandemic period. ScilifeLab will also need to take the pandemic preparedness aspect into account when planning the selection of and assignments to its infrastructure facilities. In addition, SciLifeLab should be prepared to quickly start new facilities if need arises, something that is not usually possible in its 4-year facility cycle.

There is a need for better preparedness on how to quickly identify, scale up, organise and fund missing laboratory resources before the next pandemic. In 2020, required capabilities at SciLifeLab were set up (e.g. set up of environmental virus profiling or high-throughput technologies in BSL-3 lab facilities). Sweden has many BSL-3 laboratories, but they are poorly equipped for molecular biology or high-throughput work and often lacked trained staff, and could not handle the flood of requests when the pandemic started. To identify needs and get access to BSL-3 involved meetings between SciLifeLab/COVID-19 program management, the head of the department at KI, the head of BSL-3, KI Facility management and PIs of the program. SciLifeLab allocated funding covering needed equipment and a technician at Biomedicum's BSL-3 lab, but practical challenges in managing a BSL-3 laboratory that was not a SciLifeLab facility remained. To not lose the knowhow gained from establishing assays and methods in the Biomedicum BSL3 lab, maintaining the BSL-3 environment during inter-pandemic times and having arrangements ready for the next pandemic is critical.

Reagents and consumables from commercial vendors for virus research and testing ran out in the early phases of the pandemic, not just in Sweden, but globally. This raised the concern as to whether there should be more investments to ensure self-sufficiency with enzyme and reagent production in Sweden. Novel technologies (kits and reagents – both academic and commercial) need to be validated through a coordinated instance (test bed with access to a hospital data flows) to set up eg. a benchmarked sample set for validation of new technologies against gold standard methods. Questions have also been raised regarding the need for production of vaccines and antiviral drugs in Sweden. SciLifeLab can support these pandemic laboratory preparedness efforts in collaboration with other parties in society.

We do note, however, that the next pandemic may not follow the course of

COVID-19, and the problems faced in 2020 may not be repeated. For example, mRNA-based vaccines are now validated as a result of Covid-19 and these can be rapidly modified for new virus versions or strains and the scale up of their production is now well established. In contrast, the "old" protein- or adenovirus-based vaccines have faced major delays, production difficulties and may even have worse side effect/efficacy profiles.

2020: *Ex. for the Nilsson/ Hober large-scale serology initiative, protein deliveries from international companies were delayed and products of bad quality delivered (due to lack of time for the companies to quality check their products). Adequate in house/ national protein production capacity (from different species/ production systems) is an important resource to be secured. A plasma preparation facility (from whole blood patient samples) was not in place but needed to be set up, while the remaining step from plasma to analyses could be managed with available robots (requiring a bit of tweaking).*

SUCCESFULL NATIONAL INITIATIVES paving way for better future pandemic laboratory preparedness

Large national initiatives where SciLifeLab played a central role during the acute phase of the pandemic in 2020 were that the national infrastructure prioritised Covid-19 projects and quickly engaged in setting up diagnostics and sample collections (biobanking) efforts. SciLifeLab also launched a novel national research program aiming to coordinate activities and resources across the country, and set up the national COVID-19 data portal as the first national portal in Europe linked to the European COVID-19 data platform (Fig 2 and below).

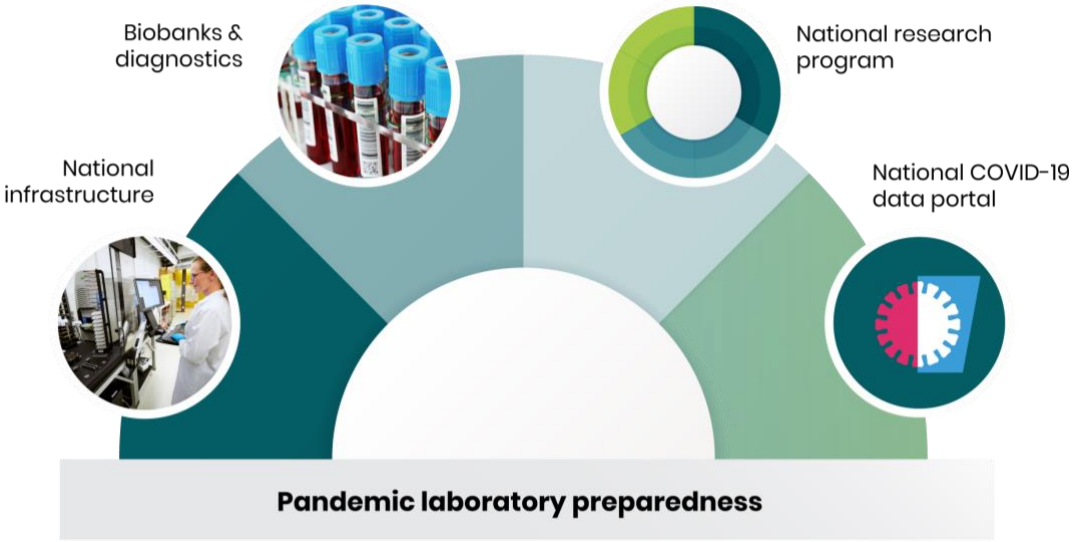

Figure 1. Central national initiatives paving way for better future pandemic laboratory preparedness.

SCILIFELAB NATIONAL RESEARCH PROGRAM

Through funding from KAW, fast actions and coordination, SciLifeLab launched a national research program in mid-April 2020 following an open call. The program resulted in 67 funded projects within nine research areas together aiming at understanding and inhibiting development of COVID-19 at the molecular, cellular, individual, societal and environmental level, as well as supporting establishment of COVID-19 biobanks (Fig 1). This initiative established Team Science efforts of new constellation of researchers, and in January 2021 a second call was announced resulting in 34 additional COVID-19 research grants awarded to allow continuation of the projects, as well as inclusion of new projects and studies on the impact of the different COVID-19 vaccines.

SciLifeLab national funding has been used for program coordination, data management support, and support to specific needs identified by the research areas. This has resulted in creation of an infrastructure for collection and storage of samples from patients and from the environment, as well as data analysis and logistics. In addition, the effort resulted in expanded access to a BSL3 facility for handling of live coronavirus, and capacity development in serology, chemoinformatics, and computational chemistry at SciLifeLab. The achievements of the program have been plentiful. So far, the projects funded through the program has resulted in 76 publications (June, 2021), https://covid19dataportal.se/publications/, and major achievements from the program were also presented at the public symposia Combating COVID-19 in October, which had close to 400 participants.

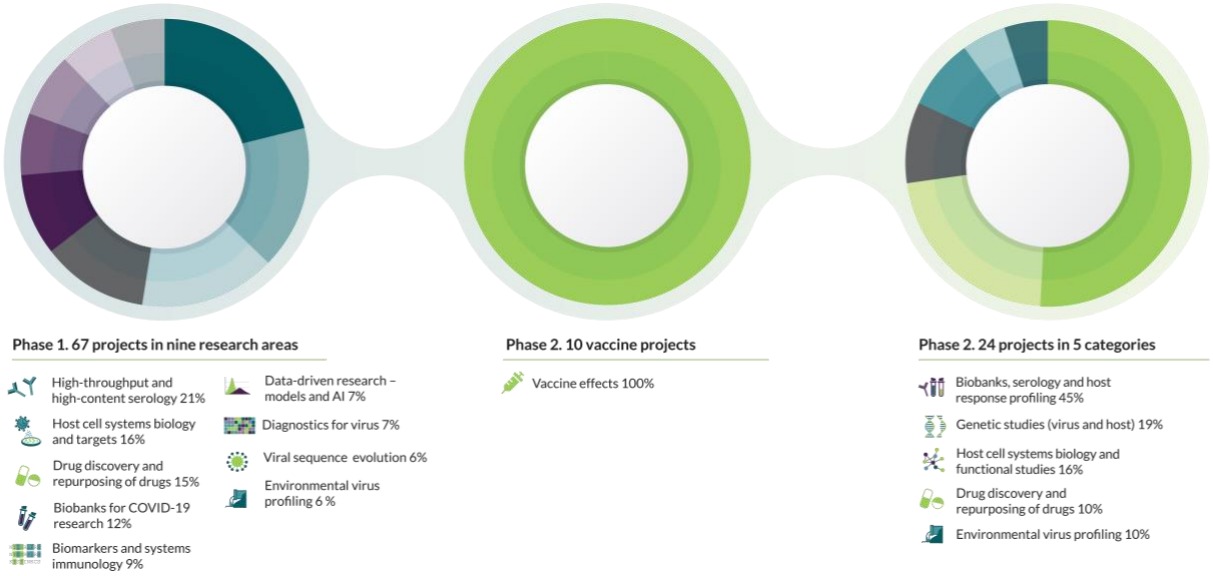

Figure 2. SciLifeLab COVID-19 national research program was launched in two phases. Phase 1 encompasses funding of 67 individual projects grouped in 9 thematic collaborative research areas in phase 1, followed by further funding and development of the program in phase 2 with funding for 10 vaccine projects and 24 projects in five categories.

DATA SHARING

Data sharing has been central for the international collaborative work on COVID-19, both in supporting a rapid pace of open research, but also to support data-driven approaches to public health policy.

SciLifeLab Data Centre launched the National COVID-19 Data Portal on June 3, 2020, as the first national portal in Europe linked to the European COVID-19 data platform coordinated by EMBL-EBI. VR assigned SciLifeLab Data Centre to develop and operate the Swedish portal. The design and code of the Data Portal

website has been shared openly with other countries to establish other national portals.

The Data Portal supports all Swedish researchers and aggregates data, guidelines, tools, services and information. The principal functionality is the link to the data archives at the EMBL-EBI, which holds nearly 300 PB life science data and is the de facto standard data sharing platform in the field. The portal also provides a number of databases for Swedish researchers, including a publication database, databases for ongoing projects and open calls for funding, datasets published from Swedish research projects, and a database for sample collections and biobanks making both research sample collections and clinical biobanks findable for Swedish research. The sample collection database is operated in collaboration with Biobank Sweden.

By mid-March 2021, the portal has had over 100,000 page views from 22,000 visitors, of which half come from outside Sweden. The Swedish COVID-19 Data Portal has been a resounding success and lauded internationally for leading the way among national data portals in the EU coordinated network on data sharing.

We identify three success factors for the rapid implementation of the National COVID-19 Data Portal: i) The government acted rapidly to assign VR to coordinate the Swedish participation in the European data sharing platform, and VR rapidly assigned SciLifeLab Data Centre to develop and operate the portal with a national mandate; ii) SciLifeLab already had a national mandate for life science infrastructure and there was an operational and technical readiness, as well as in-house staff with the right skills, to quickly get a Data Portal up and running; and iii) The Data Portal could work closely with well-funded research programs, instructed to prioritize data sharing through the Data Portal, in addition to the many other research projects that started at Swedish institutions.

General data sharing challenges in Sweden caused considerable difficulties also for COVID-19 efforts, in particular between health care and research domains. For almost one year since the start of the pandemic, the number of sequenced virus strains available in the EBI and other related databases was extremely small, as no party in Sweden had the mandate or ability (or data sharing permission) to share such data with international databases. Thus, freely available data from Sweden were missing or extremely limited while most other countries in the EU could arrange data sharing freely. Thus, from the angle of global tracing of the pandemic, Sweden was almost like a white spot.

The questions concerning data sharing hurdles are too many and too complex to dive into in this document, but concrete solutions in this area are needed from the perspective of better future pandemic preparedness: legal hurdles, organisational issues, fragmentation and confusion in assignments, lack of incentives for data

producing organisations to share data for research, and a great lack of interoperability between data services and resources across the many regional operators. Sub-optimal prerequisites for data sharing as well as data ownership issues hamper real-time publication of sequences and tracking of virus strain evolution. Data release is important for monitoring the national spread in real time and comparison of the virus strains circulating in Sweden vs. those in neighbouring countries and globally.

Examples of questions to address to allow increased and streamlined secure data sharing:

- Clarity between actors and mandate for data sharing – fear of overstepping mandates and doing something new and perhaps inappropriate leads to situations where the "grey zones" never get addressed, in particular when they would need to be addressed through interactions between different organisations, sometimes across different public sectors.
- Permission for data sharing – Virus vs. human data. During a virus outbreak it is essential that virus sequences are widely shared, while in Sweden all such sequences were often considered personal human data, even though no person can ever be identified from a virus sequence. Therefore, clarity is needed for the future to ensure that personal protection is not unnecessarily blocking the public availability of virus sequences or the public response to the virus.
- Agreements for data sharing – In order to share data from research or biobanked samples, it is necessary to have the patient consent define the ability to share results with other researchers, national data portals or with international databases. However, most academic scientists have not requested consent for such purposes. With samples obtained from clinical diagnostics, this is more complicated, as patients do not sign any consents. Agreements for sharing of data obtained from diagnostic samples between government organizations need to be considered. Swedish universities also often do not have data processing agreements set up in a way that enables researchers from one university to work on human data generated by another university. The lack of infrastructure suitable for sensitive personal data processing in collaborative projects, including with international partners, is another import issue.
- Incentives for data sharing in healthcare – even simple and legally unencumbered, non-identifiable, data (such as virus sequences) remain as a default locked in the healthcare sector in systems that prohibits interactions with the research sector, largely due to legal limitations, but also lack of incentive or culture to share.
- Incentives for data sharing in research – researchers need strong support functions and data services within these systems, in order to facilitate

sharing of data and ensuring law and IT-security are properly managed. Data publishing also needs to be merited in similar ways as publishing of scientific papers. We also need to move away from a protectiveness and sense of ownership of data, hampering sharing even when the research has been publicly funded and the data derives from samples donated by patients hoping to broadly support research.

- Collaborations with industry – increased engagement with commercial partners for technical platforms or technology development for data science would be desirable. The organisational structure of SciLifeLab makes these interactions difficult to set up and legal agreements arranged through individual universities are rarely able to fully take the national perspective SciLifeLab operates in into account.

SciLifeLab can build on the Data Portal model to provide integrated and rich data sharing platforms for Swedish researchers, that engages with the research community and provides a platform to share data and host user created databases and services, as well as leads the technical and the scientific development of data driven life science in Sweden.

SAMPLES & BIOBANKS

Collecting patient samples coupled to relevant medical data are key for studies providing deeper disease understanding and allowing better treatment.

There are several considerations to be made:

When confronted with a new disease, samples constitute an urgent requirement for research and tech development. Samples need to be well documented and correctly collected, and it is important to ensure processes to access samples for research (e.g. clinical vs. research samples, patient consents, ethical permits, prioritization of scarce material, acute crises versus long-term research etc.)

Setting up pipelines for adequate collection and storage of relevant sample types with relevant patient consent in the middle of acute crises and chaos at the hospitals was very challenging in the early phases of the pandemic. It was necessary to avoid burdening routine care. Several lessons can be learned for better preparedness and smoother processes including:

- Digital tools needed – to avoid contagious consent papers
- Information in several languages needed – to reach a heterogeneous patient group
- How to access samples from deceased patients needs to be considered
- The challenge with a fast developing disease with patients moving between different wards needs to be considered

- Securing longitudinal samples coupled to clinical data, etc.

It is important that the sense of urgency is embraced by all parties and that central authorities have the flexibility to prioritize towards a pandemic and rapidly set up fast-tracks, for ex. EPN prioritizing COVID-19 applications was a central piece of the puzzle for rapid start of sample collection and research initiatives.

2020: National SciLifeLab Biobanking research track quickly funded at the start of the pandemic and biobanking efforts later developed jointly with Biobank Sweden, now a joint register is in place at the SciLifeLab COVID-19 portal.

Comprehensive EPN applications were formulated that should be made available for future usage.

PATHOGEN TRACING in the environment

In light of the many challenges with the access to health care samples and associated clinical data, as well as with sharing real-time virus data from clinical and health care samples, the ability to analyse the virus quantities and virus subtyping from the wastewater samples is a significant opportunity. This provides unbiased data from 100 000s people from each region, and once a system is properly set up it can be used to detect an upcoming epidemic wave much before clinical evidence of the disease. This can also be applied to study the load of several viruses if shed via the urinary or gastrointestinal tract, and it is unclear how many pandemic diseases outside of COVID-19 that can be detected in wastewater. SciLifeLab funded early studies to set up this technology and plans to support this approach as part of the pandemic laboratory preparedness work to set up a routine monitoring virus loads in wastewater on a weekly basis from several regions in Sweden. New methods will also be developed to get sequence information from viruses in wastewater and to identify pathogens on surfaces and in air samples.

2020: SciLifeLab funded early studies to set up this technology and plans to support this approach as part of the pandemic preparedness work to set up a routine monitoring virus loads on a weekly basis from several regions in Sweden.

REFLECTIONS LOOKING AHEAD: FOCUS AREAS

It is important to take advantage of the experience gained during the COVID-19 pandemic to be better equipped for the next pandemic. We have therefore made a comprehensive analysis of SciLifeLab's role during the pandemic so far, as presented in this document. Based on this analysis, important focus areas and

developed measures that need to be implemented to strengthen SciLifeLab's role in future pandemics were identified. The work for pandemic laboratory preparedness will naturally be carried out in close collaboration with other parties (Fig. 3), and defining roles and mandates as well as keeping an active dialogue between stakeholders is a central part of being better prepared for future challenges. Below are our eight focus areas and proposed measures outlined.

1. Research is needed during pandemics - SciLifeLab will focus on research support

SciLifeLab should not function as a clinical laboratory during pandemics, as this should be done by clinical microbiology labs at hospitals, companies and authorities. SciLifeLab-associated capabilities can support clinical laboratories in the initial phase of a new pandemic crisis if regulatory issues are solved, but all diagnostics should as soon as possible rapidly shift to healthcare. Instead, the focus of SciLifeLab should be on supporting relevant research with the latest technologies. Research is central during pandemics because it generates the new knowledge needed, and the value of medical research and development has been very clear during the Covid-19 pandemic. Within the framework of Sweden's emergency preparedness work, the conditions for research and the opportunity to quickly utilize new knowledge must therefore be included. With its strong life science infrastructure and research network, SciLifeLab will strengthen basic, pre-clinical and clinical research, as well as technology development, at universities, hospitals, authorities (eg FoHM, SVA and FOI) and companies during and between pandemics.

2. SciLifeLab shall support team research efforts during pandemics

Coordinated joint efforts are central for adequate rapid response to new challenges and crises. This applies also for research projects, where Team Science efforts (rather than competing single PI projects) pave way for success, as resources and techniques are optimised (both with regards to scarce patient material, reagents, funding etc.). These multi expertise Team Science consortia can excel when supplied with support tools for integrated efforts (the latest infrastructure, communication tools, coordination supports, data sharing tools etc). The SciLifeLab organization is optimally set-up for these tasks, as shown in the COVID-19 pandemic, and should play an important role in the support of team research during coming pandemics.

3. SciLifeLab shall support techniques important for the study of pandemic pathogens and their effects

A number of different life science techniques are important for generating knowledge about the pathogens that can create pandemics, and their effects in

patients. All platforms within SciLifeLab can contribute to this type of knowledge and they should all be adapted to facilitate such use. Initially, during the investment in pandemic laboratory preparedness, the focus will be on Sequencing of DNA / RNA, Serological analyzes, Immune monitoring, BSL3 studies of pathogens and detection of pandemic pathogens in the environment. These activities build up an initial network that will be expanded with other technologies / platforms and actors at hospitals, authorities and universities. It is important that the technologies also have functions during inter-pandemic times such as in e.g. precision medicine and studies of antibiotic resistance.

4. SciLifeLab shall operate nationally and in collaboration with other infrastructures

Research infrastructures need to be better coordinated and made available nationally during pandemics. SciLifeLab is already a national infrastructure with nodes and users at all larger universities across the country. The work with pandemic laboratory preparedness within SciLifeLab must consider where to focus its activities and how they are to be coordinated with other research infrastructures at hospitals / regions, authorities, universities and companies, and thus contribute to the work with a national division of responsibilities within pandemic laboratory preparedness.

5. SciLifeLab shall work to facilitate the flow of patient samples to its facilities

In a crisis situation, it is of utmost importance that patient-centered studies on, for example, viruses, vaccines and treatment methods can get started quickly, so that new knowledge is passed on and really benefits healthcare and the general population. This presupposes that patient material can be collected and that these samples can be analyzed at infrastructures such as SciLifeLab. During this COVID-19 pandemic, it has become clear that there are a large number of rules and regulations that obstruct sample management and the flow to relevant facilities. Many regulatory adjustments were pushed through with record speed for the extraordinary challenge in 2020, but still several systematic challenges made it difficult for SciLifeLab and its partners to achieve a more significant impact. These issues have to be dealt with when preparing for the next pandemic to ensure a long-term and / or streamlined rapid contribution of academic labs and research infrastructures.

6. SciLifeLab shall support data management and data sharing during pandemics

Open sharing and availability of data needs to be promoted during a pandemic when there is no concern of patient identity/privacy (e.g. virus sequences). During the COVID-19 pandemic, SciLifeLab has played an important role in making various types of research data related to COVID-19 available via the FAIR principle.

An important role for SciLifeLab during pandemics will be data management and data sharing nationally between healthcare, academia and authorities but also internationally. The investment in the DDLS program (SciLifeLab and Wallenberg National Program for Data-Driven Life Science) over the next 12 years will increase these opportunities and anchor it in the research community. This will lead to the development and use of new knowledge required for Sweden's citizens to quickly and efficiently receive the help they need during a pandemic.

7. SciLifeLab shall support training in pandemic laboratory preparedness

In addition to building knowledge, the pandemic has also emphasized the importance of researchers' competence as a central resource in crises. There must be research competence in health care that can carry out early studies during pandemics and thereby quickly increase knowledge in order to provide patients with the best possible care in the event of a health crisis. Researchers at all levels in the academic sphere need continuous further education in life science techniques and data management. SciLifeLab will provide training for both clinical and academic researchers in techniques useful in the study of pandemic pathogens and their effects.

8. A permanent investment in pandemic laboratory preparedness within SciLifeLab

A strong research infrastructure in life science, adapted for research on pandemic pathogens and its effects, is required to cope with future pandemics. SciLifeLab, Sweden's largest and most complete infrastructure in life science, has played an important role during the COVID-19 pandemic. Between 2021-2024, SciLifeLab will develop a pandemic laboratory preparedness for the future, but long-term investments at the same level are required if SciLifeLab is to play a key role during future pandemics. Thus, resources should be permanent within SciLifeLab from 2025 to maintain and develop the built capacity.

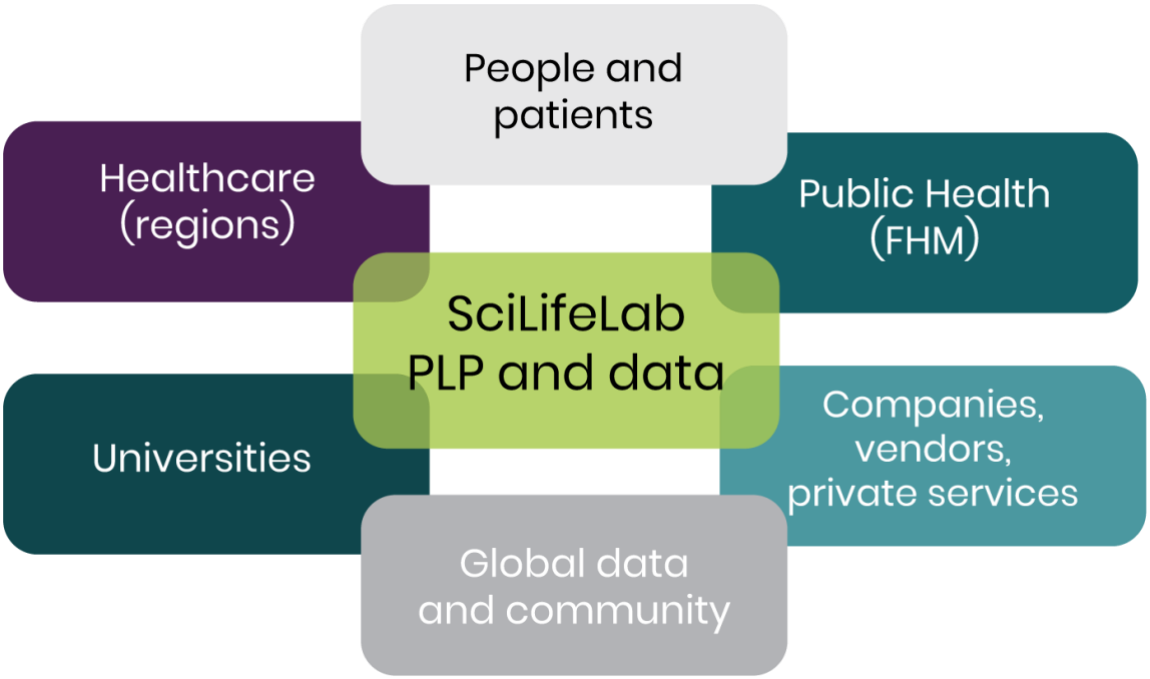

Figure 3. SciLifeLab Pandemic Laboratory Preparedness (PLP), with strong focus on research and data, is one central building block that together with other parties will work to ensure better preparedness for future challenges.

How this report was compiled

This report is based on internal interviews held with people engaged in central initiatives within SciLifeLab Covid-19 efforts during 2020. The first version of the report was completed in April 2021, but is likely to be updated with new versions as more viewpoints in this multifaceted effort have been gathered. Written by Mia Phillipson (Co-Director from 2021-01-01), Staffan Svärd (Scientific Director, Uppsala University) and Sandra Falck, approved by Olli Kallioniemi (Director), Siv Andersson (Co-Director until 2020-12-31) and the SciLifeLab Management Group.

Interview questions:

- Vad var den största utmaningen från ditt/ert perspektiv i Covid-19 arbetet under våren 2020? Hösten 2020? Vad var de största lärdomarna?
- Utvecklade du/ni någon ny process/metod/produkt/resurs som du ser kan ha värde även för framtida behov? – utveckla gärna
- Med lärdom från pandemin 2020 hur ser du att vi kunde vara bättre förberedda nästa gång och vad behövs för att SciLifeLabs ska kunna bidra fullt ut?

Interviewed people:

Lars Engstrand & Per Sikora (Virus testing and Sequencing), Peter Nilsson & Sophia Hober (Serology), Johan Rung (Data Centre), Hans-Gustaf Ljunggren (patient sample collections/ Biobanking etc), Maria Pernemalm & Janne Lehtiö (Research area Serology), Marjo Puumalainen (BSL-3 work), Annika Jenmalm Jenssen & Lars Johansson (SciLifeLab infrastructure)

This document will be drafted in two versions. A longer version (current) targeted for internal use aiming to improve internal processes and define prioritized areas and modes of action where SciLifeLab is best equipped to act for maximum value for society. A shorter summary for distribution to relevant governmental authorities (i.e., the Life Science Office, the Government pandemic group (Corona-kommissionen), FoHM and other stakeholders) to concretely highlight the challenges and possibilities to be considered in connection to fully utilizing the potential of SciLifeLab for pandemic preparedness and rapid response.