eu:::openscreen

# ACTIVITY AND FINANCIAL REPORT 2020

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ACTIVITY AND FINANCIAL REPORT 2020

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# EXECUTIVE SUMMARY

## A SUCCESSFUL YEAR - IMPORTANT MILESTONES AND PROGRESS

Dr. Wolfgang Fecke,
EU-OPENSCREEN Director General

In 2020 EU-OPENSCREEN reached several important milestones and became truly operational. We achieved these goals despite the onset of the COVID-19 pandemic in March, which resulted in the closure of our research labs and offices for several weeks, while heavily impacting the work of our partner sites and scientific collaborators.

The most visible progress was clearly made in our laboratory with the completion of our compound management team, the set-up of all major instrumentation, and the purchase of our compound collections. Our Compound Management Facility (CCMF) is the basis for fulfilling our key mission – supporting our collaborators with access to compounds for finding novel chemical tool compounds for basic and applied research. We installed our automated compound store with a capacity for more than 400.000 tubes within the first half of the year, followed by the full implementation of our robotic liquid handling platforms in December. These robots are designed for pipetting a few microliters of each compound into microplates for distribution to our partner sites.

The support of the Screening Unit, one of our two FMP partner sites in Berlin, was essential during this time as we could utilise their instruments and expertise to provide the first batch of compound plates while we were setting up our own instruments. This allowed us to send about 40.000 compounds to our screening sites, and some of these have already been used in our first scientific projects. In a similar manner, the FMP Medicinal Chemistry group helped to accelerate our compound quality control measurements by giving us free access to their LC-MS instrument.

Big advances were also made in defining clear access routes for biologists and chemists to our infrastructure which made it possible to initiate the first projects for which funding is coming directly from our collaborators. Efficient procedures were put in place to make access to high throughput screening technologies and expertise as smooth as possible. Together with our partner institutes, we continued to deliver on our EU-OPENSCREEN-DRIVE project objectives – one of last year's highlights was for instance the design and shipment of the EU-OPENSCREEN fragment library to selected sites with capabilities for fragment-based drug discovery.

We were happy to see that our collaborators at the Diamond Light Source in Didcot (UK) published the first binding data for 24 of these fragments to the SARS-CoV-2 Nsp3 macrodomain using crystallographic screening in a preprint in November, offering potential starting points for the development of anti-Covid-19 therapeutics. Similarly, our repurposing library of 2.500 bioactive compounds was used by our Fraunhofer ITMP partner site in Hamburg to find novel modulators for the SARS M-Pro protease. At the time of writing, these important results are going into press as well. Another highlight of the year was the finalisation of our new 'European Chemical Biology Database (ECBD)' development which allows scientists free access to structural and high throughput screening data. We recently began uploading the first structures and quality control data on our Bioactives library into the ECBD.

Finally, we further intensified our collaborations with other like-minded research infrastructures both in the context of the EU projects ERIC Forum, EOSC-Life, RI-VIS and iNEXT-Discovery as well as in the Life Sciences Research Infrastructure (LS-RI) Strategy Board. Based on lessons learned from our successful CORBEL project, the discussions and actions will allow us to capitalise on existing competences within these other infrastructures and therefore accelerate our mission of chemical probe discovery.

# EU-OPENSCREEN TEAM 2020

In 2020 our international team grew from nine to twelve employees. We now have four employees working in our central compound management facility, and eight people in the central office.

In January we recruited **Christian Guijarro Reznicek** as our new Finance Officer. Christian holds a Master's in biology, a PhD in biotechnology and a Master's in economics. His international background makes him an ideal contact for our current and prospective member countries.

In June 2020, **Micaela Graglia** joined our compound management team as an analytical chemist. Micaela has a PhD in Chemistry from the Max Planck Institute and has previous experience as an analytical scientist for different pharmaceutical and biotechnological companies. Micaela is mainly responsible for the quality control of our compounds, and the LC-MS analysis for determining the identity and purity of the compounds and characterising their physicochemical properties.

In July, the compound team was completed by **Sophie Brusseau**, who joined us as our new Laboratory Automation Manager. Sophie holds a degree in Bioengineering and a Master's in Medical Diagnostics. She has previous experience working in different CROs and biotech companies in the United Kingdom. Together with our interim Compound Manager, **Edgar Specker**, Sophie is responsible for running the EU-OPENSCREEN compound management facility at our head offic on Campus Buch in Berlin.

In 2020, our good IT and organisational preparations of the previous years paid off. We were in an excellent position to react to the restrictions that arose from the outbreak of COVID-19. From one day to the next our employees working in the office could continue their work without interruption working home-based. The decisive factor here was that at EU-OPENSCREEN we have always placed value on the independence of our employees with flat hierarchies and short decision-making paths right from the start, and that the technical prerequisites for the use of mobile work were already in place. Equipment and IT devices for mobile work were provided to all employees within short notice to ensure a healthy and efficient work environment for the home office, equivalent to that of the Central office.

At the same time, our lab team had to work on site under the difficult conditions of the lockdown. Nevertheless, it excelled in setting up our new lab, sending out the compounds to our partner sites, and onboarding two new team members. Especially from a human resource perspective, 2020 was a challenging year for EU-OPENSCREEN.

We are extremely grateful for the exceptional performance of our team under these difficulties. Despite the distance, we continued to work efficiently and to pursue our goals. We learned about new ways of collaboration, new tools, and new formats of work. However, we have also learned that nothing can replace the physical exchange of ideas. Therefore, carrying on we plan to offer our staff a mix of office-based and mobile work when appropriate.



The EU-OPENSCREEN Team in June 2020 (left to right):

Tanja Miletic
Christian Guijarro Reznicek
Alessandra Silvestri
Katja Herzog
Wolfgang Fecke
Federica Rossella
Micaela Graglia
Edgar Specker
Kathy Skopelitou
Maren Kappe
Sohie Brusseau
Bahne Stechmann

# SET UP OF THE CENTRAL COMPOUND MANAGEMENT FACILITY (CCMF) AND AUTOMATION OF WORKFLOWS

In the early phase of the project the compound management team established a list of requirements and specifications to automatically reformat compounds that are retrieved from a connected tube store, into microplates for high throughput screening. Working in collaboration with Hamilton, the team first designed the layout of all instrumentation and the different workflows.

In May 2020, the automated sample and compound management system “Verso” from Hamilton was delivered and installed at the EU-OPENSCREEN central office site in Berlin-Buch. The system was configured to meet the needs of current and future sample management applications. The Verso can handle a wide range of labware types, including tubes, vials, and plates, to accommodate a variety of different workflows. The system operates via high throughput tube picking and is equipped with a universal tube picker which enables the possibility to pick multiple labware types with different lengths and diameters.

The system will be used to store and manage the EU-OPENSCREEN libraries at -20°C under controlled conditions and is connected to two liquid handling workstations for further processing.


Sohie Brusseau, Laboratory Automation Manager and Edgar Specker, Interim Compound Manager, with the new compound storage system

The larger workstation, a Hamilton Star liquid handling robot, was delivered in August and passed all site acceptance tests in the last quarter in 2020. The system is equipped with eight 1,000 µL pipetting channels and a 96 tip pipetting head. A plate gripper in the peripheral area allows the integration of all functional modules and 3rd party equipment such as a plate sealer, a Labcyte Echo 650, a plate peeler, two plate decappers and a plate hotel from Liconic. The platform was also designed to allow later integration of additional devices.

Important milestones that were achieved during 2020 include both factory and site acceptance tests for the different systems and workflows. One of the main methods include the unsupervised reformatting from 96-well to 384-well plate formats. This method allows a rapid generation of several copies of the whole compound library from the stock tubes in 96-well format into 384-well plates which can then shipped to all the high throughput screening partner sites.

The instrumentation was also designed to answer possible future requests of the partner sites which can have different demands in terms of plate types and designs, allowing efficient screening for a variety of discovery projects. The Echo® 650 Series of liquid handling devices represents an innovative technology that produces faster and more accurate results than traditional pipetting methods. This new technology is already used in drug discovery and compound management applications, genomics research, synthetic biology, proteomics, and many other research applications. The Echo acoustic droplet ejection technology focuses ultrasonic acoustic energy at the meniscus of a fluid sample to eject small droplets of liquid from wells and position them precisely onto a surface suspended above the ejection point.

With that technology, the CCMF can meet the ongoing challenges of doing more with less. These type of liquid handlers are single, sim ple-to-operate systems that can work in multiple workflows and generate also so-called ‘assay ready’ plates, using only nanoliters of compound solutions instead of microliters, thereby achieving both significant cost savings while also reducing the need for plastic tips and laboratory waste, as is still the case with traditional tip-based liquid handling.

The second unit, another but smaller STARlet liquid handling workstation from Hamilton, passed all acceptance tests in August 2020. This unit will be used mainly to register compounds and reformat the European Academic compound library (EACL). As the name suggests, this innovative and unique library is made up of compounds provided by academic chemists from Europe and beyond. Here, the main workflow is designed to reformat the compounds from larger scale 24-well plates into 96-well plates.

# THE EU-OPENSCREEN COMPOUND LIBRARIES

Supporting the exploration of the chemical space and target biology with Europe´s only open-access chemical biology infrastructure



## THE EUROPEAN CHEMICAL BIOLOGY LIBRARY (ECBL)

EU-OPENSCREEN´s unique compound collection supports the exploration of the chemical space and target biology with Europe´s only open-access chemical biology infrastructure. The main library, the European Chemical Biology Library (ECBL), consists of about 100.000 compounds with unbiased chemical diversity, designed by five renowned academic computational chemistry groups in member countries of EU-OPENSCREEN.

**The following design strategy was applied:**

- Selection of 40.000 compounds by each of the five groups, with the aim of achieving maximal chemical diversity based on different principles. These principles examined a) the substructure composition using 561 substructures from the World Drug Index (Lisurek/Kühne, FMP in Berlin), b) the predicted pharmacology profiles against 3.600 proteins (Mestres, GRIB in Barcelona), c) negative scaffold comparison to the ChEMBL database and physicochemical property filtering (Skuta/Bartunek, IMG in Prague), d) 3D pharmacophore fingerprints of compounds from MolPort (Kupio, Eastern Finland), and e) enrichment for complex sp3 compounds with more stereocenters (Sopo/Guiliani, Fraunhofer ITMP in Hamburg)
- Use of prefilters such as a molecular weight range between 200 to 1200 g/mol, predicted aqueous solubility and chemical reactivity to reduce the commercially available compounds from major vendors from 5 million to about 2 million compounds
- Further down-scaling of the 200.000 compound set by deselecting pan-assay interference (so-called PAINS) compounds and carboxyl esters, and by removing compounds that are already present in national screening libraries of EU-OPENSCREEN member countries
- A final collection of 132.000 compounds was then offered for purchase in a public tendering process

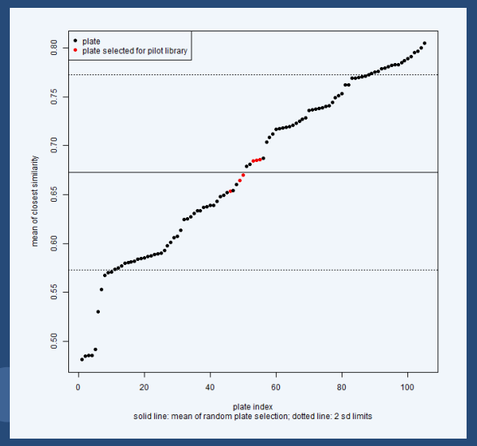
# THE PILOT LIBRARY OF THE ECBL

The aim of the pilot library is to provide a small but characteristic collection of the entire library which can be used by scientific collaborators for estimation of hit rates, and to evaluate the robustness of their biological assays. In addition, the library contains a large collection of well characterized compounds with known bioactivities which offer a good chance of finding active compounds for novel biological targets (repurposing). In total, the pilot screening library consists of nearly 5.000 compounds.

The selection of the ECBL representative compounds was based on similarity calculations using a Tanimoto coefficient. This included a random selection of plates sets with 352 compounds in each plate, and a calculation of mean similarities per plate set. Out of these, seven plates were selected which showed a mean value (~ 0.67) close to the mean values from all plate sets (shown with red dots in the Figure below), resulting in a total of 2.464 compounds.

The bioactives part of the library, again consisting of seven plates with 2.464 compounds, was designed by Ctibor Skuta/ Petr Bartunek from the EU-OPENSCREEN partner site IMG in Prague. A strong emphasis was put on the selection of molecules with high target selectivity. The compounds are active against 1039 different targets, among them 654 approved drugs and 368 highly selective probes from the public domain.

A graphical overview about target and pathway coverage is shown in the Figure below and was generated using the Probes & Drugs portal (www.probes-drugs.org). All these compounds are now available for research projects which can be carried out in collaboration with one of our screening partner sites.





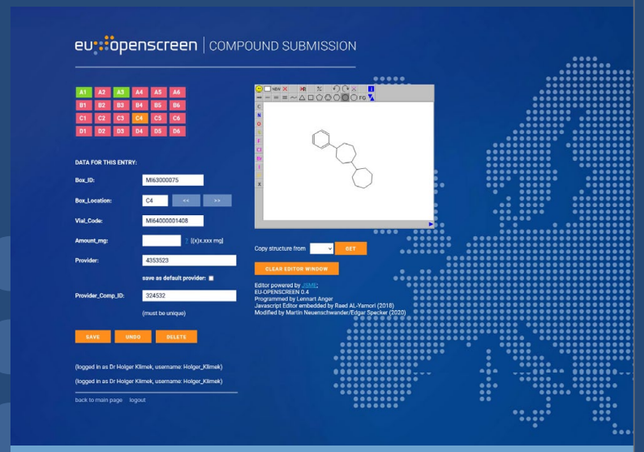
Composition of target and pathway classes of compounds of the EU-OPENSCREEN designed library (courtesy of probes-drugs.org)

## THE EUROPEAN ACADEMIC COMPOUND LIBRARY (EACL)

Chemists are now invited to submit natural and synthetic compounds to the EU-OPENSCREEN compound collection to build up the European Academic Compound Library (EACL). In this model, any chemist in the world can provide compounds which are then integrated into the EU-OPENSCREEN compound collection. This initiative is designed to help in the identification of biological activities for the generation of tool compounds and novel leads for drug development, and to facilitate new collaboration opportunities. The objective of EU-OPENSCREEN is to collect up to 40.000 compounds which might not always be 'drug-like' in the classical sense but often represent innovative chemistry.

The CCMF team implemented a dedicated website to support the academic compound submission process. Chemists can either draw structures of their compounds in that platform or can directly submit SD files for batch submission which are then reviewed by the team. The drawing of the molecules directly translates into the molecular weight of the compound which in turn determines the amount of powder which has to be added to the vial by the chemist prior to shipment.

Once the compounds are received at the CCMF in Berlin, the powder will be dissolved in an automated process to a 10mM concentration in DMSO, and two tubes per compound will then be stored in the Verso tube store as described above. In 2020, the team has already been in contact with several chemistry labs in Europe. Their valuable feedback was used to implement a standard Material Transfer Agreement (MTA) that was validated by several technological transfer offices from European universities and research institutes.



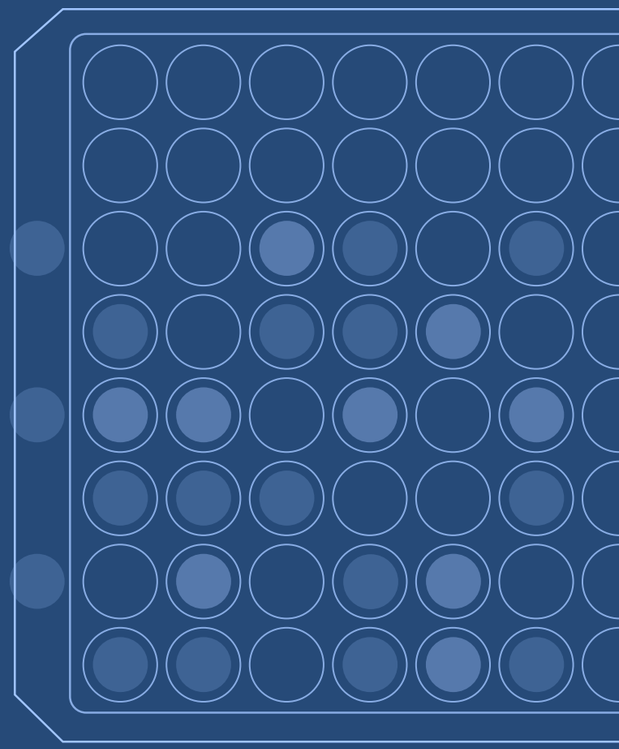

Screenshot of our web-based compound submission platform (www.eu-openscreen-cmpds-donation.eu)



## THE EU-OPENSCREEN FRAGMENT LIBRARY

In collaboration with several European partners, EU-OPENSCREEN established its own unique fragment library. This set of compounds is composed of about 1.000 low molecular weight fragments (available in 100 mM DMSO-d6 solutions with an average molecular weight of 189) and nearly 100 ultralow molecular weight compounds (so-called 'minifrags', available in 1M DMSO-d6 with an average molecular weight of 127) which are all derived from the available fragment space of the ECBL (see above). The fragment library has been designed to facilitate the follow-up of initial fragment hits with a rapid selection of parent molecules in the EU-OPENSCREEN high diversity ECBL screening library of which the fragments and minifrags are substructures.

The fragment library is available for biophysical experiments in structure-based fragment screening projects at several EU-OPENSCREEN-DRIVE facilities, and also at five iNEXT-Discovery/ Instruct-ERIC sites for X-Ray and NMR screens. EU-OPENSCREEN medicinal chemistry sites are available to support further fragment evolution campaigns.



# REFORMATTING CAMPAIGNS AND DISTRIBUTION OF THE ECBL LIBRARY TO SCREENING PARTNER SITES

During 2020, the CCMF team received three 1mL tube copies of the Bioactive compounds, one copy of the fragments and two copies of the ECBL through public procurement procedures, resulting in a total of 204.160 tubes which are stored in the compound management facility. As soon as the compounds arrived in the laboratory, the tubes were scanned for registration into a KNIME database to crosscheck the position of the tube positions in the racks against supplier datafiles.

While the Hamilton robotic platforms were being installed in the CCMF, the team initiated several reformatting campaigns by pipetting compound DMSO solutions from tubes into microplates, using a Tecan liquid handling robot from our FMP partner facility in Berlin. By June 2020 the team had reformatted and sent out a first batch of 2.464 Bioactives compounds to 11 high-throughput screening sites across Europe, and by July the 1.056 fragments were also sent to nine other partners. By the end of November 2020, the first batch of reformatted ECBL compounds with 36.960 compounds could also be sent out to the 11high-throughput screening sites.

Overall, nearly 1.300 plates were sent out to our different screening sites in 2020, adding up to more than 400.000 distributed aliquots. Importantly, all compounds from the different libraries are quality controlled by LC-MS, and data from these efforts will be made available for our scientific collaborators in the open access European Chemical Biology database.



# FINALISATION OF THE ACCESS PROCEDURES AND FIRST USERS OF THE SCREENING SERVICES

EU-OPENSCREEN offers access to biologists with robust and suitable assays to collaboratively develop chemical tool compounds for their targets of interest. Assays are screened against the whole European Chemical Biology Library (ECBL) in one of the 17 EU-OPENSCREEN screening facilities across Europe and the details are made available to the broader scientific community through our open access European Chemical Biology Database (ECBD).

In 2020, eighteen international researchers expressed their interest in accessing EU-OPENSCREEN libraries and screening services. A total of 8 screening projects, submitted by researchers from France, Germany, Italy, Spain, the Netherlands, and the United Kingdom, were accepted and will be performed in collaboration with our partners MEDINA, UiO, IBCH-PAS, FMP, USC, Fraunhofer and OSI. In two out of these 8 projects the EU-OPENSCREEN Central Office supported the researchers in their successful applications to national or European funding organisations.

The screening projects cover a wide range of research fields, including the identification of antibacterial compounds, the modulation of calcium signaling, the identification of myosin motors inhibitors and the targeting of leukemia cells.

To support access to the EU-OPENSCREEN research infrastructure (RI) and its affiliated partner sites, a procedure for accessing the screening services has been implemented (Figure 1 - see next page).

The EU-OPENSCREEN ERIC central office is the contact point for all researchers who want to collaborate with the consortium. In consultation with the partner sites, it provides applicants with information on the scientific, technical, administrative, and financial requirements for implementing the projects. Assay providers are requested to complete an online application form for the evaluation of the scientific excellence of the proposal and its technical feasibility. The application process as well as the access to the infrastructure are managed using the ARIA platform (https://instruct-eric.eu/help/about-aria), a cloud-based tool already implemented for the management of the EU-OPENSCREEN-DRIVE user projects and adapted to the needs of ERIC users.

Access to the infrastructure is based on scientific excellence. EU-OPENSCREEN ensures that scientific value, novelty, and impact of screening projects developed in the network are evaluated by independent experts in the field of chemical biology. The access procedure consists of several consecutive steps, where the EU-OPENSCREEN central office, applicant and partner sites are actively involved in the entire process.

If an application does not initially comply with the requirements, the project idea is further discussed with relevant partner sites and an improved proposal can be re-submitted by the applicant. Once the evaluation process is completed, screening partner sites are requested to express their interest in the project. At this stage, the joint discussion between the applicant, interested partner sites and the ERIC central office allows the interested parts to better understand project feasibility and services offered, leading the user to the selection of the most suited partner for the collaboration.

A project agreement, which clarifies the project aims, timelines, budget, workplan etc, is signed between the partner site and applicant before starting the project. Screening data will be shared with the applicant and uploaded on the open access European Chemical Biology Database. In collaboration with our medicinal chemistry groups, identified active compounds ('hits') can be chemically optimised further and translated into valuable tool compounds.

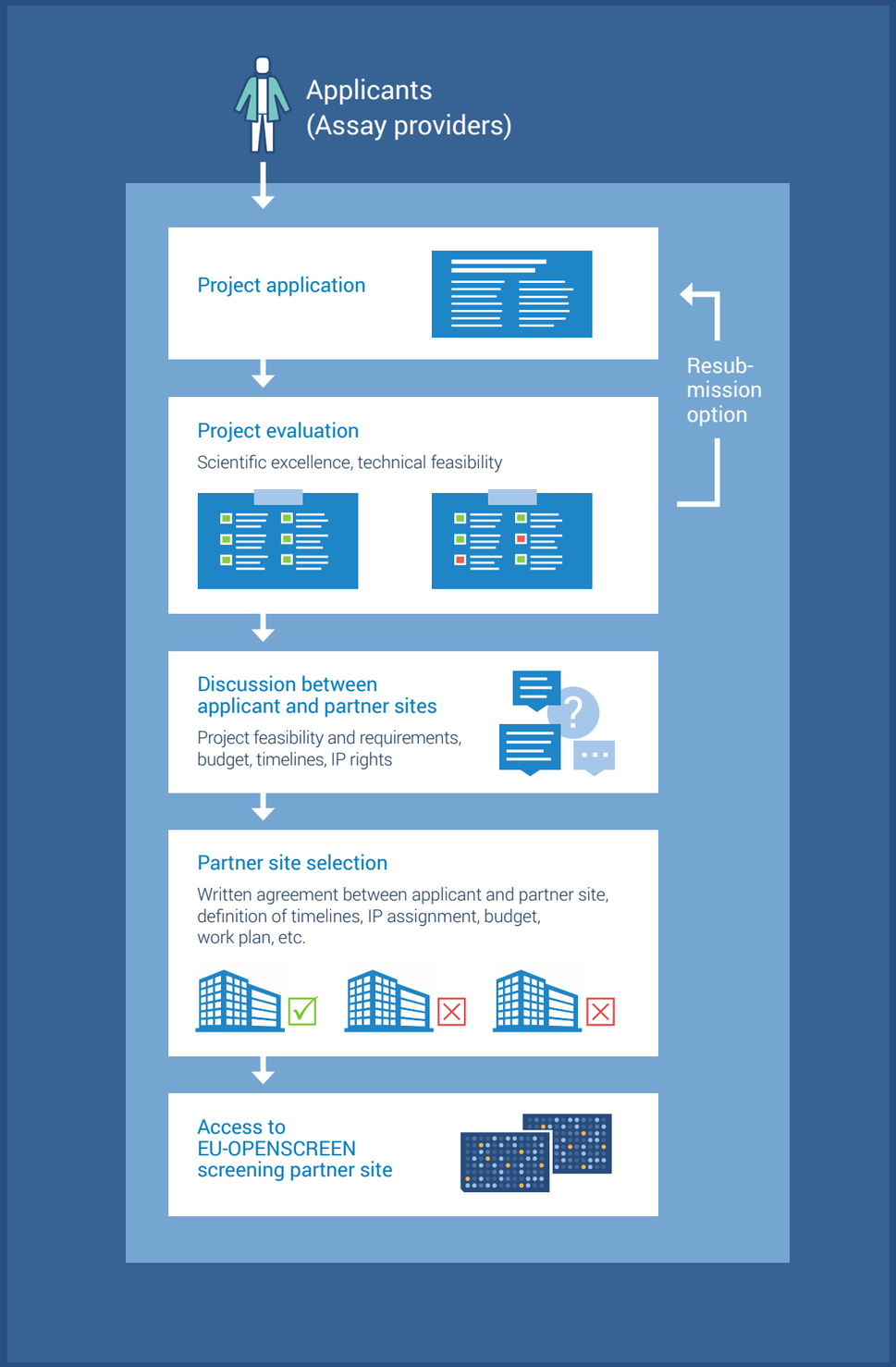



**Figure 1:**

As a biologist with a robust and suitable assay, you are invited to collaboratively develop a chemical tool compound for your target of interest. The submission process takes place in several clearly defined and transparent steps.

# ESTABLISHMENT OF THE SCIENTIFIC AND ETHICAL ADVISORY BOARD (SEAB)

"EU-OPENSCREEN is a highly novel program. The founders and funders of this initiative should be congratulated on their vision" and agree that EU-OPENSCREEN "creates a diverse and efficient ecosystem for the rapid identification of tool compounds, while minimizing the costs associated with establishing a diverse screening capability in a single location."
(SEB statement in June 2020)

The Scientific and Ethical Advisory Board (SEAB) advises, in consultation with the EU-OPENSCREEN Director General, the Assembly of Members on all scientific matters, including ethical questions, scientific quality of EU-OPENSCREEN as well as emerging technological and/or scientific developments and their potential integration into EU-OPENSCREEN.

The SEAB is composed of internationally recognised experts in the field of chemical biology and translational drug discovery. Their extensive expertise and impressive track record cover all areas of the activities of EU-OPENSCREEN, including assay development, compound screening, hit-to-lead optimisation, databases and data standards.

**Caroline Shamu** is the Director of the ICCB-Longwood Screening Facility at Harvard Medical School, which supports both small molecule and RNAi screening, and was one of the first high throughput screening facilities established in an academic setting. Dr. Shamu is also active in the development of data standards and repositories for large-scale datasets from high-throughput assays.

**Swen Hölder** leads a Medicinal Chemistry team within the Cancer Research UK Cancer Therapeutics Unit, a part of the Division of Cancer Therapeutics, at the Institute of Cancer Research, London. Swen Hölder applies his medicinal chemistry experience to discover and develop new cancer drugs. He has worked in both academia and industry, and has led teams to discover drug screening libraries and pre-clinical candidates.

**Evan Bolton** is the Coordinator of the PubChem database project at the NIH National Center for Biotechnology Information. PubChem is an open chemical data repository and contains chemical substance descriptions, biological activities and biomedical annotations. Evan Bolton is an expert in the areas of chemical information, chemical informatics, scientific data systems, and scientific programming.

**Steve Rees** is Vice-President of AstraZeneca's Discovery Biology, a global research department accountable for reagent generation, assay development, chemical biology, target identification and target validation capabilities. Prior to this, Steve Rees was the Vice-President of Screening Sciences and Sample Management at AstraZeneca.

# COMPLETION OF THE EUROPEAN CHEMICAL BIOLOGY DATABASE

One of the key components of the EU-OPENSCREEN research infrastructure is the European Chemical Biology Database (ECBD). The deployment of the ECBD was therefore an important milestone, which was reached this year.

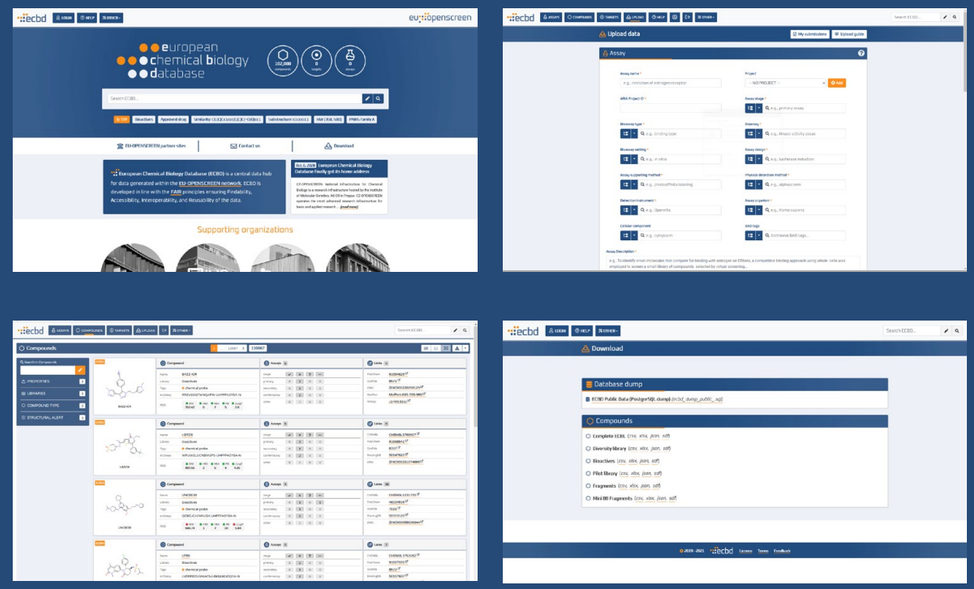
The ECBD represents the central data hub designed in a way to accommodate and disseminate data that are generated within the EU-OPENSCREEN network. As one of the EU-OPENSCREEN core services, the ECBD was developed in line with the FAIR principles, ensuring Findability, Accessibility, Interoperability, and Reusability of the data. There are several ways to access the ECBD data, serving the needs of different types of users. Common users accessing the ECBD through a web interface can view, visualise, filter, and export data, or any of their subsets, while data scientists preferring programmatic access using data for machine learning campaigns can take advantage of the REST API or download a full database for local use.

While EU-OPENSCREEN clearly promotes open access and FAIR data principles, it also pays attention to the protection of the IP interests of our collaborators and partners by offering an optional embargo period on the uploaded experimental data. During the embargo period of up to 36 months, data are accessible only by the EU-OPENSCREEN partner site which generates the data, and by the collaborators themselves, giving them sufficient time for the publication of the results in peer-reviewed journals, for patent filing, or for follow-up studies to advance their previous findings.

Between late 2020 and February 2021, EU-OPENSCREEN partner sites were exploring the ECBD functionality and made themselves more familiar with the data upload procedure. From March 2021 onwards, the ECBD will be ready for the upload of the first EU-OPENSCREEN experimental data and will be available to the wider scientific community at http://ecbd.eu. The ECBD will be continuously developed further and updated in order to reflect user needs, and to stay up to date with both technological and data standard developments in the field.



The ECBD is developed and maintained by the Institute of Molecular Genetics (IMG) in Prague, Czech Republic, led by Petr Bartůněk, Director of CZ-OPENSCREEN, the National Infrastructure for Chemical Biology. To ensure high stability, scalability, and security of the system, IMG collaborates with CESNET, the developer and operator of the national e-infrastructure for science, research, development, and education in the Czech Republic. CESNET provides the technological background of the ECBD, including cloud-based hosting with a robust backup strategy and state-of-the-art data security.




Screenshot examples of the ECBD web-interface (https://ecbd.eu)

# SCIENTIFIC OUTREACH

In 2020 we had to shift the focus of our marketing activities from physical meetings to web-based communication means. Instead of attending real-life conferences, our team successfully raised the awareness for our services at many specialised virtual events. A particular focus of our outreach activities was placed on intensifying collaboration with our partner sites, other research infrastructures and industry partners.

We successfully advertised our services to Baltic researchers at the first Baltic Symposium jointly organised with our partner sites in Latvia and Finland in May 2020. At the Cell Bio Virtual 2020 online ASCB|EMBO meeting we explained the benefits for researchers in collaborating with research infrastructures in biological and medical imaging (Euro-BioImaging), and high-throughput screening (EU-OPENSCREEN) and at the ENRIITC meeting we were able to demonstrate what EU-OPENSCREEN is offering to industry.

We also made progress on our way to recruit new member countries. In 2020 PT-OPENSCREEN was included in the 2020 Portuguese Roadmap of Research Infrastructures, and our partner in Romania, the Coriolan Dragulescu Institute of Chemistry received 9.1 million Euro in funding for the project 'ICT -Interdisciplinary Center for Smart Specialisation in Chemical Biology (RO-OPENSCREEN)' for the rehabilitation of two buildings and the acquisition of state-of-the-art equipment for basic and applied research in chemical biology. We developed and established our training activities and introduced several high-level webinars on recent topics for our user groups.

Together with other life-science research infrastructures we produced a video on how European Life Science Research Infrastructures can contribute to advance research on the coronavirus and other diseases.

Additionally, we set up a new section on our website showcasing the efforts of EU-OPENSCREEN and its partner sites in the fight against COVID-19. Furthermore, we continued our efforts to optimise our website, our social media activities and our other outreach tools such as our newsletter. These efforts paid off as shown in the increasing numbers of followers, subscribers to our newsletter and website clicks, reflecting the growing interest in our services and the growing awareness in our community.


## Accelerate your SARS-CoV-2 and COVID-19 research with European Life Science Research Infrastructures

The European Life Science Research Infrastructures provide access to high-end facilities and services for biological and medical research – from human samples to mouse models, imaging technologies to chemical screening and data analysis. Plus, we can advise on ethical, legal and societal issues in biomedical research.

This explanation video describes how 9 of the European Life Science Research Infrastructures can be used to advance research on coronavirus and other diseases.

See this and other videos on our website.

Video section

# TRAINING

The provision of highly qualified training is one of EU-OPENSCREEN´s core activities. Examples of relevant training topics are assay development, assay technologies, instrumentation and automation, compound management, and informatics. In order to optimise collaboration and knowledge transfer, the continuous training of our platform staff through staff-exchanges and courses is one of the main tasks. In addition, we are also providing training packages dedicated to Master and PhD students, postdoctoral scientists, and independent principal investigators. Such courses will help to foster the next generation of European researchers and ensure the optimal use of the EU-OPENSCREEN infrastructure.

During the 1st call for the 2020 ERIC training activities, our partners sites submitted their proposals for training programs including external courses, which are mainly targeted at Ph.D. students and post-doc researchers. Training courses for the staff working at our partner sites and webinars are organised by our partner sites, which are accessible on-line for everyone. The training activities refer to several areas and topics such as drug discovery, compounds logistics, screening, and others. Due to COVID-related restrictions 2020 has been a special year for EU-OPENSCREEN training programs since on-site courses and external conferences and workshops were cancelled. Despite these limitations, EU-OPENSCREEN successfully organised chemical biology and drug discovery webinars with expertise speakers form our partner sites.

More specifically the webinars included presentations and discussions on chemo-sensitive profiling analysing the present cell-based assay systems and their adaptation for chemosensitive assays as well as case studies of chemosensitivity assays. Another topic, the “tool compound/probe evaluation and selection” webinar aimed at introducing the main sources/providers of chemical probes along with the criteria to assess their quality and provide an overview of data platforms helpful during their selection process with live demonstrations employing the Probes & Drugs portal (https://www.probes-drugs.org).

For another webinar, expertise speakers presented the DNA-encoded libraries technology, a game changing innovation in Drug Discovery, in order to identify novel chemical matter for undruggable targets. The EU-OPENSCREEN webinar “Introduction to High-Throughput Screening” was a web-based theoretical course for researchers and students including presentations on target identification and definition (hit, lead, drug target), assay development, desired compound collection properties, assay optimization, pilot screen and primary screen hit selection and confirmation and data analysis (detection technologies and data normalisation).

The recorded webinars have been uploaded to the video section on our website, which is regularly updated.







## Webinar recordings and promotion

Several webinars on chemical biology and drug discovery were successfully held with expert speakers from our partner sites.

All webinars were promoted on our website, in our newsletter and on our social media channels.

The recorded webinars are available on our website in the newsroom section.

Webinar recordings

# EU-OPENSCREEN-DRIVE

## Successful implementation of transnational access projects in the framework of the Horizon 2020 project EU-OPENSCREEN-DRIVE (grant agreement No. 823893)

Transnational access allows researchers in Europe and beyond to benefit from the expertise and the technologies offered by EU-OPENSCREEN state-of-the-art facilities that are not available in their home countries.

Through the two successful transnational access calls launched in 2019 in the framework of the EU funded project EU-OPENSCREEN-DRIVE (www.drive.eu-openscreen.eu), we provided European researchers with logistical, technological and scientific support needed to access the infrastructure services for small molecule screening and chemical proteomics available at EU-OPENSCREEN-DRIVE partner facilities.

With a total of 53 proposals submitted by researchers coming from 17 different European Countries, the "High-throughput screening call" allowed 13 European researchers to access our high-throughput screening services for developing projects that will contribute to answer open questions in oncology, neurodegenerative diseases, inflammation, viral infection and biocalcification.
To increase the understanding of the mechanism of action by which a small molecule hit/lead compound exerts its pharmacological effect, the "Chemoproteomics open call" attracted applicants from Germany, Italy, Portugal, Spain and the United Kingdom and supported three successful projects focused on cancer, inflammatory diseases and depression.

The outbreak of the COVID-19 pandemic in March 2020 caused an unavoidable delay in the development of the projects but thanks to the expertise and flexibility of our partners as well as of our users, most of the projects were initiated. In fact, 70% (9/13 projects) of the screening projects were transferred to our partners' screening facilities, while 2 out of the 3 chemoproteomics collaborations started during 2020. All the funded projects are planned to be concluded between Summer and December 2021.

eu openscreen drive

EU-OPENSCREEN DRIVE provides detailed information on our transnational access calls: conditions, procedures and partner sites involved.

› www.drive.eu-openscreen.eu



# EU-OPENSCREEN EXTENDS ITS CAPACITIES IN THE FIELD OF FRAGMENT-BASED DRUG DISCOVERY (FBDD)

Within the framework of the H2020 funded project EU-OPENSCREEN-DRIVE, EU-OPENSCREEN worked on the extension of its scientific capabilities and service portfolio in the area of fragment-based screening / fragment evolution. This was possible thanks to the close collaboration with Instruct-ERIC (https://instruct-eric.eu), the European Research Infrastructure Consortium for Structural Biology, and the iNEXT-Discovery consortium (https://inext-discovery.eu). iNEXT-Discovery/ Instruct-ERIC sites are specialized in X-Ray crystallography, NMR spectroscopy and cryo-Electron Microscopy, among other structure-based techniques. Such expertise in structural biology, combined with EU-OPENSCREEN's strong medicinal chemistry expertise, allowed us to set the first steps toward the establishment of a complete FBDD pipeline from the design of a novel fragment library (see description above), to fragment screening campaigns all the way to hit evolution.

Besides the design and the acquisition of the new fragment library, in 2020 a legal framework formalizing the collaboration with iNEXT-Discovery/ Instruct partners and regulating the usage of the fragment library has been defined by EU-OPENSCREEN with the support of our partner Aigars Jirgensons (Latvian Institute of Organic Synthesis). Moreover, guidelines and procedures for accessing the fragments and monitoring its performance has been established. In late 2020, a consultation service for chemical evolution of fragments and screen follow-up was assembled. Five EU-OPENSCREEN medicinal chemistry experts (https://drive.eu-openscreen.eu/drive-startseite/about/medchem-consultants.html) will evaluate fragment screening projects coming from iNEXT-dicovery/ Instruct sites regarding target opportunity to develop medicinal chemistry project(s).

The fragment library was provided to a total of five iNEXT-Discovery sites, which made available their extensive expertise and facilities for X-ray crystallography and NMR spectroscopy-based experiments and to five EU-OPENSCREEN-DRIVE facilities for biophysical studies.  Due to the COVID-19 pandemic and the urgency to develop new drug candidates against COVID-19, partner sites at EU-OPENSCREEN-DRIVE/ iNEXT-Discovery/ Instruct started to use the EU-OPENSCREEN fragment library in screening projects focused on SARS-CoV-2 targets immediately after its delivery in June 2020. The first screening project using the fragment library on a SARS-CoV-2 target with X-ray technology was performed at the Diamond Light Source, an iNEXT-Discovery/ Instruct-ERIC partner and the results were published as  preprint in November 2020 (https://www.biorxiv.org/content/10.1101/2020.11.24.393405v1). The use of the EU-OPENSCREEN fragment library in screening campaigns on SARS-CoV-2 targets underlined the importance of a joint research effort exploiting competences from different fields of the life sciences for a prompt contribution to a global endeavor in understanding and combat COVID-19.

# ESTABLISHMENT OF THE INDUSTRY BOARDS AND DEVELOPMENT OF NEW R&D COLLABORATIONS

The European Commission recommends to fully exploit the potential of Research Infrastructures as innovation hubs and encourages and supports industry engagement. EU-OPENSCREEN supports innovation by facilitating the interaction between industrial partners and the partner sites that are offering technologies and technical expertise which are not available within companies.

Within the framework of the Horizon 2020 project EU-OPENSCREEN-DRIVE a shared Industry Liaison Office (ILO) has been constituted and extended in 2020 with the involvement of an increasing number of industry representatives. The aim of the ILO is to establish a clear communication channel with industry for understanding industry needs and develop a collaboration strategy that will be part of the ERIC business plan for 2023-27.

For defining industry access rules to the ERIC including Intellectual Property Rights (IPR) management, an Industry Associate Group (IAG) has been established. The latter consists of industry representatives which are involved in a number of co-development projects implemented together with EU-OPENSCREEN partner sites (e.g. Fraunhofer Institute for Translational Medicine and Pharmacology, Fundación MEDINA, Centro de Investigaciones Biológicas-CSIC, University of Oslo).

The IAG acts as a hub for local partnerships that will be directed to EU-OPENSCREEN for the co-development of the local programs. This will allow enriching the already existing partnerships by accessing an innovative environment that would yield novel products and technologies.

To efficiently implement collaborative projects between EU-OPENSCREEN partner sites, users and industry, a roadmap for industry interaction has been developed. The roadmap aims at executing co-developments with the industry that may serve as a Proof-of-Concept for exemplifying the usefulness of EU-OPENSCREEN for industry engagement.

In 2020, the already established collaborations with pharmaceutical companies allowed the beginning of several R&D projects focused on the development and automation of novel readout technologies to be applied for the screening of our European Chemical Biology Library (ECBL). Moreover, new collaborations with European SMEs in the field of compound permeability studies, virtual screening and microarray-based high-throughput screening have been settled.



# EU-OPENSCREEN ACTIVELY PROMOTES INITIATIVES FOR IMPROVING GENDER EQUALITY

According to the “She Figures 2018” Report published by the European Commission (EC), a disproportion between women and men in both academia and the private sector is still present in all European Member States especially when considering senior levels of employment and decision-making positions. EU-OPENSCREEN is fully committed to take all the necessary actions to improve gender equality within the consortium and to promote gender balance in the partner institutions. Moreover, EU-OPENSCREEN will promote actions to stimulate the public opinion, supporting focused initiatives to reduce the current gender gap at the institutional level as well as in the entire society.

The set-up of a permanent internal representative for gender equality ensures a continuity in the development and improvement of the action plan inside the organization. Following EC indications, EU-OPENSCREEN nominated a gender officer, Dr. Federica Rossella, who monitors gender distribution in the network and is responsible for actively sensitizing partner institutions on gender-related aspects, taking the necessary actions to ensure equal opportunities concerning recruitment, retention and career development within the EU-OPENSCREEN consortium.

Based on the results of the gender balance analysis in our partner institutions performed in the framework of the Horizon 2020 project EU-OPENSCREEN-DRIVE, a gender action plan has been developed to define specific initiatives that will allow the discussion and the exchange of experiences among the partners, as well as the participation to external conferences with the final aim to improve gender balance and increase diversity in our network.

EU-OPENSCREEN will promote actions to stimulate the public opinion, supporting focused initiatives to reduce the current gender gap at the institutional level as well as in the entire society.

# PROJECTS

EU-OPENSCREEN is involved in several European projects in order to ensure the long term sustainability and to enhance the collaboration with other life science research infrastructures



## CORBEL (GRANT NO. 654248)

CORBEL, the EC funded initiative of thirteen Life Science Research Infrastructures (LS RIs) established in 2015, was a four-year and nine months Research and Innovation Action aimed to establish shared services between the ESFRI LS RI to enhance the efficiency, productivity and impact of European biological and medical research and its translation into societal benefits.

The project ended in May 2020 and its effort continues through the common platform of the European LS RIs (https://lifescience-ri.eu), supporting cutting-edge science by offering access to the latest technologies, comprehensive resource collections and technical expertise. In 2020 the CORBEL website translated into the new LS RI website, which functions as a single-entry point to all LS RIs, enabling researchers to seamlessly access the rich landscape of ESFRI LS RIs services.

Moreover, in the final months of the project the LS RI could leverage the solutions established in the project to promptly respond to the COVID-19 outbreak. For instance, the developed user access pipelines provided support to screening projects for drug repurposing and structural analysis of SARS-CoV-2. In this context, the EU-OPENSCREEN partner-site Fraunhofer (Germany), working with EMBL Euro-Bioimaging (Hinxton - UK) and the University of Dundee (UK), promptly reacted to the pandemic and actively collaborated to assure public access to the results of a SARS-CoV-2 anti-cytopathic phenotypic screening campaign, which involved 3600 known drugs and 2000 pre-clinical candidates analysed for their anti-COVID-19 therapeutic potential as part of a large scale repurposing effort using Caco-2 cells.[1]

[1] https://www.biorxiv.org/content/10.1101/2020.11.12.378422v2.full.pdf

CORBEL SHARED SERVICES FOR LIFE-SCIENCE

www.corbel-project.eu

## ERIC FORUM (GRANT NO. 823798)

The ERIC Forum Project connects 20 established European Research Infrastructure Consortia (ERICs) and 3 ERICs in preparation with the common goal to strengthen coordination and enhance collaborations between them. The main aim is to develop common guidelines and best practices based on the shared experience. EU-OPENSCREEN is actively involved in the development of finding best practices in the areas of finance, operations and marketing.
During the ERIC Forum meeting 2020 in Brussels, the EU-OPENSCREEN director, Wolfgang Fecke, was elected to the ERIC Forum Executive Board as representative of the Life Science Cluster. The Executive Board is an important part of the permanent governance model for the ERIC Forum.

23 different ERICs and ERICs-to-be, as well as representatives from the European Commission (DG RTD), Ministries of Science, the European Strategy Forum on Research Infrastructures (ESFRI), and Research councils exchanged information and best practices. The Rules of Procedures (ROPs) for the implementation of the ERIC Forum Memorandum of Understanding were signed by all 18 established ERICs that took part in the meeting.

Within the ERIC Forum project as a first step towards establishing harmonised standards for ERICs, a guidance document on accounting principles for ERICs was developed. The guidance document is expected to improve the communication of financial information of the ERICs to the public and to identify a common set of general accounting principles, standards, and procedures.

In 2020 EU-OPENSCREEN was also involved in the establishment of best practices for recruitment and employment. A survey on recruitment practices and challenges was carried out among the ERIC Forum project partners and the major results were summarised. An upcoming deliverable due for publication in June 2021 will provide best practices guidelines in employment and secondment for ERICs and will further outline the challenges brought by secondment and in-kind personnel as referred to in this report.

ERIC FORUM

› www.eric-forum.eu



## EOSC-LIFE (GRANT NO. 824087)

EU-OPENSCREEN has actively contributed to the EOSC-LIFE project with Partner sites Fraunhofer ITMP (Hamburg) and IMG (Prague). The team were part of a successfully completed Demonstrator project covering data workflows in Chemical and Structural biology. In the project EU-OS worked on harmonisation of protein structure and compound bioactivity data sets, especially in the framework of Covid-19 pandemic related studies.

The outcomes of the project were detailed in a video presentation which can be found here. Support from the EOSC-LIFE project led to the deployment to public clouds of multiple Covid-19 related bioactivity and cell-image data sets arising from compound repurposing efforts including using the EU-OS bioactive collection of 2500 compounds.
Associated scientific publications covered studies on the main protease (MPr) of SARS-Cov2 (https://doi.org/10.1021/acsptsci.0c00216 , https://doi.org/10.1021/acsptsci.0c00215 ) using phenotypic screening for assessing the anti-cytopathic effects of compounds (https://doi.org/10.1038/s41597-021-00848-4).

FAIRified versions of the data sets have been made available on the ChEMBL and Image Data Repository clouds with support from EOSC-LIFE and will form part of the initial data to be included in the ECBD. This allows for greater Reuse of the data by external scientists as well as providing a resource which will support training in advanced image analysis methods which is being planned by the Euro-BioImaging research infrastructure.

EOSC-Life

› www.eosc-life.eu

## INEXT-DISCOVERY (GRANT NO. 871037)

EU-OPENSCREEN ERIC is partner in the recently funded Horizon 2020 project, iNEXT-Discovery (Infrastructure for transnational access and discovery in structural biology).

This project brings together 26 partners and aims to make structural biology key facilities for X-rays, NMR, cryo-EM and macromolecular biophysics accessible to new user communities, develop the methods further exploiting joined research efforts, and integrate different scientific fields into structural biology through the organisation of multi-disciplinary courses, workshops and training activities.

The project started in February 2020. The collaboration between EU-OPENSCREEN ERIC and iNEXT-Discovery enables the connection of structural biology with screening and medicinal chemistry areas. EU-OPENSCREEN will contribute in particular to the project through networking activities and will consolidate the collaboration started within the EU-OPENSCREEN-DRIVE project related to the screening of the newly established EU-OPENSCREEN fragment library.

iNEXT DISCOVERY

› www.inext-discovery.eu



## RI-VIS (GRANT NO. 824063)

RI-VIS, a Horizon 2020-funded project to increase the visibility and raise awareness of European RIs to new communities in Europe and beyond, brings together 12 RIs working in the fields of the life sciences, social sciences and environmental sciences as well as expert advisors from the physics sector, and an e-infrastructure.

EU-OPENSCREEN co-leads the Work Package 3 ‘International outreach and partnering events’ and organises global symposia to engage with new user communities and research infrastructures. Three bi-regional symposia with a focus on Africa, Latin America and Australia were initially planned as in-person events, but due to the Covid-19 pandemic had to be postponed tto 2021. The first of these global symposia will be co-organised with Professor Trevor Sewell at the University of Cape Town, South Africa, and will be held as an online symposium in February 2021.

In 2020, RI-VIS developed the “Communication Toolkit for European Research Infrastructures”, which provides an easy and useful set of tools, guidelines and resources to improve the communication strategy and activities of research infrastructures. Its common use is expected to increase the individual and collective visibility of research infrastructures, by aligning key-messages and improving how different stakeholders perceive them. The Communication Toolkit can be downloaded here: https://ri-vis.eu/download/?file=RI-VIS+Communication+Toolkit.pdf

Furthermore, RI-VIS project is developing three White Papers, which will provide recommendations on how to increase collaboration between European research infrastructures and their counterparts from Africa, Latin America and Australia. The papers are targeted at funders, policy makers and research infrastructure managers and collate the insights of experts from research infrastructures and policymakers from the respective regions.

RI-VIS

› www.ri-vis.eu

# FINANCIAL STATEMENT

EU-OPENSCREEN member countries - Czech Republic, Denmark, Finland, Germany, Latvia, Norway, Poland and Spain - supported the ERIC through their annual memberships. This contribution guaranteed that the Central Office and the Central Compound Management Facility (CCMF) were fully operational and that the infrastructure could fulfill its mission.

Furthermore, the host country, Germany, contributed with an additional budget for the establishment and the development of the CCMF that allowed the coverage of the costs for the equipment and compound collection acquired during the year 2020.

An important line in the expenses is the refund from EU-OPENSCREEN to the German Federal Ministry of Education and Research for an amount of 167,105€. This loan was granted in 2018 to ensure ERIC's operations during its initial stages. As presented and discussed with the members of this infrastructure, the balance for the year 2020 shows a deficit. The absolute value is nevertheless lower than the refund, since VAT refunds from the year 2018, and 2019 together with the coverage of personnel costs from third-party funding projects assured a mitigation of the overall ERIC's costs.

Last, due to the nature of the tax reimbursement process the application for the refund for the 4th quarter of 2020 was still being reviewed at the time this report was written. Until the German Federal Central Tax Office delivers the result the surplus in the amount of 95.332€ made in the year 2019 (see financial report 2019), ensures the coverage of the deficit shown here.



EU-OPENSCREEN ERIC BUDGET 2020

## Income and expenses 2020

| Income | Amount (€) |
|---|---|
| Regular ERIC membership fees | 1,240,520 |
| Host country contribution | 2,625,745 |
| Third party funding | 467,619 |
| Other incomes (tax refunds and other refunds) | 531,772 |
| Total contributions | 4,865,656 |

| Expenses * | Amount(€) |
|---|---|
| ERIC Office / Central Compound Management Facility (CCMF) | 1,227,947 |
| Laboratory | 2,655,279 |
| Third party funding | 144,898 |
| European Chemical Biology Database (ECBD) | 206,000 |
| BMBF Refund | 167,105 |
| VAT & Import Taxes | 534,397.66 |
| Expenses total | 4,935,626 |

| Surplus/Deficit: | -69,971 |
|---|---|

# Funding from projects

Awarded grants for projects and research platforms improve EU-OPENSCREEN's mission by increasing the organisation's know-how and strengthening synergies among partner sites and all institutions within and beyond the European Union.The current section focuses on their financial aspects and impact.

In the year 2020, six Horizon 2020 projects from the European Union were active. One of them, CORBEL, which started in 2015, prior to the official foundation of the ERIC, ended in 2020. It was therefore administered by the Leibniz Research Institute for Molecular Pharmacology in the Forschungsverbund Berlin e.V. (FVB-FMP) until the year 2019.
As depicted by the timetable below new projects like iNEXT-Discovery and MARBLES ensure a sustainable reallocation of resources. The role of EU-OPENSCREEN in the CHARLIE Consortium is mere of organizational and administrative nature. Financial beneficiaries are among others the three EU-OPENSCREEN partner sites: BioFarma Research Group from the University of Santiago de Compostela, FUNDACION MEDINA from Spain and the Fraunhofer Institute for Translational Medicine and Pharmacology from Germany.

| Project | Start | End | Amount (€) |
|---|---|---|---|
| EMBRIC * | | 05/2019 | 238,750.00 |
| CORBEL * | | 08/2020 | 106,250.00 € |
| ERIC-Forum | 01/2019 | 12/2022 | 44,166.25 € |
| RI-VIS | 02/2019 | 07/2021 | 91,035.00 € |
| EU-OPENSCREEN DRIVE | 02/2019 | 01/2023 | 1,438,758.00 € |
| EOSC-Life | 03/2019 | 02/2023 | 73,718.75 € |
| i-Next Discovery | 02/2020 | 01/2024 | 24,375.00 € |
| MARBLES | 04/2021 | 03/2026 | 76,250.00 |
| CHARLIE Consortium | 05/2021 | 10/2022 | 80,500.00 € |



# Planned project funding and grants

| | DRIVE | RI-VIS | Corbel | EOSC-Life | ERIC-Forum | iNEXT |
|---|---|---|---|---|---|---|
| Personnel (€) | 719.606 | 102.125 | 30.000 | 44,975 | 33.333 | 10,000 |
| Subcon-tracting (€) | 25.000 | / | / | / | / | / |
| Direct costs * (€) | 411.400 | 87.000 | 55.000 | 14.000 | 2.000 | 9,500 |
| Indirect costs (€) | 282.752 | 47.281 | 21.250 | 14,744 | 8.833 | 4,875 |
| | 1.438.758 | 236.406 | 106.250 | 73,719 | 44.166 | 24,375 |

# Actual third-party project funding in 2020

| | Drive | Ri-Vis | Corbel | EOSC-Life | ERIC-Fo-rum | iNEXT |
|---|---|---|---|---|---|---|
| Personnel | 165,439 | 44,332 | 7,417 | 7,449 | 2,092 | 2,292 |
| Subcontract-ing | / | / | / | / | / | / |
| Direct costs* | 123,504 | 8,264 | 8,849 | 1,864 | 239 | 2,177 |
| Indirect costs | 72,236 | 13,149 | 4,067 | 2,328 | 583 | 1,117 |
| | 361,179 | 65,744 | 20,333 | 11,641 | 2,914 | 5,586 |

*) Travel, equipment, goods and services

# COUNTRY IN FOCUS: DENMARK

## ABOUT DK-OPENSCREEN

The EU-OPENSCREEN partner sites in Denmark are the Biotech Research & Innovation Centre (BRIC) at the University of Copenhagen, a specialised screening site focusing on high-content screening; and the department of Chemistry at the Technical University of Denmark (DTU), a medicinal chemistry partner site, which hosts the national compound collection. Both partner sites are part of the National Infrastructure for Chemical Biology DK-OPENSCREEN.

The National Infrastructure for Chemical Biology DK-OPENSCREEN was founded in 2017 by four Danish universities: University of Copenhagen, Aalborg University, Aarhus University and the Technical University of Denmark. It is designed to be an open access platform for interdisciplinary chemical biology research spanning institutions,  industrial organisations and scientific disciplines. The core principles of the infrastructure guarantee that biologists have access to compounds with the potential to modulate biological systems, while chemists have a platform for testing the biological activity of their molecules.

The mission of DK-OPENSCREEN is to unite chemists and biologists to advance biomedical research. The platform offers access to a collection of more than 50,000 high-quality single molecules (the DK-OPENSCREEN Library) for use in biological screening assays. Users can either request the library in an assay-ready format for their own screening use – or screens can be performed by the network of DK-OPENSCREEN partner sites.
The platform consists of several nodes: 1) the compound library hosting facility, which prepares and distributes assay-ready plates to be directly used in biological screening; 2) a number of screening nodes, which currently includes sites specialised in pathogenic bacteria, phenotypic screening and bacterial communities.

# BIOTECH RESEARCH & INNOVATION CENTRE (BRIC) – UNIVERSITY OF COPENHAGEN, COPENHAGEN

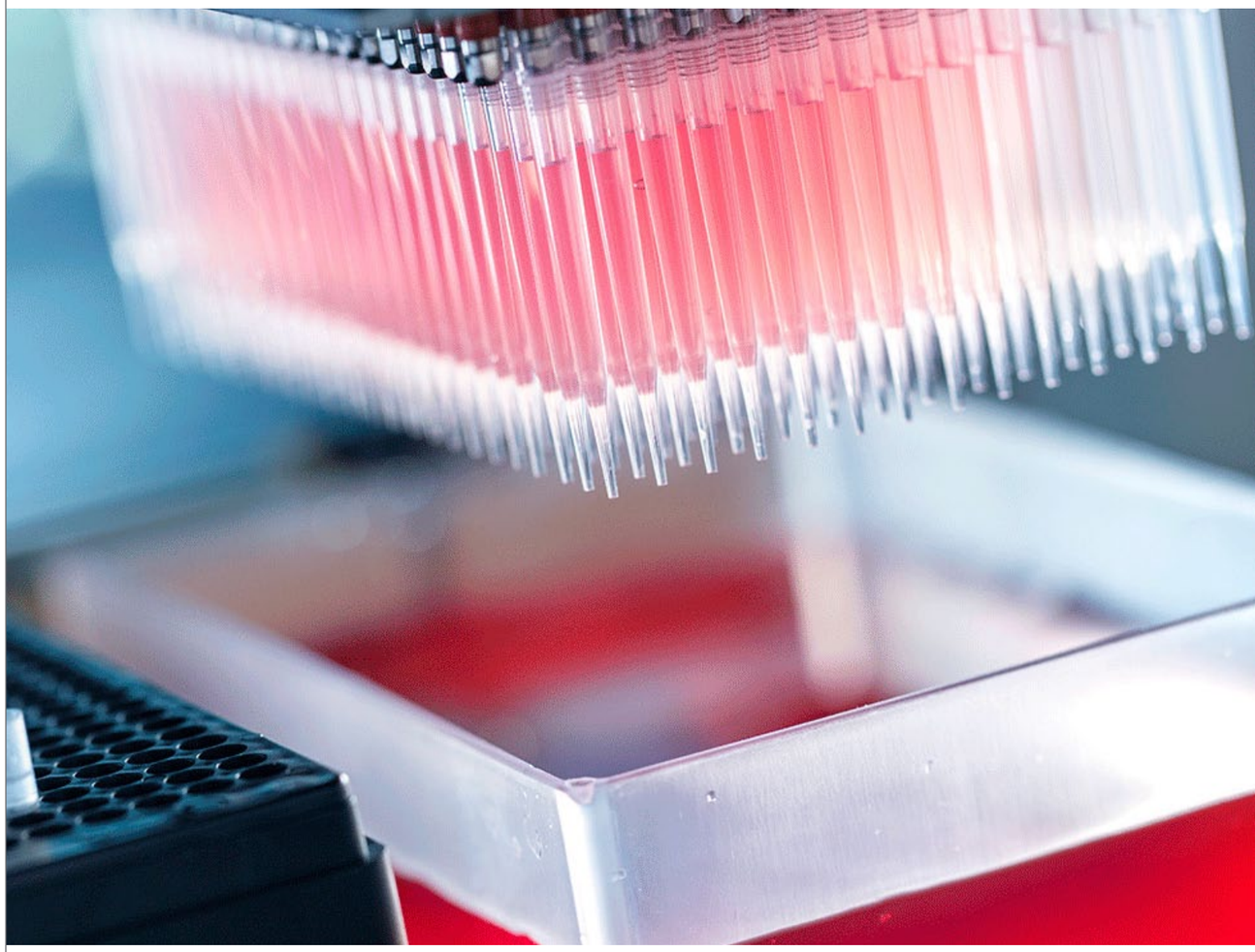
The Biotech Research & Innovation Centre (BRIC) at the University of Copenhagen is an internationally recognised biomedical research centre, supported by several high-end research infrastructures. The core facility for High Throughput Cell Based Screens (HTCBS) has a long tradition in supporting internal and external users in their cellular screening projects, in particular in the field of high content screening.

High-content screens are usually performed in medium throughput, either on smaller libraries or as phenotypic validation screens. The expertise of the HTCBS facility includes assay development, high-throughput screening and advanced image analysis on a variety of phenotypic readouts, such as autophagy, ribosome modifications, cell cycle regulation, DNA damage, neuronal homeostasis, cancer cell proliferation and protein degradation pathways. Furthermore, the facility provides support in statistical analysis and data visualisation.
In 2020, the facility ran several high content screens on DNA damage response, autophagy and some initial drug screens on patient-derived tumor organoids. Current developments focus on advanced image analysis pipelines for multiparametric analysis.

Currently, the facility is in the process of establishing a new high content CRISPR screening unit. This involves the setup of an automated liquid handling and imaging workstation, including a new confocal high content imaging system for advanced screening capacities in 3D.

> „EU-OPENSCREEN connects resources and technologies in a common effort to provide top-notch screening possibilities for European researchers. BRIC is looking forward to contribute to this community with our expertise on high content screening.“
>
> Prof. Krister Wennerberg





**Head of Core Facility:**
Prof. Krister Wennerberg

**Website:**
www.bric.ku.dk/core-facilities/ht-cell-based-screens

# DEPARTMENT OF CHEMISTRY – TECHNICAL UNIVERSITY OF DENMARK (DTU), LYNGBY

The Division of Chemical Biology at DTU Chemistry hosts research groups, which carry out projects in medicinal chemistry and chemical biology. Building on this experience, the EU-OPENSCREEN medicinal chemistry partner site offers a broad range of chemistry services, on a full-cost model or through collaborations.

DTUs expertise includes the design and synthesis of libraries of compounds for biochemical and cellular screening, phenotypic screening and target deconvolution (FACS, fluorescence microscopy, affinity chromatography and pull-down, covalent probes, mass spectrometry-based chemical proteomics), medicinal chemistry (hit-to-lead, structure activity relationship (SAR), Fragment-based drug discovery (FBDD), lead development, ADME-Tox), preclinical development of drug candidates (animal experiments performed both at the DTU animal facility and in collaboration with external partners).

The DTU Chemistry site is currently constructing an integrated HTS platform for biochemical and cellular screening. The platform will be operational in 2021 and will accelerate the screening capabilities within DK-OPEN-SCREEN.

In 2020, DTU Chemistry focused on fragment-based screening, where the range of targets has been extended and several hit-to-lead programs have been initiated. Additionally, the site has partnered with Aarhus University in a SARS-CoV-2-related project.

> „For DTU Chemistry, our membership of the Danish research infrastructure for chemical biology and being a medicinal chemistry partner site with EU-OPEN-SCREEN enable us to interact with potential collaborators in chemical biology across Europe."
>
> Prof. Mads H. Clausen

**Head of Unit:**
Prof. Mads H. Clausen

**Website:**
www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/kemisk_biologi/madshclausenintro

## ACCEPTING THE CHALLENGES

2020 was an eventful year in which we have reached significant goals - despite the restrictions imposed on us by the pandemic. We would like to take this opportunity to thank all our partners, who have supported us along the way.



# Imprint


### Publisher

EU-OPENSCREEN ERIC
Robert-Rössle-Str. 10
13125 Berlin, Germany
Phone: +49 (0)30 9489 2422
www.eu-openscreen.eu

### Content

EU-OPENSCREEN ERIC

### Layout / Design

KLIMEK WEB/PRINT/BRAND,
Braunschweig, Germany
(www.h-klimek.de)

### Images

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p.20-21 – contributed by SEAB members
p. 44-45 – contributed by partner site (BRIC)
p. 46-47 – contributed by partner site (DTU)
p.47 (top) – Joachim Rode (Denmark)

### Publication

June 2021

### Communication

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### European project funding

These projects receive funding from the European Union's Horizon 2020 research and innovation programme under grant agreement:

No 654008 (EMBRIC)
No 654248 (CORBEL)
No 823893 (EU-OPENSCREEN-DRIVE)
No 824087 (EOSC-LIFE)
No 823798 (ERIC Forum)
No 824063 (RI-VIS)
No 871037 (i-Next Discovery)

# APPENDIX: FINANCIAL AUDIT REPORT 2020

**RT Revisionstreuhand Berlin GmbH**
Wirtschaftsprüfungsgesellschaft

**Audit Report**

for the

**Fiscal Year**

ending December 31, 2020

of

**The European Infrastructure of Open Platforms for Chemical Biology**

**EU-OPENSCREEN ERIC**

**Berlin**



**RT Revisionstreuhand Berlin GmbH**
Wirtschaftsprüfungsgesellschaft



**A. Audit contract and performance of the engagement**

The Director General of

**The European Infrastructure of Open Screening Platforms for Chemical Biology**

**EU-OPENSCREEN ERIC, Berlin**

(hereinafter referred to as „EU-OPENSCREEN“ or „ERIC“)

appointed us as auditor for the income and expense accounts for the fiscal year ending December 31, 2020.

The EU-OPENSCREEN ERIC was established by seven founding members (Czech Republic, Germany, Spain, Finland, Latvia, Norway, Poland) as a European Research Infrastructure Consortium (ERIC) by statutes dated March 25, 2018. Denmark was at that time an observer and was welcomed as a member on January 1, 2019.

EU-OPENSCREEN ERIC is a non-profit organization, which integrates high-capacity screening platforms across the European Union and beyond, strengthening the synergies among different partners on research facilities. It uses a rationally selected compound selection from European chemists. EU-OPENSCREEN ERIC is committed to grant open access to its recources to researchers from academic institutions, small and medium-sized enterprises and industrial organizations. Moreover, the ERIC will profile all compounds delivering extensive information on physico-chemical cellular toxity and antimicrobial properties.

**RT Revisionstreuhand Berlin GmbH**
Wirtschaftsprüfungsgesellschaft



The year from January 1, 2020, up to Debember 31, 2020, is the second complete fiscal year oft he ERIC.

As the statutes do not define in Article 11 the kind of financial reports to be issued, income and expense accounts based on a cash basis (similar to those required for charitable and tax-exempt foundations in Germany) were presented to us by the EU-OPENSCREEN ERIC.

We conducted our audit in accordance with the legal requirements applicable for charitable and tax-exempt institutions in Germany. An auditor conducting an audit obtains reasonable assurance about whether the financial reports are free from material misstatements. Absolute assurance is not attainable due to the inherent limitations of an accounting and internal control system and due to the sample-based test nature of an audit. There is an unavoidable risk that material misstatements in the financial reports remain undetected. Areas which are generally covered in special engagements were not included in our scope of work.

We performed the audit in June, 2020, in Berlin. The audit was completed at the date of this report.

Our responsibilty and liability as auditor is guided by the „General Engagement Terms for Wirtschaftsprüfer and Wirtschaftsprüfungsgesellschaften - General Public Auditors and Public Audit Forms - as of January 1, 2017“, which are in Appendix III to this report.

**RT Revisionstreuhand Berlin GmbH**
Wirtschaftsprüfungsgesellschaft



Summary of audit findings

During our audit, we obtained evidence that the requirements as described in Article 21 of the (revised) statutes of the EU-OPENSCREEN ERIC dated May 16, 2019, and generally accepted accounting principles as applied in Germany for charitable an tax-exempt foundations have been complied with.

In line with our risk and control based audit approach and the extent we considered necessary for the purpose to express an opinion, we considered internal controls related to sub-processes of the financial reporting process as a part of our audit.

The ERIC’s legal representative provided all evidence and explanations requested by us. We obtained a representation letter signed by the legal representative, which we included in our working papers.

During our audit, we did not note any facts which indicate there could be substantial doubt about ERIC’s ability to continue as a going concern or which indicate a material deterioration of the ERIC’s performance or a material offence of the ERIC’s legal representative or its emplyees againt German law.

**RT Revisionstreuhand Berlin GmbH**
Wirtschaftsprüfungsgesellschaft



**B. Auditor's report**

We have audited the financial report of

**The European Infrastructure of Open Screening for Chemical Biology**

**EU-OPENSCREEN ERIC, Berlin.**

These financial reports comprise the income and expense position for the year ending December 31, 2020.

Based on our audit, the accompanying financial reports were prepared in accordance with the legal regulations applicable for charitable and tax-excempt foundations and present fairly, in all material respects, the income and expense situation of the EU-OPENSCREEN ERIC as of December 31, 2020, and its financial performance for the year then ended.

Basis of Opinion

We conducted our audit in accordance with the German standards of auditing. Those standards require that we comply with the International Standards of Auditing (ISA). Our responsibilities under those regulations and standards are further described in the „Auditor's Responsibilities for the Audit of the Financial Report" section of our report. We are independent of the ERIC in accordance with the German General Accepted Accounting Principles and professional requirements and we have fulfilled our other ethical responsibilities in accordance with these rquirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

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Responsibilities of Management for the Financial Reports

Management is responsible for the preparation of the financial reports in accordance with General Accepted Accounting Principles and other legal or regulatory requirements, for them to present a true and fair view of the financial position and the financial performance of the ERIC and for such internal controls as management determins are necessary to enable the preparation of financial reports that are free from material misstatements, whether due to fraud or error.

In preparing the financial reports, management is responsible for assessing the ERIC's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless management either intends to liquidate the ERIC or to cease operations, or has no realistic alternative to do so.

Auditor's Responsibilities for the Audit of the Financial Reports

Our objectives are to obtain reasonable assurance about whether the financial reports as a whole are free from material misstatements, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the International Standards of Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial reports.

As part of an audit, we exercise professional judgment and maintain professional skepticism throughout the audit.

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We also

identify and assess the risks of material misstatements of the financial reports,. whether due to fraud or error, we design and perform audit procedures responsive to those risks and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal contral.

obtain an understanding of internal control relevant to that audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control.

evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the management.

conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the ability to continue a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial reports or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the ERIC to cease to continue as a going concern.

evaluate the overall presentation, structure and content of the financial reports, including the disclosures, and whether the financial reports represent the underlying transactions and events in a manner that achieves fair presentation.

Berlin, June 25, 2021

W. Happich

Wolfgang Happich
Wirtschaftsprüfer