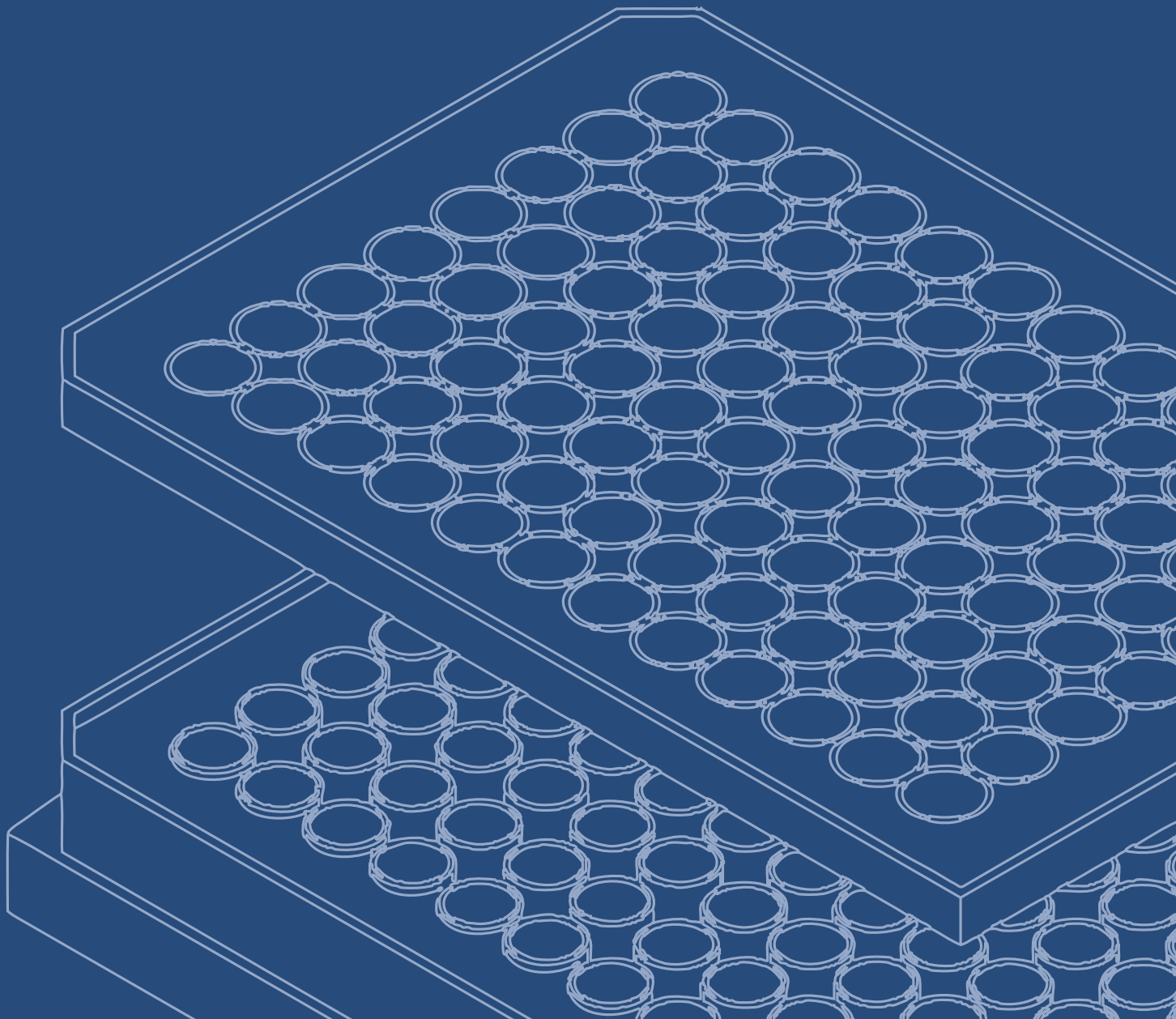
eu:openscreen

Activity and Financial Report 2019



A screening network for life science research and its translation to medicine and agriculture

Stay tuned:
www.eu-openscreen.eu

Content

Interactive Navigation:

- go to chapters
- turn back to the table of contents

Foreword

by Director General Dr Wolfgang Fecke

We started this eventful second year as an ERIC with welcoming Denmark as a new ERIC member country. The two official partner sites in Denmark – the Technical University of Denmark (DTU) and the Biotech Research & Innovation Centre (BRIC) at the University of Copenhagen – now complement our consortium of screening and chemistry sites across Europe.
A first highlight of the year already happened in February when we as coordinator had the opportunity to host the Kick-Off meeting of our large European project EU-OPENSCREEN-DRIVE. This consortium of 34 institutions, most of them already partner sites but some also renowned institutes in EU-OPENSCREEN candidate member states, serves as a testbed for our ERIC as it provides the means to support several screening and medicinal chemistry projects. Furthermore, it gives us the possibility to try out novel scientific services such as fragment screening or chemoproteomics approaches. The tight deadlines in this project truly accelerated the setup of our laboratory and acquisition of chemical libraries! After moving to our new home in the beautiful Timoféeff-Ressovsky-Haus (TRH), which has been renovated in 2018/2019, we were able to purchase and install our first major equipment in the new laboratories, a sensitive and high throughput LC-MS Instrument from Agilent, and decided on the purchase of a large automated tube store from Hamilton and selected our library of bioactive compounds. Meanwhile, the

project managers Tanja, Kathy and Alessandra as well as our first laboratory scientist Federica joined the team, increasing our headcount during 2019 from five to nine. We also received valuable input into the set-up of our laboratory from our FMP partner site, to be mentioned in particular here are Martin Neuenschwander and Edgar Specker.

We are now all very much looking forward to completing the implementation of our unique research infrastructure for chemical biology so that we can start offering full access to our chemical libraries, high throughput screening technologies and training opportunities in 2020.
I hope you enjoy reading our annual report 2019!

Executive Summary

EU-OPENSCREEN ERIC has made progress in implementing a European research infrastructure in chemical biology: the Central Compound Management Facility (CCMF), European Chemical Biology Database (ECBD, which is developed and hosted by our partner site IMG Prague) and compound libraries are currently being set-up, and the EU-OPENSCREEN ERIC central office now occupies its permanent office and lab space at the Campus Berlin-Buch.

EU-OPENSCREEN is a growing active community with Denmark as a new member country, which hosts two partner sites at the DTU and BRIC. The team at the ERIC office grew from five to nine collaborators, in part as a result of the start of the EU-OPENSCREEN-DRIVE project, which is coordinated by the EU-OPENSCREEN ERIC. In addition to EU-OPENSCREEN-DRIVE, EU-OPENSCREEN has been successful with several grant proposals and actively participates in several EU projects, i.e. CORBEL, EOSC-Life, ERIC Forum and RI-VIS, while the EMBRIC project came to an end in May 2019.

EU-OPENSCREEN actively engages with and raises awareness among the scientific community at many scientific outreach activities, and successfully co-organised our biennial scientific meeting, the European Chemical Biology Symposium (ECBS/EuChemS-LS) at the CSIC in Madrid in April. Service level agreements with nearly all screening partner sites are now in place, while a material transfer agreement for donation of compounds from academic chemists to the ERIC is also ready.

EU-OPENSCREEN ERIC Central Office

Organisation

The research infrastructure EU-OPENSCREEN offers three types of services to the scientific community which are depicted in the organisational chart:

1. It provides access to their biological screening and chemistry technology platforms by means of projects between the collaborating external and partner site scientists,

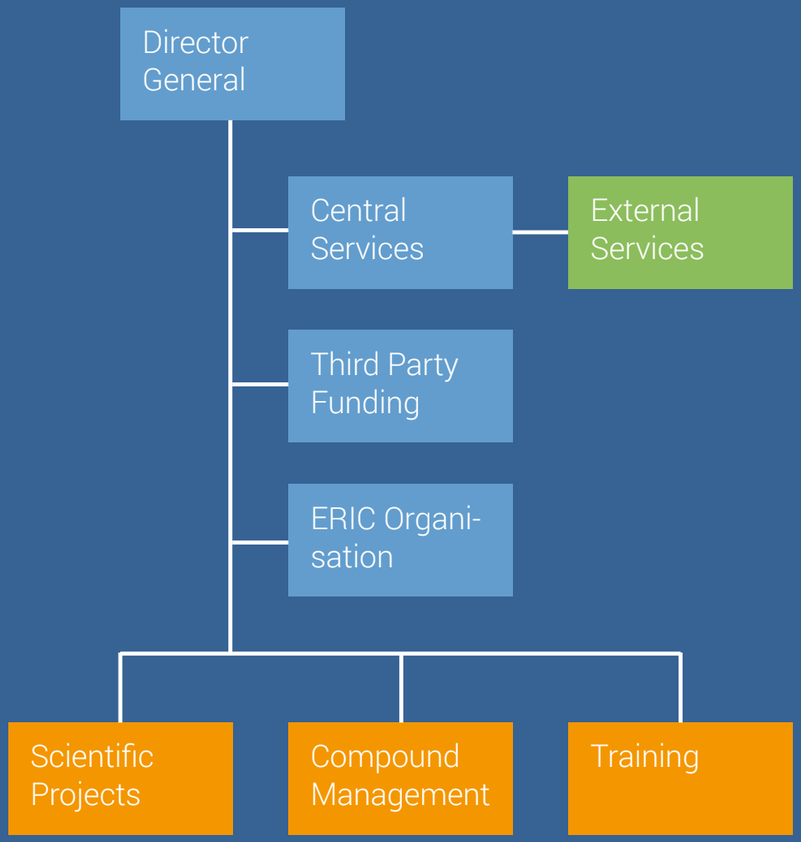
2. manages an extensive collection of commercially and academically sourced small molecule compounds for screening and provides its partner sites with copies of these libraries and larger amounts of validated hit compounds, and

3. supports training activities such as courses or staff exchanges in assay development, high-throughput screening (HTS) or data analysis.

The **director general** is legally responsible for all ERIC activities and is supported by a team of scientific and administrative managers and laboratory scientists. **Central services** oversee the financial and office management of the ERIC while also being responsible for outreach and human resources activities. Part of the work is outsourced to **external companies or consultants**, in particular related to accounting and legal aspects of our work. Other support functions make sure that the ERIC can always fulfill its main service offerings.

The "**ERIC organisation function**" is mainly responsible for internal communication to member states and partner sites. It organises regular events such as our "Assembly of Member" and "Partner Site Forum" meetings as well as many activities aimed at enlarging the number of member states. It also helps in organizing our biannual "European Chemical Biology Symposium" and identifies suitable grant opportunities through which EU-OPENSCREEN can reach out to a wider community.

These opportunities are then turned into proposals by the "**Third Party Funding**" function which also manages our successful grants and works on strategic collaborations with industry or disease foundations.



EU-OPENSCREEN ERIC Organisation

At the core of EU-OPENSCREEN´s organisation are three main services:
The implementation of scientific projects, the handling of the unique EU-OPENSCREEN compound collection and the coordination and organisation of dedicated training courses.

EU-OPENSCREEN Team

While EU-OPENSCREEN ERIC is still a young organisation and was legally established only in April 2018, several of its team members have worked for much longer on the set-up of this unique infrastructure.

Wolfgang Fecke is a biologist and worked for several years at the VIB in Belgium, acting also as consultant to the ERIC for several months before he joined the team as director in April 2018. He took over the role from Philip Gribbon who acted as coordinator during the ERIC transition period and returned back to our partner site in Hamburg. **Bahne Stechmann** is our strategy officer and joined the team nearly ten years ago when EU-OPENSCREEN just started the Preparatory Phase. Having by far the longest experience with ERICs, he currently heads the "ERIC organisation" function, acting as key contact to our partner sites and member states.

As a trained biologist, **Katja Herzog** has been part of the team since 2016 and played an essential role in the administrative and operational set-up (including the IT infrastructure) of the ERIC central office. She is managing our European projects with particular responsibility for the EU-OPENSCREEN-DRIVE project which requires the effective coordination of more than 30 partners. Together with **Tanja Miletic**, who joined the office in January 2019, she took over the responsibility for the EU-OPENSCREEN-DRIVE transnational access open calls for user projects for HTS and chemoproteomics projects as well as for the generation of a novel fragment screening library. Tanja has a background in organic chemistry and works as a project manager for the ERIC.

The EU-OPENSCREEN-DRIVE team was strengthened further in December 2019 when **Alessandra Silvestri** became part of the team. Having a background in 3D cell culture models, she took over some of the HTS projects in EU-OPENSCREEN-DRIVE and is now also responsible for technology co-development projects with industry partners.

The first members of the compound management team joined the ERIC in May 2019. **Federica Rossella** is an analytical chemist and responsible for the quality of the compounds in our collection, and works together with **Martin Neuenschwander**, also a member of the FMP Screening Unit and has been already for several years involved in the planning of the EU-OPENSCREEN laboratory facilities. He will return to a full-time position at the FMP in May 2020.

Maren Kappe has a background in marketing and already served in several roles for the ERIC during the last five years. While mainly responsible for outreach activities and HR aspects, she also stepped in and supported billing and accounting work whenever needed.

Kathy Skopelitou joined the ERIC in May 2019 as administrative project manager. While first working on our EU-OPENSCREEN-DRIVE project, she later took over responsibilities for managing our training activities and the development of our "Bioprofiling" assay portfolio. She is also the key contact for our legal advisors.

EU-OPENSCREEN Team 2019

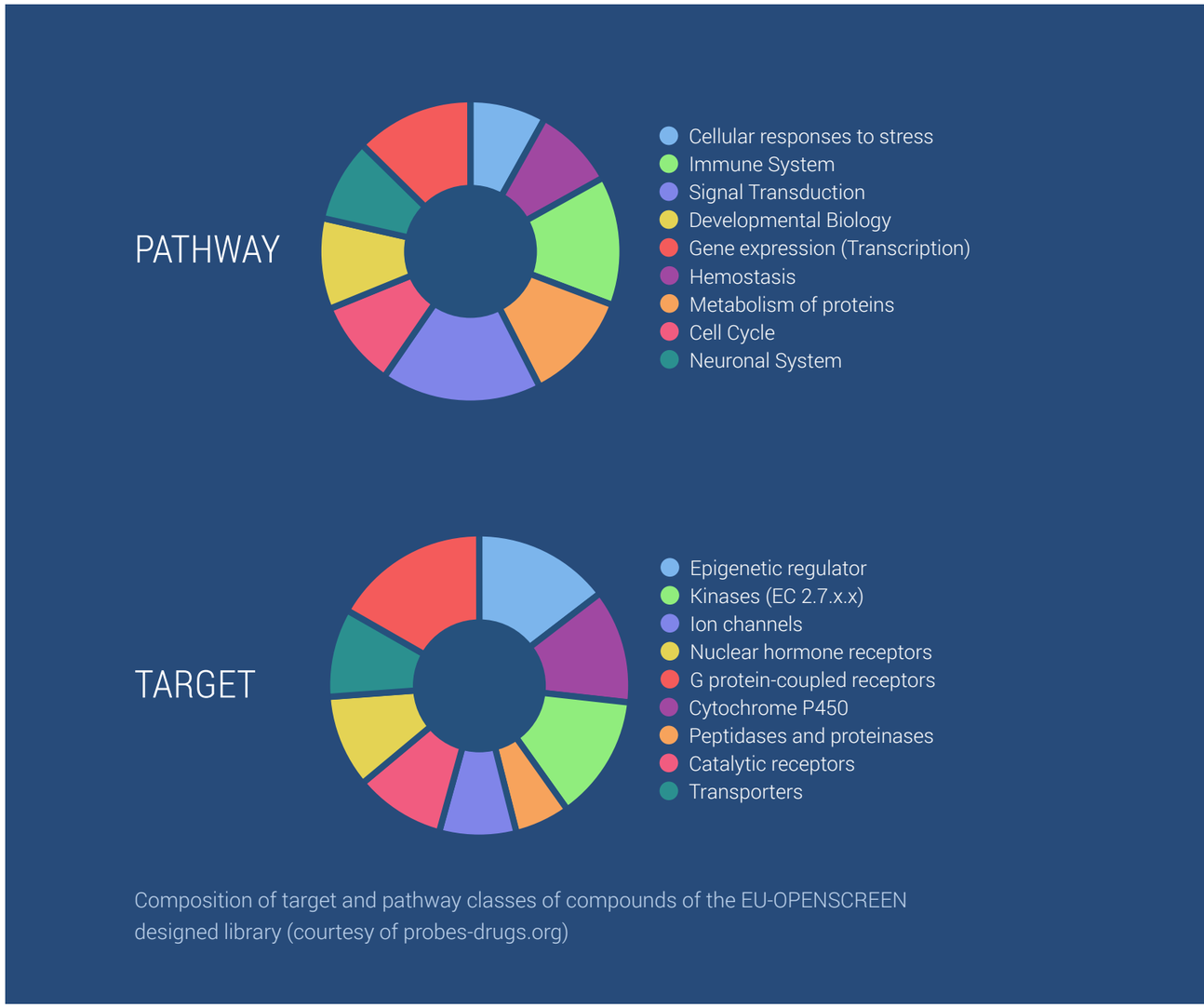
Director General Wolfgang Fecke	**European Relations and Grant Officer** Katja Herzog
Scientific Strategy Officer Bahne Stechmann	**Communication & HR Manager** Maren Kappe
Scientific Project Manager Tanja Miletic	**Administrative Project Manager** Kathy Skopelitou
Interim Compound Manager Martin Neuenschwander	**Compound Scientist** Federica Rossella
Scientific Project Manager Alessandra Silvestri	**Senior Advisor** Ronald Frank

Accessing EU-OPENSCREEN

The global community of chemical biologists from both academic and commercial organisations can make use of EU-OPENSCREEN's technologies and expertise. Scientists with an interest in finding chemical tool compounds for basic research purposes or candidate molecules for e.g. the development of therapeutics can contact our scientific team with a project idea via our website at https://www.eu-openscreen.eu/about/contact-team.html. Besides a novel protein target or innovative project idea, it is essential to also have access to a robust biological assay which can deliver reproducible data in at least a 96-well plate format. Some of our screening partner sites might even support the development of such an assay through consultations or stages in their screening labs.
A positive proposal evaluation allows the collaborating partner to get free access to our pilot screening library of about 5,000 compounds.

Half of these compounds are representative of our large screening collection of 100,000 commercial compounds while the other half is made up of about 2.500 bioactive compounds. EU-OPENSCREEN has recently purchased this unique library which was designed by Ctibor Skuta and Petr Bartunek from our partner site IMG in Prague. A strong emphasis during the design of this library was on the selection of molecules with high target selectivity.

The selected 2464 compounds are active against 1039 different primary targets, contain 654 approved drugs and 368 highly selective probes. A graphical overview about target and pathway coverage is shown on the right and was generated using the Probes & Drugs portal (www.probes-drugs.org). The bioactives library will be available to researchers from early 2020.



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

Pilot library testing

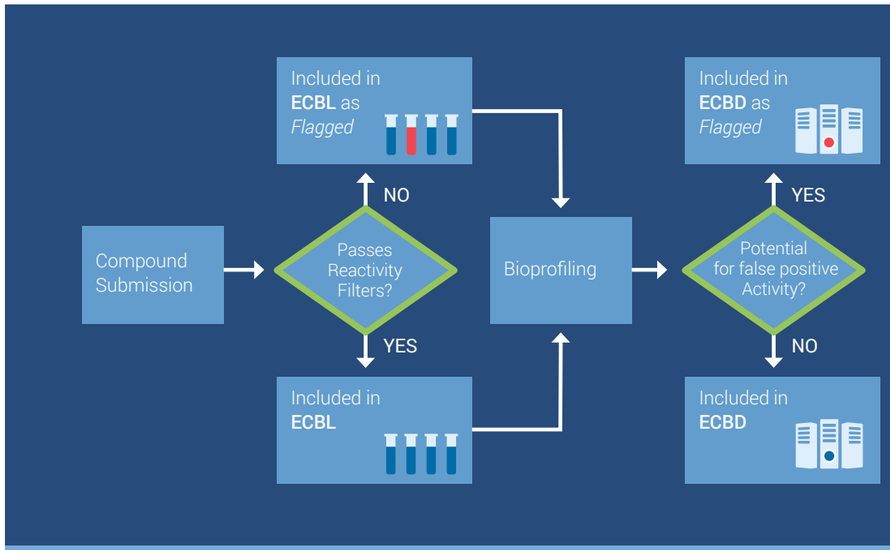
Testing of the pilot library has several advantages as it might provide first hits to follow up, as well as statistics on assay robustness which can indicate suitability of the assay for large scale screens. Positive results can be incorporated into grant proposals which in turn will provide the funding for an HTS-driven lead discovery campaign. We expect that most pilot library screens can be followed with a large HTS of our European Chemical Biology Library (ECBL), which consists of 100,000 commercial compounds and a growing number of academically sourced compounds. A compound replenishment fee for scientists from member states of currently €0.20 per commercial compound (€0.40 per commercial compound for scientists from non-ERIC member countries) applies, which will be reinvested to replenish our commercial compound stocks. Importantly, all intellectual property on hit compounds from the 100,000 compound library will remain with the collaborating scientists.

Chemists from academia and industry can donate their compounds which are integrated in the ECBL and thereby expose them to a variety of different biological targets. This will increase the attractiveness of the ECBL for our scientific collaborators as compounds with novel chemistry will become available. The incentive for the donating chemists is the possibility to get their compounds tested in innovative projects at high-throughput screening sites across Europe with the chance to collaborate further with scientists on chemical tool development, generating publications and/or IP in the process.

We require 10 mg of solid compound with a purity of at least 90%, the structure and data of which is then uploaded via a purposefully created interface with full annotation, NMR analysis or mass traces. The donated compound will then be tested for purity and identity in EU-OPEN-

SCREEN's Central Compound Management Facility (CCMF), and the fundamental physical-chemical (i.e. solubility, fluorescence) and biological (i.e. cytotoxicity) properties will be assessed through a process termed 'bioprofiling'. Compounds that do not meet the library standard of ≥ 90% purity, or that contain predicted or measured properties with potential to lead to false positives in screening campaigns, such as self-aggregation, autofluorescence etc., will nevertheless be integrated in the ECBL, but will be 'flagged'. Once compounds are identified as validated hits, donating chemists will receive an automated notification through the ECBD, giving them the opportunity to work with the project team on these compounds, whilst the IP is shared between them and the team. In the time frame between the compound submission and the publication of the bioprofiling results, all data will be part of the embargo section of the ECDB, to allow the donating chemist to assess all the data first. The whole donating, profiling and publication process of compounds is summarised below.

Data scientists from all over the world will be able to access the public section of the ECBD, using all positive and negative data on the increasing number of screens for the prediction of protein target modulations by existing and related compounds. Importantly, these complex datasets contain also metadata on used reagents, cell lines, experimental protocols etc. This will greatly improve data quality by ensuring full transparency according to FAIR principles (findable, accessible, interoperable, reproducible), thereby also tackling reproducibility issues in Life Science research.



Selection process of compounds for the European Chemical Biology Library (ECBL) and the European Chemical Biology Database (ECBD)

Developing and growing

Highlights in 2019

Founded by seven European countries in 2018, EU-OPENSCREEN encourages scientists, institutions and countries to join and participate in a collaborative effort to develop novel chemical probes.

Reaching out to, and engaging with, scientific communities in countries that have not joined EU-OPENSCREEN is an important goal.

In 2019, numerous workshops and symposia have been organised in our candidate countries, e.g. Greece, Israel, Italy, Portugal, Romania, Switzerland and the UK. These events brought together scientists and funding organisations to discuss ongoing research in drug discovery and community needs, and will hopefully pave the way towards their membership in EU-OPENSCREEN.

Denmark joins EU-OPENSCREEN as a new member country

EU-OPENSCREEN is a growing community and welcomed Denmark as a new ERIC member country in January 2019. Denmark now hosts two official EU-OPENSCREEN Partner Sites: The high-throughput cell-based screening facility of the Biotech Research and Innovation Centre (BRIC) at the University of Copenhagen, led by Prof. Krister Wennerberg; and the Chemical Biology group at the Technical University of Denmark (DTU), led by Prof. Mads H. Clausen.

The Biotech Research & Innovation Centre (BRIC) is an elite centre for biomedical research formed in Denmark in 2003. BRIC's High-throughput Cell Based Screening Facility offers flexible and state-of-the-art high-throughput screening technologies for a wide variety of automated assays. Customised screens can be performed both in 96- and 384-well microtitre plate format utilizing immunofluorescence/fluorescent markers, luminescence or qPCR as a read-out.

The chemical biology group at the DTU carries out research on diversity-oriented synthesis of fragments and HTS compounds as well as bioorganic chemistry. The group uses small organic molecules to approach a wide variety of challenges in biology. The current focus is directed against cancer, inflammatory and metabolic disease. Research efforts are aimed at the development of screening technologies, new chemical probes, diagnostic tools, and lead compounds for drug discovery.

Both partner sites are members of DK-OPENSCREEN and complement EU-OPENSCREEN's growing network of excellent screening and chemistry sites across Europe.

Biotech Research & Innovation Centre (BRIC)


Technical University of Denmark (DTU)

Funding of EU-OPENSCREEN-DRIVE to further strengthen chemical biology services in Europe and beyond

Since April 2018, international researchers have the possibility to easily access a distributed network of screening and medicinal chemistry facilities through EU-OPENSCREEN ERIC partners. To further support the development and long-term sustainability of the EU-OPENSCREEN ERIC operations, EU-OPENSCREEN-DRIVE (https://drive.eu-openscreen.eu) – a Horizon-2020-funded project (Grant No. 823893) – was established to implement actions focused on widening awareness of academia and industry for its services and data, growing the capacity and competences in this field and supporting the management needed for a large distributed infrastructure.

The EU-OPENSCREEN-DRIVE project kicked off with a meeting in Berlin on February 18, 2019. Participants from 34 project partners and from all the main partner sites of EU-OPENSCREEN met at the MDC Conference Centre on Campus Buch to 'drive' forward the implementation of the EU-OPENSCREEN operations, and to enhance the EU-OPENSCREEN ERIC's capabilities further. During the two-day meeting the acquisition of academic compounds, the start of transnational user projects, the organisation of training activities and many other topics were discussed in the 10 different work package meetings. In the evening there was time for individual talks and networking.


EU-OPENSCREEN-DRIVE Kick-Off Meeting with 65 participants in Berlin, 2019.

EU-OPENSCREEN ready to source and collect academic compounds from chemists in Europe and beyond

One of EU-OPENSCREEN's main objectives, the systematic crowd-sourcing of academic compounds from chemistry labs across Europe, ensures that under-exploited compounds become accessible to the research community. As part of the EU-OPENSCREEN collection, unique academic compounds will be distributed to our partner sites and used in a variety of screening projects, allowing the generation of a large amount of data that will contribute to their characterisation and the development of new molecules with medical potential. Moreover, the incorporation of these compounds into the EU-OPENSCREEN ERIC library will ensure that under-exploited compounds will be made available to the scientific community, strongly stimulating the collaboration between chemists and biologists.

To ensure correct management of the acquisition process in terms of legal and technical requirements, our partners Päivi Tammela (University of Helsinki), Mabel Loza (University of Santiago de Compostela), and Edgar Specker (Leibniz Research Institute for Molecular Pharmacology in the Forschungsverbund Berlin e.V./ EU-OPENSCREEN ERIC) with the support of Federica Rossella (EU-OPENSCREEN ERIC) have finalised the Material Transfer Agreement to be signed between the academic donor of the compound and EU-OPENSCREEN ERIC.

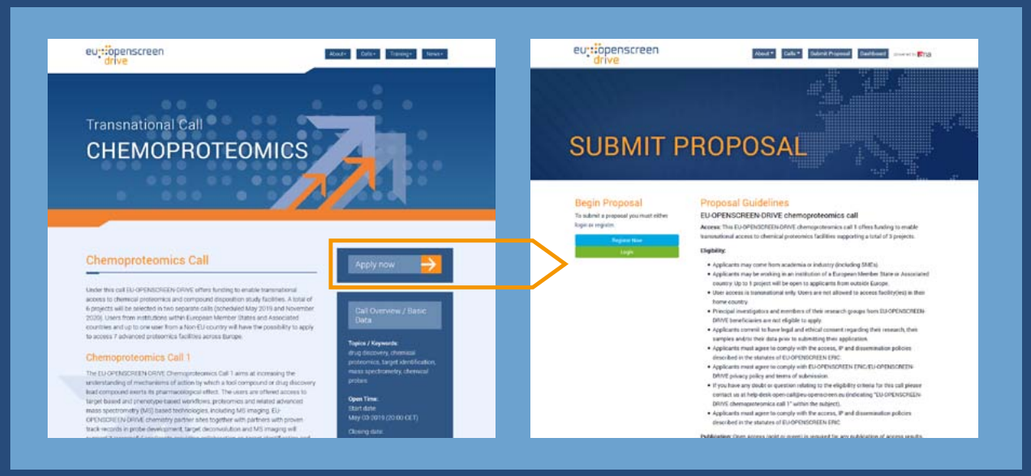
Moreover, they have defined a workflow for the compound collection during which identification, tracking and storage of the academic compounds are managed according to FAIR (Findable, Accessible, Interoperable, and Reproducible) data in chemistry.

> Since 2019, EU-OPENSCREEN is ready to realise the vision of a pan-European network collection.

Establishment of a user-friendly online access management system

The first pilot open calls for transnational access for small molecule screening and for chemoproteomics services were launched in Spring 2019 and closed in September 2019. Capitalizing on the successful implementation of ARIA within the CORBEL open calls, this cloud-based administration system for research infrastructures was implemented for access and facility management and tracking of EU-OPENSCREEN's first set of user projects. The ARIA access management system comprises full proposal submission and administration including the pre-award and post-award management of proposals.

Using ARIA features, EU-OPENSCREEN easily configured customised forms tailored to our EU-OPENSCREEN-DRIVE calls for users, reviewers and service/technology managers using a large number of different field types. ARIA's integrated messaging system was used for general and official communication between applicants/ users, EU-OPENSCREEN administrators and/or service/technology managers. For reporting purposes, it is possible to access proposal statistics as well as reports. Moreover, the entire service was styled and customised according to the EU-OPENSCREEN ERIC branding. EU-OPENSCREEN benefitted also from the possibility of using personalised workflows, and thus, set-up specific workflows based on the need of the different calls from application, submission and proposal evaluation to management of user access.



EU-OPENSCREEN-DRIVE OPEN CALL webpage (left) and online application platform powered by ARIA (right). Each of the two 2019 calls has a dedicated access rout in ARIA.

Selection of EU-OPENSCREEN-DRIVE transnational access user projects

The selection process of the first EU-OPENSCREEN-DRIVE open calls for transnational access has been almost completed in 2019. Outstanding academic as well as industry researchers from all over Europe have been attracted by EU-OPENSCREEN-DRIVE's 'Small Molecule Screening Call' and 'Chemoproteomics Call 1'. Independent, external experts in the field of small-molecule screening and chemoproteomics evaluated the quality of the proposals in terms of its scientific excellence, impact and innovation potential, project feasibility, excellence of principal investigator and research staff, and gender balance.

Small Molecule Screening Call

53 proposals were submitted from 17 different European countries to the Small Molecule Screening Call. The highest number of applications were received from Germany, Italy, Spain and the United Kingdom.

The research projects covered a broad range of research fields and were characterised by scientific excellence and significant scientific impact. The available funding allows EU-OPENSCREEN to support the implementation of 13 projects that have been submitted by researchers coming from eight different European countries, strongly improving the transnational collaboration within the European Union.

The selected proposals will contribute to answer open questions in oncology, neurodegenerative diseases, inflammation, viral infection and biocalcification.

Chemoproteomics Call

In total, eight projects were submitted to the first EU-OPENSCREEN-DRIVE Chemoproteomics call 1 by applicants from Germany, Italy, Portugal, Spain and the United Kingdom. This call was aimed to support European researchers' access to target-based and phenotype-based workflows, proteomics and related advanced mass spectrometry-based technologies.

The research fields covered by the proposals were diverse and characterised by a broad scientific interest from mitochondrial function to immune oncology, multiple sclerosis and Leishmaniasis. Three projects with the highest scientific potential have now been selected and they will receive scientific support from our partner sites as well as from other advanced proteomic facilities in Europe. A second Chemoproteomics call 2 is planned for the end of 2020.

Chemoproteomics Call – Selected projects

User institutions

- Technical University of Darmstadt, DE
- German Cancer Research Center (DKFZ), DE
- University of Nottingham, UK

Chemoproteomics facilities

- SINTEF, NO
- Institute of Bioorganic Chemistry, Polish Academy of Science, PL
- Leibniz Research Institute for Molecular Pharmacology, DE
- University of Santiago de Compostela, ES
- Technical University of Munich, DE
- Helmholtz Centre for Infection Research, DE
- Hochschule Mannheim, University of Applied Sciences, DE

Small Molecule Screening Call – Selected projects

User institutions

- University of Oxford, UK
- Instituto de Investigación Sanitaria de Santiago de Compostela, ES
- University of Cologne, Institute for Genetics, DE
- University of Oslo, NO
- University Pompeu Fabra, ES
- CIBIO, University of Trento, IT
- University of Glasgow, UK
- Institute of Biochemistry of the Romanian Academy, RO
- Biozentrum University of Basel, CH
- University of Oulo, FI
- Institute for Research in Biomedicine Barcelona, ES

Screening facilities

- University of Santiago de Comostela, ES
- Leibniz Research Institute for Molecular Pharmacology, DE
- Principe Felipe Research Center, ES
- Institute of Bioorganic Chemistry, Polish Academy of Science, PL
- Helmholtz Centre for Infection Research, DE
- Fraunhofer IME ScreeningPort, DE
- University of Bergen, NO
- University of Helsinki, FI
- Institute of Molecular Genetics of the Czech Academy of Sciences, CZ
- Fundación Medina, ES
- Centre for Molecular Medicine Norway, University of Oslo, NO
- Institute of Molecular and Translational Medicine, Palacký University, CZ

EU-OPENSCREEN supports collaborative projects with academia and industry

One important goal of EU-OPENSCREEN-DRIVE is to intensify the collaboration between academic research centers and industry partners by actively supporting industry engagement in EU-OPENSCREEN-DRIVE projects.

Together with the EU-OPENSCREEN partners Mabel Loza and Pepo Brea from the University of Santiago de Compostela and Kjetil Tasken and Johannes Landskron from the University of Oslo, the EU-OPENSCREEN Industry Liaison Office (ILO) has been established, representing a direct communication channel between academic research centers and industry representatives. Several co-development proposals are ready to be discussed during the first ILO workshop that will take place in Santiago de Compostela in 2020. The proposed collaborative projects will be aimed at establishing innovative methodologies that can become part of the routine workflow of pharmaceutical companies, or to support providers of reagents or instrumentation through the validation of their technologies by using the EU-OPENSCREEN compound collection at EU-OPENSCREEN partner sites.

Knowledge exchange during the first EU-OPENSCREEN-DRIVE compound logistics course

Participants from EU-OPENSCREEN-DRIVE partner sites in Poland, Spain, Norway and Germany participated in the first EU-OPENSCREEN 'Compound logistic course' which took place on November 28-29th 2019 at the Institute of Molecular Genetics (IMG) in Prague. The training also raised the interest of external researchers from the Research Center for Natural Science in Budapest, that were attracted by the state-of-the art technologies available at IMG and the high-quality training offered. Experienced scientists from IMG Prague as well as from our partner site FMP Berlin contributed with interesting lectures as well as hand-on training focused on compound management workflows, automated liquid handling workstations and storage systems, and compound quality control. As this course proved very popular, EU-OPENSCREEN-DRIVE will offer this training again in 2020, and in upcoming years.

Fragment-based screening: The new EU-OPENSCREEN fragment library

A library of fragments will soon be made available as part of the EU-OPENSCREEN small molecule collection, benefitting research into early stage drug discovery. Fragments are compounds with relatively low molecular weights (MW < 300 Da) and contain target affinities, which can bind important sites on proteins (e.g. catalytic or ligand domains) not accessible to 'conventional' small molecules.

During the first 'EU-OPENSCREEN-DRIVE Fragment-based screening workshop' which took place on June 13th 2019 at our Latvian partner site, the Latvian Institute of Organic Synthesis in Riga, Prof. Aigars Jirgensons together with EU-OPENSCREEN and i-Next Discovery/Instruct experts discussed the criteria for library design and defined a workflow for monitoring the performance and the improvement of the library. After the selection of the fragments of interest deriving from the EU-OPENSCREEN compound library, EU-OPENSCREEN worked on the acquisition process of the first EU-OPENSCREEN fragment library that will be available for structure-based fragment screening projects at the EU-OPENSCREEN and i-Next Discovery sites that expressed interest in receiving the library. Starting in 2020, users will have access to the EU-OPENSCREEN fragment collection and will be able to screen the fragments from the library at i-Next Discovery sites using NMR and X-ray methods.

The recently funded Horizon-2020 project i-Next Discovery enables European facilities to offer access to advanced technological instrumentation and expertise for the development of new drugs, advanced vaccines, novel biomaterials, engineered enzymes for food production, efficient biofuels, and other benefits. Scientists from Europe will be able to perform high-end structural biology research with state-of-the-art equipment that is often unavailable in their home countries.

The fragment library is an exciting tool to foster the collaboration between EU-OPENSCREEN and the i-Next Discovery and Instruct ERIC communities, which represents a new strategic cooperation across research disciplines.

Representatives from EU-OPENSCREEN-DRIVE and i-Next Discovery communities discussing the fragment library design.

New Offices and Laboratory

Starting from September 2019, EU-OPENSCREEN ERIC moved its central office and laboratories from their temporary location into the newly refurbished Timoféeff-Ressovsky-Haus (building 87) on Campus Berlin-Buch. The Timoféeff-Ressovsky-Haus hosts research groups of the Max-Delbrück Center for Molecular Medicine (MDC) and the Leibniz Institute for molecular pharmacology (FMP), including the FMP's EU-OPENSCREEN partner sites Screening Unit and Medicinal Chemistry Unit.

The central office consists of four offices and a large meeting room. The newly developed EU-OPENSCREEN Compound Management Facility was in the process of reconstruction for most of the year, with the aim to create enough space for our fully automated tube store and liquid handling instrumentation.

Our offices and labs moved to the Timoféeff-Ressovsky-Haus, Campus Buch, Berlin

Quality control for over 100,000 compounds

Already by the end of 2019, most of the laboratory space was made available, and in October our first instrument, an Infinity LC/MSD from Agilent Technologies was delivered and installed. Although the instrument relies on a simple and relatively inexpensive single-quadrupole mass technique, it is equipped with a new type of high performance and versatile ion source called ESI Jetstream. The most common mass techniques rely either on Electrospray Ionisation (ESI) and Atmospheric-Pressure Chemical Ionisation (APCI) source.

The two techniques are complementary, as ESI-MS is a sensitive technique that is used extensively for the analysis and identification of small molecules and proteins, while APCI is the technique of choice for ionisation of large and unipolar molecules. The ESI Jet Stream source, however, can efficiently detect both small and large molecules. ESI Jetstream technology allows sensitive detections with a superior signal-to-noise ratio compared to a traditional ESI source, though retaining characteristics such as limited cost and a compact design. It is reported to produce dramatic gains in sensitivity, decreasing sample size requirements, increasing sample throughput and improving assay robustness. Furthermore, the InfinityLab LC/MSD is equipped with a DAD detector and as well as a fluorescent detector, and its autosampler can allocate up to eight 384-well plates each time, allowing a real high-throughput analysis of our library.

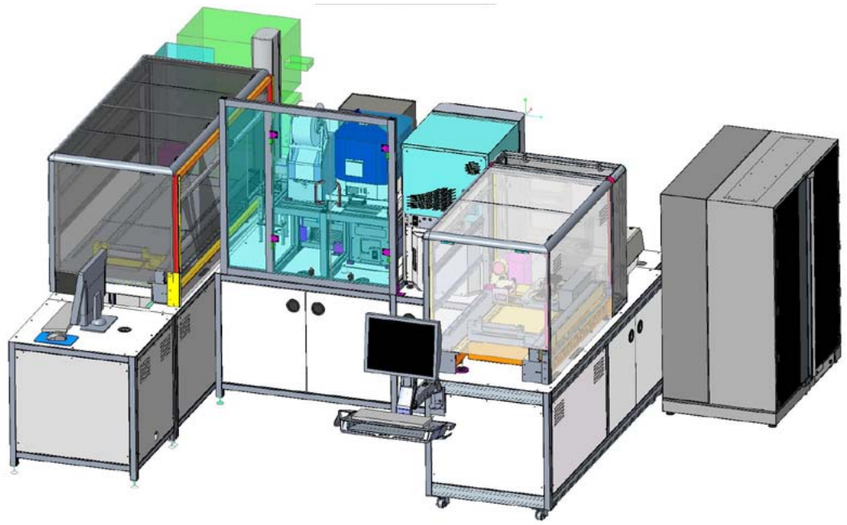
Countdown to 2020 for our tube storage and liquid handling systems

In collaboration with the procurement team of the Forschungsverbund Berlin and the Berlin law firm WMRC, we conducted several public tenders for our equipment and compound libraries. By the end of 2019, we ordered an automated tube store for our compounds and entered into final negotiations for our liquid handling workstations for dissolving dry compound powders and reformatting them into compound mother plates.
The automated tube store was ordered from Hamilton Storage GmbH, Switzerland. The model „Verso M2" has a capacity for storage of up to 284'400 1 mL external thread screw cap tubes. The tubes are stored at -20°C, and the storage system can either import or export whole racks with tubes (this feature will be required for generating the compound mother plates) but is also equipped with a tube picker that allows to recombine specific samples in any required pattern on the tube racks (this feature will be required to perform cherry-pick requests of individual samples). To further reduce manual processing steps of the samples, the store is equipped with an active thawing station for the sample racks, thereby preparing the requested sample racks to be processed when exported from the store. This model also has high flexibility and expandability for future applications - it will be possible to double the number of stored tubes by changing to smaller storage tubes, and even increasing by another 40% by storing tubes in high-density racks. In this way, up to 817,000 compound samples may be stored in the future in our system.

The automated liquid handlers will allow us to generate high-quality compound mother plates. To avoid any contact with aqueous system liquids, all pipetting systems will work with air displacement. Furthermore, disposable tips are used in order to avoid cross-contamination. Generated compound mother plates will be sealed with an Agilent PlateLOC heat sealer, which also allows to flush the plate with Argon prior to application of the heat seal. If compound mother plates for acoustic dispensing are produced, the fill level of each individual well can be audited on the acoustic dispenser, as well as the water content of the DMSO samples. To allow integration of a large number of third-party devices (centrifuge, sealer, pealer, plate hotel, tube decappers), these devices are lined up outside of the liquid handling devices and are operated through a plate robot that will be mounted onto a linear rail. The two workstations are integrated at each end of the linear rail. The larger system will be equipped with a 96-channel pipetting head and an 8-channel single channel pipettor. This system will be used for reformatting the compounds coming from the 96-well racks of the tube store into 384-well compound mother plates.

The smaller system will be equipped with a tube decapper for 24-well racks and shakers and will be used for dissolving the compound powders to prepare DMSO solutions with standardised concentration, and reformatting those solutions in 96-well racks for permanent storage in the tube store. It is furthermore equipped with a 384-channel pipetting head, which allows us to condense the 384-well compound mother plates further into 1536-well compound plates if required.

In order to generate also assay-ready plates, an acoustic dispenser will be integrated along the linear rail. Using the plate hotel, plate peeler, plate sealer and centrifuge as additional devices, large batches of assay ready plates (with wells containing only 30-50 nL of compound samples) can be produced.



3-D model of the proposed liquid handler (courtesy of Hamilton GmbH).

The European Chemical Biology Database

EU-OPENSCREEN's new European Chemical Biology Database (ECBD) offers the opportunity to structure a complex matrix of data from more than 100,000 highly biologically-annotated and characterised compounds by using ontologies, defined vocabularies and metadata such as information on reagents, cell culture protocols etc. in a way that enables efficient linkage to other -omics databases and resources for further data mining and non-biased analysis. This open access database is key for the success of EU-OPENSCREEN as it will allow the thorough analysis of compound structures and activities by users from all over the world, thereby setting standards and opening-up ways of collaboration between chemists (e.g. as donators of compounds) and biologists (e.g. as assay providers) which were so far not possible. While clearly being open-access and promoting FAIR (findable, accessible, interoperable and reproducible) data policies, the ECBD will also protect the IP interests of their collaborators by offering an embargo period on primary screening data for up to three years, thereby allowing sufficient time for the characterisation of promising compounds, patent filing and the generation of innovation with commercial partners. The ECBD will therefore strictly separate the public data space from the data which are under embargo.

The ECBD is currently being developed at one of our partner sites in the Czech Republic, the Institute of Molecular Genetics (IMG) in Prague, under the leadership of Petr Bartunek who is the director of CZ-OPENSCREEN. This infrastructure consists of three components (high-throughput screening, compound management and cheminformatics) and has a long track record in developing informatics solutions for LIMS, database and compound management software tools. Some of these were made publicly available such as the Probes & Drugs portal (www.probes-drugs.org) or Molpher for the exploration of chemical space (app.assembla.com/spaces/molpher). The team at the IMG works together with CESNET which is an e-infrastructure for the research and development of advanced network technologies and applications. CESNET will provide the cloud-based hosting, backup and security of the ECBD.

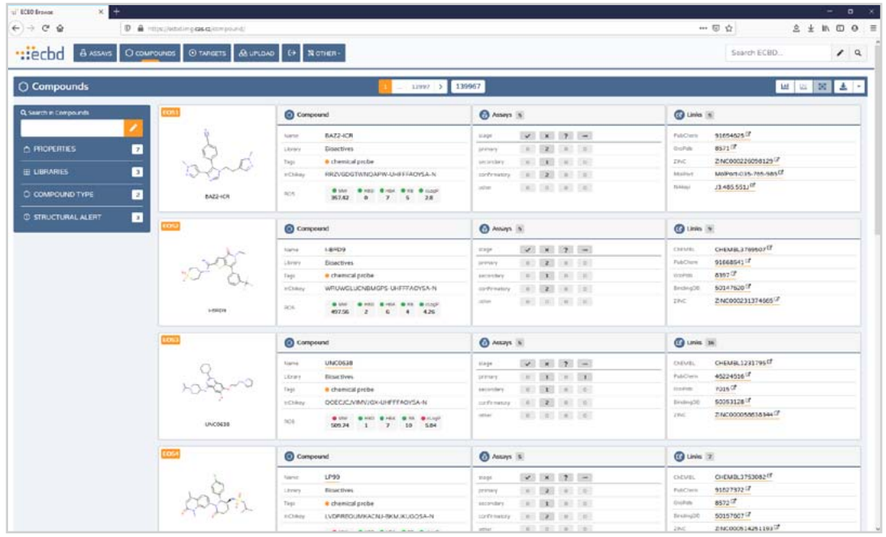
The contract between the EU-OPENSCREEN ERIC and the IMG was signed in March and outlines a set of technical specifications and four milestones, two of these were already met in 2019. The fully functional and open access ECBD is expected in the summer of 2020 and will host all structural, physicochemical and biological data from EU-OPENSCREEN's chemical biology compound screening collections.

The first milestone was reached in July 2019 when the team established a secure user login and profile website interface and set up data template and upload procedures which includes

also automated and manual curation routines. Compound storage, standardisation and curation mechanisms were also set up which made also the calculation of structure-related data (e.g. scaffolds, fingerprints, alerts etc.) possible. A flexible user access control system was also implemented.

The second milestone was achieved by the end of 2019 when important data view, search and export functions were put in place. It is now possible to browse data between different attributes such as compounds, their known biological targets or IC50 data values.

A text search engine with autocomplete function was added, offering automated suggestions to the user. A chemical structure search was also implemented that allows the user to search compounds based on identity, similarity and substructures, combined with an export function for different file formats. Finally, established ontologies such as BioAssay Ontology for assays, ChEMBL target ontology and UniPROT IDs for biological targets, PubMed IDs for references etc. were linked to queries to promote data standardisation.



Screenshot of the ECBD data-output interface in development (example).

European Chemical Biology Database (ECBD) Development Timeline

The ECBD development started in spring 2019 and is realised in several project steps in cooperation with CESNET, an e-infrastructure for the research and development of advanced network technologies and applications

07/2020 — **ECBD finalized**
User support with tutorials and workshops

03/2020 — **Data Visualization**
Tools for data transfer to other public databases (primary ChEMBL)

11/2019 — **Data Output**
Data search,
Filtering system and data export,
Browse and detail view

05/2019 — **Data Input**
User registration and authentication process,
User Interface for data upload from partner sites to ECBD

03/2019 — Start Project

Contracts and Agreements

In 2019 two important contracts were implemented by EU-OPENSCREEN ERIC: First, a 'Screening Partner Sites (SPS) Agreement', which defines the collaboration framework between EU-OPENSCREEN ERIC and the respective Screening Partner Site; and second, a 'Material Transfer Agreement' (MTA), which defines the collaboration between EU-OPENSCREEN ERIC and the chemist wishing to donate chemical compounds to be integrated into the European Chemical Biology Library (ECBL).

Screening Partner Sites Agreement (SPS)

The SPS Agreement defines the framework for regulating the collaboration between EU-OPENSCREEN and SPS during the scientific undertaking carried out by SPS and external assay providers that use the EU-OPENSCREEN ERIC compound collection to screen assays at an appropriate Screening Partner Site. EU-OPENSCREEN ERIC assesses incoming project requests and establishes contact with appropriate screening partner sites on a project-by-project basis. The decision on project's acceptance is done jointly by EU-OPENSCREEN ERIC and SPS taking into account provided information about the target, the assay, resource requirements, and the estimated duration of the project. SPS Agreements have already been accepted and signed by all Screening Partner Sites.

Material Transfer Agreement (MTA)

The MTA regulates how a chemist can donate compounds to the ECBL, how her/his compounds are processed, characterised by their physicochemical properties and distributed through the EU-OPENSCREEN network. The contract also details the intellectual rights of the donating chemist, the biologist in charge of the screenings, the screening partner sites and the ERIC regarding the use of the generated data obtained from the screening of the compounds. Finally, a part of the contract is devoted to regulate the confidentiality between the partners and the procedure in case of termination of the collaboration.

Scientific Outreach

As a newly established ERIC, EU-OPENSCREEN reinforced its dissemination and outreach activities in 2019 in order to raise awareness among the scientific community of the unique opportunities which are offered by our research infrastructure. A particular focus was on expanding our existing marketing activities, i.e. our website, regular newsletters and presentations at scientific conferences.

Main achievements

In order to strengthen our outreach activities, we decided to complement our so far existing marketing tools, our website and our newsletter with an accompanying social media strategy. This included the selection and setting up of different and suitable social media channels to reach out to our target groups. As a result, EU-OPENSCREEN became active on LinkedIn with an EU-OPENSCREEN company page and a group page called 'Chemical Keys for Life´s Locks', which connects more than 250 people with a common interest in chemical biology. We also consolidated our social media channels on Twitter, Instagram, Facebook and YouTube. This involved the careful development and maintenance of our company profile, the definition of relevant hashtags and target groups and the determination of a target-group-oriented strategy for each channel.

Outreach at scientific conferences and events

Due to our highly complex and specialised services, EU-OPENSCREEN's main focus was reaching out to our target audiences via face-to-face communication at conferences and other specialised events.

An important highlight in 2019 was our biennial scientific meeting, the **6th European Chemical Biology Symposium (ECBS)/ EuChemS-LS** held at the CSIC in Madrid, Spain on April 2019.

More than 200 chemical biologists from all parts of Europe and overseas came together to present and discuss the latest achievements in organic and biological chemistry, proteins biotechnology, computational biology, proto-cells, machine learning, bacterial resistance, drug discovery, synthetic biology, biomedical materials and chemical glycobiology. EU-OPENSCREEN partner sites gave inspiring talks and could use the conference for the active sharing of knowledge and experience with top level international experts in the field of chemical biology. We are looking forward to the next European Chemical Biology Symposium which will be held in May 2021 in Milan, Italy.

Impressions from the ECBS 2019 in Madrid – the co-organisation of the fruitful meeting was one of our highlights in 2019.

Personal presentations

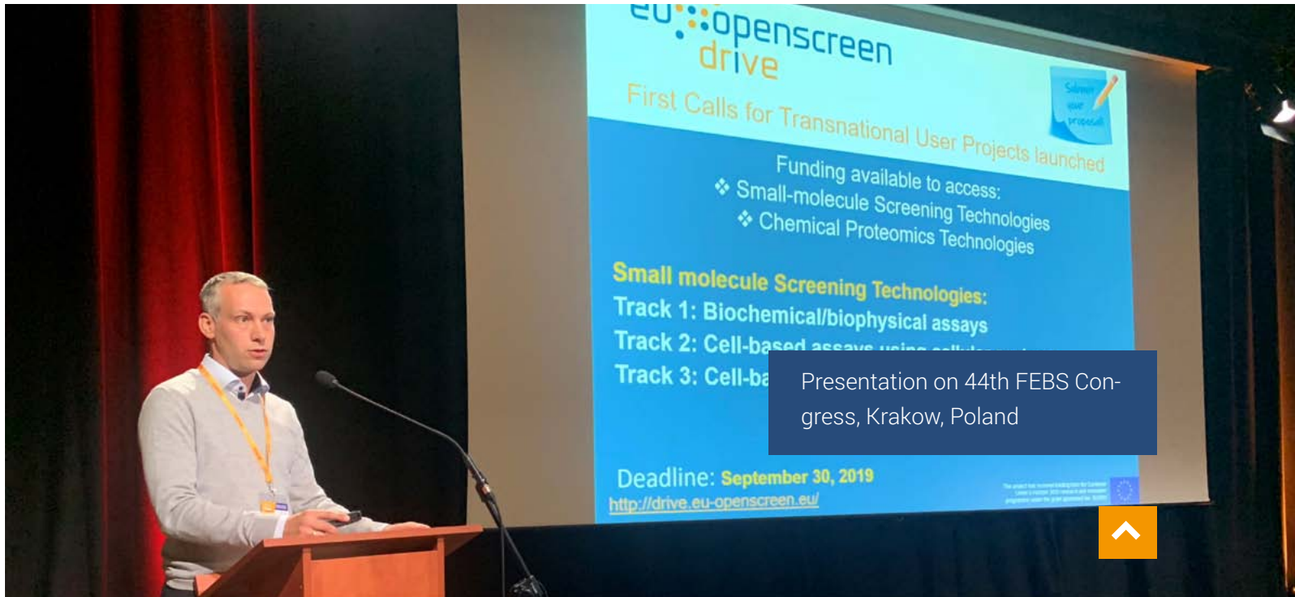
In 2019 we were represented with scientific talks, posters and exhibitions stands at more than 30 scientific conferences and meetings worldwide. These events helped us to accomplish different communication goals, to reach out to our scientific community, new member countries and new partner sites, to intensify relationships and collaborations with other research institutes and research infrastructures in the area of life sciences and to identify new grant opportunities.

Participation in international events 2019 (selection)

SLAS	February	Washington, USA
Novel Antimicrobials and AMR Diagnostics	March	Berlin, Germany
ECBS/EUCHEMS LS	April	Madrid, Spain
ASBMB	April	Orlando, USA
ELRIG	May	Gothenburg, Sweden
Instruct Biennial Structural Biology Conference	May	Madrid, Spain
Oxford Global's R&D Series EU	June	Berlin, Germany
SLAS Europe	June	Barcelona, Spain
16th Annual Meeting of the Medicinal Chemistry Section	June	Rehovot, Israel
44th FEBS congress	June	Krakow, Poland
International Conference on Biotechnology and Bioengineering (ICBB)	September	Poznan, Poland
51st Congress of SBFTE	September	Maceió, Brasil
Greek Symposium on Chemical Libraries	October	Thessaloniki, Greece
Biotechnology and Genetic Engineeering Conference	October	Paris, France
ELRIG Drug Discovery	November	Liverpool, UK
Cambridge Cheminformatics Network Meeting	November	Cambridge, UK
ASCB/EMBO	December	Washington, USA

Visit of Bill and Melinda Gates Foundation and World Health Summit to EU-OPENSCREEN

Meeting with BLAVATNIK CENTER for Drug Discovery, Israel



Presentation on 44th FEBS Congress, Krakow, Poland

Regional symposia and international collaboration

In 2019, EU-OPENSCREEN organised a series of regional symposia which were co-organised by our partners in candidate countries in Greece, Israel, Portugal, Romania and Switzerland. For example, the first ISR-OPENSCREEN workshop "Bringing together small molecules and biology" took place at the Weizmann Institute of Science in Rechovot, Israel on November 25th and provided an overview on the exciting research of the Israeli chemical biology community. At this workshop, representatives from our partner sites in the Czech Republic, Denmark, Norway and Finland presented their research and national initiatives, and explained how they contribute to, and benefit from, their involvement in the European Research Infrastructure in Chemical Biology.

Another example of our regional symposia was our OPENSCREEN-GR meeting on 'Organizing Chemical Libraries as a Pillar of Research and Economic Development', which was held at the Aristotle University of Thessaloniki on October 4th. Researchers from academia and industry discussed about the current status of Chemical Libraries in Europe and future challenges regarding the organisation, function and contribution of Chemical Libraries in Research and Economic Development.

Within the framework of our EU-OPENSCREEN DRIVE and RI-VIS projects, EU-OPENSCREEN also engaged with scientific communities outside of Europe. As part of the RI-VIS project we also actively collaborated with our communication colleagues from other research infrastructures, exchanged experiences and worked on common communication tools. In addition, we engaged with various stakeholders in the wider scientific community at the European Strategy Forum on Research Infrastructures (ESFRI), the ERIC Forum and other Life-Science Research Infrastructure meetings.

A significant outcome was the signature of a collaboration agreement with Euro-BioImaging, the European research infrastructure for biological and biomedical imaging, in order to harmonise and facilitate access for users across our research infrastructures and to enable cutting-edge research.

Scientific publications

In addition to directly reaching out to individual researchers at scientific conferences, we chose scientific articles as an efficient communication channel to inform the scientific community about EU-OPENSCREEN.

In March, we published a perspective (doi: 10.1177/2472555218816276) with a detailed overview of the EU-OPENSCREEN network and reviews of recent scientific work coming from our European partners. The article, which was published in SLAS Discovery, highlights the benefits of small-molecule screening, the plethora of assay designs, and the close connection between screening and medicinal chemistry within EU-OPENSCREEN.

The European Marine Biological Research Infrastructure Cluster (EMBRIC), a Horizon 2020 project which ended in 2019, brought together six RIs (including EU-OPENSCREEN) in a European project to promote the blue bio-economy. EMBRIC's objective is to develop coherent chains of high-quality services for access to biological, analytical and data resources providing improvements in the throughput and efficiency of workflows for discovery of novel marine products. EU-OPENSCREEN co-authored a scientific article (doi: 10.1007/s11274-019-2685-y), which describes the development of discovery pipelines for marine resources and which has been published in the World Journal of Microbiology & Biotechnology.

Webinars

As part of a new series of open access online courses and webinars on hot topics in Translational Medicine, developed by our partner research infrastructure EATRIS, EU-OPENSCREEN presented how quality is achieved across our research infrastructure during a webinar on ‘Quality in Screening’ with a focus on the development of standards and assays guidelines for high-throughput screening (HTS).

To increase the visibility of our training offer, we established a new training section on our webpage, to advertise training courses and webinars and to publicly share the content of past training events and webinars.

The webinar on ‘Quality in Screening’ with a focus on the development of standards and assays guidelines for high-throughput screening (HTS) presented how quality is achieved across our infrastructure.

Training

Distributed research infrastructures have a unique governance and organisational model, funding structure, various stakeholder groups (ERIC staff, funders, partner sites, user community) etc. and therefore have specific managerial requirements. The Horizon 2020-project RI-Train aimed to improve the training of management and leadership staff in RI and developed an international 'Executive Masters in Management of Research Infrastructures' (EMMRI) programme that is tailored to the specific needs of research infrastructures. The EMMRI programme is delivered by University of Milano Biccoca. One member of the EU-OPENSCREEN ERIC office team has been selected among 115 applications to participate in the first Master class of the EMMRI programme and was among the first to graduate with an MBA in March 2019. Currently, a second member of the EU-OPENSCREEN ERIC office team is enrolled in the EMMRI programme and will graduate in 2020.

EU-OPENSCREEN also started to organise its own training programme: Together with our partner sites, we will provide training to the scientific chemical biology community through practical courses, webinars and staff exchanges. EU-OPENSCREEN drafted a training handbook and opened a call for training proposals in December 2019, with the aim to announce the first training courses by mid-2020.

'Executive Masters in Management of Research Infrastructures' (EMMRI) graduation ceremony at the University of Milano Bicocca.

Horizon 2020 projects

EU-OPENSCREEN is involved in several Horizon 2020 projects in order to ensure the long term sustainability and to enhance the collaboration with other life science research infrastructures

Overview of additional European Horizon 2020 Projects

CORBEL (Grant No. 654248)

www.corbel-project.eu

The CORBEL project (grant agreement No. 654248) brings together the ESFRI Biological and Medical Research Infrastructures (LS-RIs) with the aim to facilitate harmonisation amongst the LS-RIs to enable ground breaking scientific discoveries, which require knowledge and resources from different research fields. CORBEL uses a user-led approach in which collectively the LS-RIs have established a sustained foundation of collaborative scientific services for biomedical research in Europe and offer to users access to the latest technologies, resources and technical expertise. The CORBEL project will end in May 2020 and its effort will continue through the common platform of the European Life Science Research Infrastructures.

Within work-package 4 (WP4) dedicated to the Bioscience Research Use Cases, EU-OPENSCREEN ERIC manages the open call projects under the "Access Track 2: Predictive systems pharmacology for safer drugs and chemical products". During 2019 there were several user's success stories, which highlight how interdisciplinary research projects have benefitted from the joint support of different RIs and how RIs collaboration impacts the European life science research landscape. Below, we present two success stories, which work has been in part carried out at our partner site facility, the Leibniz Research Institute for Molecular Pharmacology (FMP) in Berlin, Germany (the text has been prepared by the CORBEL communication manager and taken from online sources).

Establishing high-throughput methods to study 'mini-guts'

User: *Jenny Ostrop, Norwegian University of Science and Technology, Norway*
Service Providers: *EU-OPENSCREEN, Leibniz Research Institute for Molecular Pharmacology (FMP) and Euro-BioImaging EMBL Node, Germany.*

The human gastrointestinal tract is a highly sophisticated organ. The gut epithelium consists of several specialised cell types in a distinct spatial arrangement that enable efficient nutrient uptake and forms a barrier against commensal bacteria and pathogens. CORBEL user Jenny Ostrop from the Centre of Molecular Inflammation Research at NTNU in Trondheim, is using organoids - 'mini-guts' that form characteristic crypts and villi - to study the intestinal epithelium. Her scientific interest lies in the differentiation of stem cells into the diverse epithelial cell lineages.

'We are trying to find the molecular 'switches' that determine which cell types develop from the stem cells and how the epithelium is composed', explains Jenny. The organoids are grown in a collagen matrix and their handling is challenging and time-consuming. Having heard about the CORBEL Open Call for research projects from colleagues, Jenny applied for access to the high-throughput screening facilities at EU-OPENSCREEN. During her visit, Jenny was able to automate several working steps in her experimental pipeline, thereby accelerating the workflow. This allowed her to screen a library of compounds that might influence organoid development for their effect on cell differentiation and organoid composition. As the next step, based on the screening results, Jenny is planning to visit Euro-BioImaging to quantify the three-dimensional morphology of the organoids following certain treatments, using advanced microscopy techniques and automated image analysis.

Screening for active compounds against acute myeloid leukemia

User: *Maria Paola Martelli, University of Perugia, Italy*
Service Providers: *EU-OPENSCREEN, Leibniz Research Institute for Molecular Pharmacology (FMP) and Euro-BioImaging EMBL Node, Germany.*

Prof. Maria Paola Martelli focuses her research on acute myeloid leukemia (AML) with the aim to translate her findings into novel diagnostic tools and therapies. AML affects the maturation of myeloid blood cells leading to accumulation of abnormal cells and ultimately to bone marrow failure. AML accounts for about 80% of acute leukemia in adults with a grim prognosis in particular for elderly patients, often leaving allogeneic stem cell therapy as the only treatment option.

Prof. Martelli is primarily interested in a genetic alteration, present in about one-third of AML cases. This was discovered by Brunangelo Falini when Martelli was a researcher in his lab and has remained a central research interest throughout her career. This mutation alters the properties of a phosphoprotein, which in its mutant form accumulates in the cytoplasm. Prof. Martelli's CORBEL project aims to identify small molecule compounds, which attack either the mutated phosphoprotein or a key partner. To this end, the first set of experiments was carried out by Prof. Martelli's PhD student Roberta Ranieri at the EU-OPENSCREEN Node. Access to EU-OPENSCREEN allowed her to screen their collection of compounds against AML cell lines, which she characterised in her lab together with Dr. Ilaria Gionfriddo (Assistant Professor in Hematology, at Perugia University in Prof. Martelli's lab). Specifically, two FDA-approved drugs resulting from the screen were proved to be highly effective in our cell models and profitably synergistic with drugs already in use in the AML settings. Those promising combinations will soon be tested in murine preclinical models, prior to being employed in a clinical trial. Selected molecules are now being evaluated using advanced imaging technologies at the Euro-BioImaging EMBL-Node. This project will hopefully be a step towards novel therapy options for AML, which are desperately needed and will have a positive impact on human health.

RI-VIS (Grant No. 824063)

www.ri-vis.eu

RI-VIS is an Horizon 2020 project to increase the global visibility of research infrastructures. EU-OPENSCREEN co-leads work package 3 on 'International outreach and partnering events' and organises global symposia to engage with new user communities and research infrastructures across the globe. As part of WP3, RI-VIS exhibited at various scientific meetings, including the 51st Brazilian Congress of Pharmacology and Experimental Therapeutics and the AAAS2020, a major international gathering, attracting thousands of scientists, engineers, policymakers, educators and journalists to discuss the most recent developments in science and technology.

An important deliverable of RI-VIS in 2019 was the 'Communication Toolkit for European Research Infrastructures' which has been developed by 31 communication experts representing 17 research infrastructures. This toolkit 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.

ERIC FORUM (Grant No. 823798)

www.eric-forum.eu

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. In 2019 a common governance structure was developed and surveys to analyze the current situation were designed, sent out and evaluated. EU-OPENSCREEN took a key role in analyzing, together with other ERICs, the currently available transnational access funding in H2020 and generally within the ERIC budgets. EU-OPENSCREEN also participated in several ERIC-Forum meetings in Amsterdam, Oslo and Brussels, where we got the chance to directly exchange information and to intensify contacts with our European counterparts.

EOSC-LIFE (Grant No. 824087)

https://www.eosc-life.eu

This large project with 39 partners addresses the publications of research data under FAIR principles and develops data policies to increase trust from patients and participants. Importantly, it will utilise data from 'demonstrator' projects, which are generated, for example, at EU-OPENSCREEN partner sites. Consequently, several partners such as IMG Prague, IMIM Barcelona, CSC Espoo and Fraunhofer IME Hamburg are involved while EU-OPENSCREEN will support data generation and transfer.

Together with ELIXIR/EMBL-EBI, our EU-OPENSCREEN ERIC partner site FRAUNHOFER IME ScreeningPort under the supervision of Philip Gribbon leads the work package on the publication of FAIR RI data resources in EOSC-Life, which will drive the development of BMS RIs' data handling and integration capabilities and ensure that data from RI nodes and facilities is integrated in cloud compatible, FAIR compliant data resources.

This is underpinned by cloud accessible tools needed to deliver the curated clean data needed to support data analyses. EU-OPENSCREEN ERIC was represented at the Kick-Off meeting and retreat of EOSC-life to discuss the set-up of open calls for user access to RI data resources for reuse by a large user-base for internationally leading science.

As mentioned above, the EU-OPENSCREEN partner site Fraunhofer has been working as co-lead of WP1 (Cloudification of data sets) in the last period. Major activities include the organisation of

- a workshop on bringing FAIR data repositories to the cloud and
- a training event in cloud deployment.

These events were held at the Fraunhofer Forum in Berlin in November 2019 and were attended by 60 people from across the consortia partners. The main attendees were the members of WP1 Data Experts, a group of technically qualified individuals managed through WP1 who are responsible for supporting the work of 8 Demonstrator projects, which are due to complete their work in Q3 2020. Fraunhofer has also been involved in specifying the first WP1 call for projects which was launched in May 2020. This will provide the next round of directly ESFRI-associated projects to be supported by WP1 teams in EOSC-LIFE through till the end of 2021.

i-Next Discovery (Grant No. 871037)

www.inext-discovery.eu

EU-OPENSCREEN ERIC is partner in the recently funded Horizon 2020 project, i-Next Discovery (Infrastructure for transnational access and discovery in structural biology), which 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 starts in February 2020 and the collaboration between EU-OPENSCREEN ERIC and i-Next Discovery will enable the connection of structural biology with screening and medicinal chemistry areas. In particular, EU-OPENSCREEN ERIC will contribute 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.

EMBRIC (Grant No. 654008)

www.embric.eu

The European Marine Biological Research Infrastructure Cluster (EMBRIC) brought together several European Research Infrastructures (RIs) in a collaborative initiative, which aimed to facilitate transnational marine science and remove existing bottlenecks which are currently impeding blue innovation.

EU-OPENSCREEN was work package leader for WP3 (Concepts for the discovery and exploitation of marine products and biomolecules), which

- identified gaps and bottlenecks together with the community,
- improved the throughput and efficiency of workflows for discovery of novel marine secondary metabolites,
- improved the throughput and efficiency of workflows for discovery of novel marine proteins and
- improved the throughput and efficiency of workflows for discovery of novel marine carbohydrates.

EU-OPENSCREEN further contributed to WP4 (Data services and reporting standards) and WP5 (Mobilizing research infrastructures to foster blue biotechnology ecosystems in maritime regions). For long-term sustainability of the secondary metabolites pipeline, collaborations continue, and EU-OPENSCREEN still offers its compound collection for marine natural products.

Financial Statement

In 2019, eight ERIC member countries supported the EU-OPENSCREEN ERIC: the Czech Republic, Denmark, Finland, Germany, Latvia, Norway, Poland and Spain. Their membership fees represent the main source of income in 2019, in addition to the host country contribution and third-party funding for Horizon 2020 projects.

For the calculation of the membership fee of the individual ERIC members, the national economic performance is an important factor, as their regular membership fees are drawn from a GDP-based calculation.

The following principles, which are defined in the Annex 2 of the statutes of the EU-OPENSCREEN ERIC, apply:

- 25% to be shared based on equal parts (‘fixed contribution’);
- 75% to be shared based on a special distribution key (‘variable contribution’): GDP-per-capita minus 8.000 €, multiplied by the population;
- an observer country pays 30% of their nominal membership fee;
- the host country pays 200% of its nominal membership fee; however, its contribution should not exceed 50% of the total membership fees of the founding member.

EU-OPENSCREEN ERIC budget 2019

Income and expenses 2019

Income	Amount (€)
Regular ERIC membership fees	1.283.439
Host country contribution	187.876
Third party funding	325.972
Other incomes (tax refunds and other refunds)	39.444
Total contributions	1.836.731

Expenses *	Amount(€)
ERIC Office / Central Compound Management Facility (CCMF)	657.009
Compound collection	235.180
Third party funding	260.777
European Chemical Biology Database (ECBD)	276.000
Training	12.959
Accrued expenses	299.474
Total contributions	1.741.399

Surplus/Deficit:	+95,332

*) The expenses for the ERIC office, CCMF, ECBD and training activities in 2019 were in line with the budget plan that has been approved by the Assembly of Members in 2018 and with the 5-year budget as proposed in the Scientific and Technical Description. Accrued expenses refer to expenses recognised in 2019 and paid in 2020.

Funding from projects

The awarded grants for projects and research platforms strengthen the synergies among different partners and research facilities across the European Union and beyond. Two of the seven ongoing Horizon 2020 projects started in 2015, thus prior to the official foundation of the ERIC.

Therefore, these activities where administered by the Leibniz Research Institute for Molecular Pharmacology in the Forschungsverbund Berlin e.V. (FVB-FMP). Four projects began their activities in 2019 allowing EU-OPENSCREEN a sustainable reallocation of resources leading to the hiring of new personnel. The following chart states the duration and awarded grands.

Project	Activity Time	Amount (€)
EMBRIC *	06/2015 - 05/2019	238.750
CORBEL *	09/2015 - 05/2020	580.200
ERIC-Forum	01/2019 - 12/2022	44.166
RI-VIS	02/2019 - 07/2021	236.406
EU-OPENSCREEN DRIVE	02/2019 - 01/2023	1.438.758
EOSC-Life	03/2019 - 02/2023	1.136.218
i-Next Discovery	02/2020 - 01/2024	24.375

*) Administered by FMP-FVB until 12/2018

EU-OPENSCREEN ERIC budget 2019

Planned project funding and grants

	DRIVE	EOSC-Life	RI-VIS	Corbel	ERIC-Forum	Embric
Personnel (€)	719.606	894.975	102.125	30.000	33.333	19.796
Subcon-tracting (€)	25.000	/	/	/	/	/
Direct costs * (€)	411.400	14.000	87.000	55.000	2.000	2.022
Indirect costs (€)	282.751	227.243	47.281	21.250	8.833	5.454
	1.438.757	1.136.218	236.406	106.250	44.166	27.272

Actual third-party project funding in 2019

	DRIVE	RI-VIS	Corbel	ERIC-Forum	Embric	EOSC-Life
Personnel (€)	129.201	28.131	20.182	3.542	2.076	1.061
Subcon-tractIng (€)	/	/	/	/	/	/
Direct costs * (€)	63.022	3.003	6.337	1.389	1.492	1.337
Indirect costs (€)	48.055	7.783	6.630	1.233	892	599
	240.278	38.917	33.149	6.164	4.460	2.997

*) Travel, equipment, goods and services

Special 2019

Country in Focus: Czech Republic

CZ-OPENSCREEN partner sites:

- Institute of Molecular Genetics AS CR, v. v. i. (IMG), CZ-OPENSCREEN – Prague
- Palacký University Olomouc, Faculty of Medicine and Dentistry, Institute of Molecular and Translational Medicine (IMTM) – Olomouc
- Masaryk University (MU) Department of Chemistry / CZ OPENSCREEN – Brno

The National Infrastructure for Chemical Biology CZ-OPENSCREEN operates the most advanced research infrastructure for basic and applied research in the fields of chemical biology and genetics in the Czech Republic and provides Open Access to its external users. The Institute of Molecular Genetics of the CAS is the hosting institution of CZ-OPENSCREEN and the other partner institutions are Palacký University, Olomouc, Masaryk University, Brno and the University of Chemistry and Technology, Prague (which is not a EU-OPENSCREEN Partner site).
The main mission of CZ-OPENSCREEN is to identify new molecular probes and to develop new tools for research of chemical compounds as candidates for the development of new potential therapeutics. Unlike commercial platforms, CZ-OPENSCREEN also focuses on non-validated molecular targets, signalling pathways and neglected diseases. Users of CZ-OPENSCREEN mainly include biologists, chemists and data users.

To the users from the biological and chemical community, CZ-OPENSCREEN offers standard biological and biochemical assays, consultancy and development of new assays, High-Throughput Screening (HTS), profiling of chemical compounds on a panel of cell lines, and medicinal chemistry optimisation of newly identified biologically active compounds. CZ-OPENSCREEN is systematically building a library of both commercial chemical compounds as well as compounds synthesised in the Czech Republic. It provides access to this unique library to external users. An integral part of the services is cheminformatics support, such as data analysis and storage, development of new analytical tools and database systems. CZ-OPENSCREEN is equipped with state-of-the-art technologies for high-throughput screening of chemical compounds such as integrated robotic HTS stations, robotic stations for automatic microscopic analysis and label-free technology, and integrated robotic systems for compound storage and sample preparation.

The CZ-OPENSCREEN infrastructure provides services either in the open access mode, where the costs are fully or partially covered by the infrastructure, or in the so-called full cost model, where the user pays all the costs of the project. The infrastructure is open to all potential users all year round, individual projects are implemented depending on the available capacity. Due to a variety of services offered in the fields of chemical biology, medicinal chemistry, cheminformatics, data mining and HTS testing, there are several options of access when users submit their project proposals and requests.

Institute of Molecular Genetics AS CR, v. v. i. (IMG), CZ-OPENSCREEN – Prague

At the Institute of Molecular Genetics of the CAS tests and tools for high-throughput screening are established, the collection of chemical compounds is continuously built (currently the collection contains more than 100,000 compounds) and new cheminformatics in-house tools are developed.

The most significant activities are as follows:

- IMG has a panel of stable luciferase reporter cell lines for all steroid receptors, platform Receptor X. This platform represents a selective and highly sensitive tool to assess the effect of newly synthesised compounds on the transcriptional activity of these nuclear receptors. Profiling of compounds using the Receptor X platform is one of the main services provided to both academic and commercial users.

- IMG uses the in-house developed Laboratory Information Management System (LIMS) for compound management with an incorporated ScreenX database. ScreenX database contains advanced tools for data processing, analysis and visualisation. It allows to normalise data obtained from HTS campaigns and remove measurement artefacts. Thanks to the implementation of cheminformatics tools, this database is a unique platform for analysing high-throughput screening data.

- The IMG team developed the Probes & Drugs portal. This portal contains information about more than 60,000 biologically active compounds - approved drugs and chemical probes which are used to study gene function, to evaluate target molecules or to describe cellular processes. This portal is freely available to the scientific community and it enables the user to flexibly search and combine bioactive data. The portal is a powerful tool to explore bioactive compound space.

Institute of Molecular Genetics AS CR, v. v. i. (IMG), CZ-OPENSCREEN – Prague

Palacký University Olomouc, Faculty of Medicine and Dentistry, Institute of Molecular and Translational Medicine (IMTM) – Olomouc

The Institute is focused on drug development, biomarkers identification and cancer diagnostics, infectious and neurodegenerative diseases. As part of biological testing, GPCR receptor testing has been introduced, including the validation of established tests and the necessary implementation of additional tests (FLIPR platform).

A significant improvement of the services was the implementation of mass spectrometry (MALDI) in a robotic platform, where this technology is used to directly identify enzymatic substrates. Due to the long-term focus of the site on cancer treatment, a battery of cell tests has been developed to map the basic cell pathways active in tumour cells, epigenetic regulation and also their morphological changes in cell organelles. The introduction of the preparation of 3D cultures and their plating into 384 test plates in semi-automatic mode, including the preparation of mixed tumour and non-tumour cultures, enables IMTM to offer another special service to the scientific community.
The institute also has a BSL (biosafety level) 2/3 facility equipped with semiautomatic pipettors and readers for 384 well plates to test BSL3 classified pathogens. Developed Leishmania strains enable researchers to test intracellular activities of potential drugs. IMTM offers tests of antiviral activity, anti-leishmanial activity and anti-tuberculosis activity.

Palacký University Olomouc, Faculty of Medicine and Dentistry, Institute of Molecular and Translational Medicine (IMTM) – Olomouc

Masaryk University (MU) Department of Chemistry / CZ OPENSCREEN – Brno

The department provides mainly services in the field of organic synthesis and medicinal chemistry. In addition to ad hoc services (characterisation of purity and structural integrity of organic compounds by NMR spectroscopy, separation of enantiomers by HPLC on a chiral stationary phase, etc.), it provides medical-chemical support in selected chemical-biological projects such as the development of potent and selective inhibitors of selected protein kinases CDK, CHK1, CLK, CK1, Haspin and CDKL, structure-specific nucleases, methyltransferases, and forskolin-based adenylate cyclase activators.

Masaryk University (MU) Brno

2019

An exciting and dynamic Year

2019 was an eventful year in which we have reached significant goals - as a team and as a community. 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

Communication

@EuOpenscreen
@EU-OPENSCREEN
@euopenscreen
@eu_openscreen

Content

EU-OPENSCREEN ERIC

Layout / Design

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

Images

S.4 - EU-OPENSCREEN
S.16 - Peter Himsel, BBB Management GmbH
S.18 - Fraunhofer IME Screening-Port, Hamburg
S.20 - pixabay/ColossusCloud
S.27 - Adobe Stock/Gorodenkoff
S.30 - Fraunhofer IME Screening-Port, Hamburg

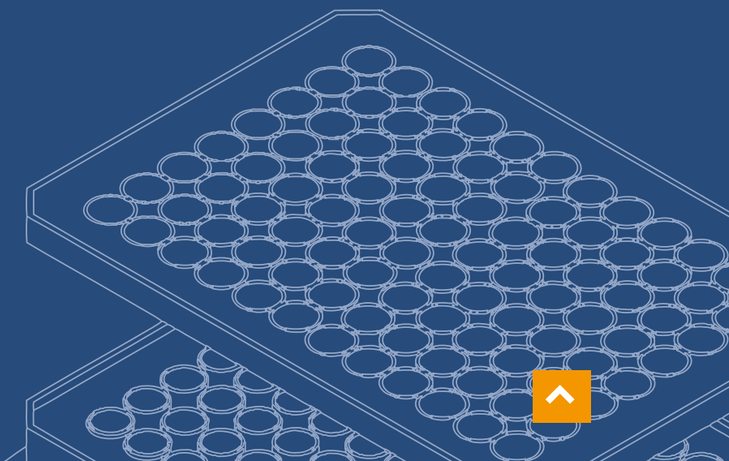
Publication

June 2020

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: Audit report 2019

RT Bade Happich Wiesner Revisionstreuhand GmbH
Wirtschaftsprüfungsgesellschaft

19-01-11065

Audit Report

for the

Fiscal Year

as of December 31, 2019

of

The European Infrastructure of Open Platforms for Chemical Biology

EU-OPENSCREEN ERIC

Berlin

Copy:
1/2

RT Bade Happich Wiesner Revisionstreuhand GmbH
Wirtschaftsprüfungsgesellschaft

19-01-11065

TABLE OF CONTENTS

INDEX OF APPENDICES

RT Bade Happich Wiesner Revisionstreuhand GmbH
Wirtschaftsprüfungsgesellschaft

19-01-11065

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 ERIC" or "ERIC")

appointed us as auditor for the income and expense accounts of the fiscal year ending December 31, 2019.

The EU-OPENSCREEN ERIC was established by seven founding members /Czech Republiv, 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 is a non-profit organization, which integrates high-capacity screening platforms across the European Union and beyond, strengthening the synergies among different partners and research facilities. It uses a rationally selected compound selection from European chemists. EU-OPENSCREEN ERIC is committed to grant open access to its resources 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 toxicity and anti-microbial properties.

The year from January 1 up to December 31, 2019, is the first complete fiscal year of the 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) were presented to us by the EU-OPENSCREE ERIC.

RT Bade Happich Wiesner Revisionstreuhand GmbH
Wirtschaftsprüfungsgesellschaft

19-01-11065

We conducted our audit in accordance with the legal requirements applicable for tax-exempt institutions in Germany. An auditor conducting an audit obtains reasonable assurance about whether the financial reports are free from material misstatement. 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 from May 19 to June 25, 2020 in Berlin. The audit was completed at the date of this report.

Our responsibility and liability as auditor is guided by the „General Engagement Terms for Wirtschaftsprüfer and Wirtschaftsprüfungsgesellschaften – German Public Auditors and Public Audit Firms – as of January 1, 2017", which are in Appendix III to this report.

Summary of audit findings

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

In line with our risk and controls based audit approach and to 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 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 the 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 employees against German law.

RT Bade Happich Wiesner Revisionstreuhand GmbH
Wirtschaftsprüfungsgesellschaft

19-01-11065

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, 2019.

Based on our audit the accompanying financial reports were prepared in accordance with the legal regulations applicable for charitable foundations and present fairly, in all materail respects, the income and expense situation of the EU-OPENSCREEN ERIC as of December 31, 2019, 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 requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Responsibilities of Management for the Financial Reports

Management is responsible for the preparation of the financial reports in accordance with Generally 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 determines are necessary to enable the preparation of financial reports that are free from material misstatement, 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 related 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 but 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 misstatement, 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 on 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 the 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 judgement and maintain professional skepticism throughout the audit.

We also:

identify and assess the risks of material misstatement of the financial reports. Whether due to fraud or error, 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 for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

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, 2020

WOLFGANG HAPPICH
Wirtschaftsprüfer