Horizon Europe Cancer Mission

Joint Statement from BBMRI, EATRIS, ECRIN, ELIXIR

September 2020

The Cancer Mission Board's interim report, *Conquering Cancer: Mission Possible*, with its 13 recommendations, represent a significant step towards an ambitious Mission strategy. The recommendations address the whole cancer continuum and offer a comprehensive plan that will require the commitment of all relevant stakeholders at national and EU level, including the one from European research infrastructures.

In particular, we welcome that the report highlights the need to overcome substantial fragmentation of national research strategies, expertise and services. The broad range of stakeholders required for successful medicines development often results in competition rather than cooperation, and in the creation of silos. National regulations, organisation and funding of medical research are also major sources of duplication, as we recently witnessed during the COVID-19 pandemic[1]. It is clear that the translation of research results into patient and societal benefit will require co-creation from all stakeholders involved in the research ecosystem: academia and industry, patient communities, funders, policy-makers, payers and pan-European networks.

The Cancer Mission Board also recognises the role that BBMRI, EATRIS, ECRIN and ELIXIR can play to support some of its preliminary recommendations. Already providing multidisciplinary research communities from any European country with efficient access to academic expertise, facilities and research data, our research infrastructures (RIs) are uniquely placed to help address cancer research challenges.

This statement provides a more in-depth overview of how BBMRI, EATRIS, ECRIN and ELIXIR can contribute to the success of the Horizon Europe Mission on Cancer.

Leveraging national investments in European research infrastructures

Cancer knows no borders, and neither should the impact of national and European investments to fight this disease. Horizon Europe will dedicate considerable resources to the fight against cancer, but it can only unlock the true potential of European research and innovation by building on existing investments.

Representing a cumulative investment of 825 million euros since 2006[2], BBMRI, EATRIS, ECRIN and ELIXIR are mature not-for-profit organisations, with strong connections with national research and innovation ecosystems and vast networks of experts, laboratories and resources that can make the

[1] COVID-19 Pandemic Readiness: European Medical Research Infrastructures are part of the global response (Recommendations published by BBMRI, EATRIS, ECRIN – May 19, 2020)

[2] ESFRI Roadmap 2018 (Part 1)

difference in the success of EU-funded cancer research. Our RIs offer access to facilities, technologies and expertise to researchers from academia and industry. These services can simply be consultation, or access to experts, but also access to data or biological and chemical samples, animal models, use of data analysis tools, access to facilities (e.g. state of the art imaging technologies, molecular screening centres) as well as support from technicians and much more. All these relevant infrastructural resources and assets would be of particular importance for the successful implementation of a Europe-wide platform (UNCAN.eu) such as envisioned by the Cancer Mission Board Interim report[3] (*Recommendation 1)*.

Researchers need effective and easy access to more central resources, including virtual networks linking databases, patient registries and biobanks, and coordinated infrastructure support. Removing barriers for data sharing across our borders remains a challenge - Hence the role that our RIs can play to support sample and data sharing in order to facilitate the rapid implementation of widespread genomic data access[4] and help identify personalised biomarkers[5] (*Recommendation 2*), and more.

For example, BBMRI-ERIC, the European Research Infrastructure for biobanks and biomolecular resources, brings together over 600 biobanks across Europe, providing the largest sample directory in the world, with over 100 million samples and data available for academic and industry researchers. It also offers quality management services, support with ethical, legal and societal issues, and a number of online tools and software solutions. The European Research Infrastructure for life science data (ELIXIR) provides infrastructure to manage data, software tools, interoperability resources, computing facilities, and training to allow researchers to understand the genetic basis of disease. ELIXIR is also leading the H2020-funded project "Beyond 1 Million Genomes" (B1MG[6]), to create a network of genetic and clinical data across Europe, that will certainly be beneficial to the Cancer Mission and in which all three other infrastructures are participating.

The support of RIs can also be instrumental to address additional areas of actions already flagged by the Cancer Mission Board, such as early detection[7] (*Recommendation 4*[8]), diagnostics development (*Recommendation 6*[9]) or the advancement of personalised medicine approaches and the validation of personalised biomarkers (*Recommendation 5*[10]). For instance, EATRIS, the European Research infrastructure for Translational Medicine focuses on the development of innovative drugs and diagnostics, as well as drug repurposing by supporting the validation and utilisation of new

[3] Cancer Mission Board Interim Report (Conquering Cancer: Mission Possible) - See Recommendation 1: Launch UNCAN.eu – a European Initiative to Understand Cancer (page 8)

[4] Nat Rev Genet.2019 Nov;20(11):693-701. doi: 10.1038/s41576-019-0156-9.

[5] Cancer Mission Board Interim Report (Conquering Cancer: Mission Possible) - See Recommendation 2: Develop an EU-wide research programme to identify (poly-)genic risk scores (page 8)

[6] https://b1mg-project.eu/ - The project provides coordination and support to the 1+ Million Genomes Initiative.

[7] In 2017, EATRIS launched the Early Cancer Detection (ECaDE) Initiative: https://eatris.eu/projects/early-cancer-detection-europe-ecade/

[8] See Recommendation 4: Optimise existing screening programmes and develop novel approaches for screening and early detection (page 11)

[9] *Idem*; See Recommendation 6: Develop an EU-wide research programme on early diagnostic and minimally invasive treatment technologies (page 13)

[10] *Idem*; See Recommendation 5: Advance and implement personalised medicine approaches for all cancer patients in Europe (page 12)

preclinical models, assays and technologies. The European Clinical Research Infrastructure Network (ECRIN) supports multinational clinical studies, including the establishment of multinational cohorts, and leads the H2020 PERMIT project[11] to develop methodological standards for personalised medicine research programmes, including umbrella and basket trials.

Additional details on how each RI can support the implementation of the Cancer Mission Board's preliminary recommendations are available as annex (see page 5).

Setting the Cancer Mission for success: Facilitating the right research environment

It is essential that the Cancer Mission facilitates the right research environment, ensuring that additional critical framework conditions for research and innovation are met.

Prioritising research quality

The challenge of irreproducibility of research results is well known and documented[12]. When cancer research studies are not reproducible, the long-term sustainability of cancer research funding is put in jeopardy, and ultimately, the very sustainability and availability of innovative treatments for patients. For cancer (and any) research results to effectively translate into innovative services and products, attention must be paid to minimise variability and increase reproducibility. Such sources of error arise in all phases of the research process, from design and execution (e.g. laboratory protocols, use of validated reagents and use of reference materials), to data analysis and reporting. When conducting multi-site studies, the need for centrally coordinated, professional quality assurance is even greater. RIs provide access to research facilities of excellence, therefore to ensure that research quality is safeguarded through the establishment of quality standards and the dissemination (and adoption) of best practices by its members as well as the broader biomedical community. For example, providing access to standards and protocols for sample access, sequencing and data analysis will be particularly important to ensure that research results are comparable across Member States. RIs' knowledge and resources should be leveraged by the network of Comprehensive Cancer Infrastructures foreseen by *Recommendation 10*[13] to increase quality of research and care.

Connecting the dots – quickly, safely and efficiently

The expectations over big data in health research remains high, while concrete, life-changing applications often remain enclosed in pilot projects or (often opaque) commercial solutions.
Yet, no one in the oncology research and care community would deny the huge role big data will have in the future of cancer care. The challenge is to create a trustworthy research environment, where patients' data and samples can be shared safely, FAIRly and cost-effectively.
Multiple efforts to solve this problem exists, each trying to solve one facet of a multifaceted problem, that includes interoperability of data, ethical approvals, data protection, among other issues.

[11] https://permit-eu.org/
[12] https://www.nature.com/news/1-500-scientists-lift-the-lid-on-reproducibility-1.19970
[13] Cancer Mission Board Interim Report (Conquering Cancer: Mission Possible) - See Recommendation 10: Set up a network of Comprehensive Cancer Infrastructures within and across all EU Member States to increase quality of research and care (page 17)

BBMRI, EATRIS, ECRIN and ELIXIR are key partners in the most important EU and global efforts on health research data sharing, from the 1 million genome project to the Code of Conduct on Health Research.

We look forward to continuing our dialogue with the Cancer Mission Board and all other relevant stakeholders to set the Cancer Mission for success and to save the lives of European citizens.

Annex 1: Overview of infrastructures' support to Cancer Mission Board Interim Report Recommendations

Recommendations	BBMRI-ERIC	eatris	ECRIN EUROPEAN CLINICAL RESEARCH INFRASTRUCTURE NETWORK	elixir
Launch UNCAN.eu – a European Initiative to Understand Cancer	BBMRI can provide data and samples from the BBMRI network of over 600 biobanks compliant with ethical and legal regulations. The data follow FAIR and FAIR-Health principles. BBMRI can provide a large community with access to experts in biological and medical research and big data analyses.	EATRIS can provide access to 110 translational research institutions, of which 54 are academic medical centres and many designated comprehensive cancers centres, and of which 26 participate in the EATRIS Oncology Task Force. Validated PDX models and advanced (organoid and 3D cultures) screening models are available.	Multinational cohort studies (retrospective or prospective) supporting patient stratification through –omics data generation and biomarker profiling provide key information of the mechanisms of disease – tumor, microenvironment, host's response to tumor.	ELIXIR's data infrastructure can facilitate knowledge generation and sharing of data enabling better understanding of cancer.
Develop an EU-wide research programme to identify (poly-) genic risk scores	BBMRI's biobanks and cohorts provide access to high quality genomic data. BBMRI can generate it from the available biological material, exploiting the vast arrays of expertise and competences in our 21 national nodes. The genomic data is complemented by clinical data, phenotype data, digital pathology scans, metabolomics and exposome data. BBMRI developed a model to store data coming from multiple biobanks at the central level: the Colorectal	Define a framework for quality and reproducibility for large WGAs studies. Design EU ring testing programmes for assessing the clinical relevance of polygenic risk scores. Access to patient cohorts (e.g. breast cancer, prostate cancer, colon cancer) and ability to link to patient immunophenotyping and metabolic status.	These omics data (see above) include information on genomic and epigenetic risks of cancer.	Support the data management of the research programme, ensuring research results are stored safely, securely and sustainably in databases, and available for re-use by others where appropriate. Harmonisation of software and computational tools to calculate polygenic risk scores from raw data via e.g. bio.tools and enable reproducible analysis via FAIR workflows and standardised deployment.

	Cancer Cohort (CRC-Cohort[14]). BBMRI is developing guidance on implementation of FAIR and FAIR-Health principles, with particular focus on quality assurance, data quality control and data protection that minimized impact on the data quality and reusability.			
Support the development and implementation of effective cancer prevention strategies and policies within Member States and the EU	BBMRI can contribute data from representative Europe-wide populations. BBMRI biobanks and cohorts can establish prospective cohorts to study specific aspects and to ensure consistent data collection. BBMRI will support the mission by advocating its main goals to its vast network of users and partners, including industry, academia, patient advocates, and policy makers. BBMRI can support the dialogue between patients' associations and researchers/physicians, relying on its well-established permanent network of expert patients advocates and associations.	Support the development of multi-stakeholder task forces, leveraging EATRIS diverse European network of translational research collaborators in 13 Member States (patient advocates, funders, international organisations, etc.). Provide translational research capacity and support for programmes aimed at the implementation of personalised prevention strategies (stratification of screening in average risk population according to genetic background and non-invasive biomarkers; identification of hereditary cancer cases).	Multinational observational studies provide information on possible prevention strategies that can be further tested in randomized trials of preventive interventions.	Descriptions and alignment of sensitive human data management technologies, strategies, and policies across Europe via the ELIXIR Federated Human Data Community, and the EU funded Beyond One Million Genomes project where 'cancer' is a key driving use case. For example, we will coordinate and work towards common minimum standards and identify applicable GDPR requirements as well as a relevant legal framework applicable for cross-border cancer related genetic data sharing.
Optimise existing	BBMRI biobanks can provide sample	Share best practices from the Early		

[14] CRC-Cohort is the largest real-world colorectal cancer collection, with rich clinical data coming from over 10,500 cases. Similar cohorts can be implemented for other cancer types, following the same processes and tools developed for the CRC-Cohort.

screening programmes and develop novel approaches for screening and early detection	collections for testing and developing new diagnostic technologies based on IVDR and international Standards conform sample collection procedures. BBMRI envisions bridging access to samples and data obtained from prospective multicenter screening trials to any other project initiative within the Cancer Mission programme, e.g., UNCAN.eu or identifying polygenic risk scores.	Cancer Detection Europe (ECaDE) initiative, led by EATRIS since 2016. Support the clinical validation and provide regulatory expertise for the efficient and compliant translation of novel (companion) diagnostic and theragnostic products towards marketing authorisation.		
Advance and implement personalised medicine approaches for all cancer patients in Europe	BBMRI's biobanks have a direct connection with patients and can be the link between samples, data, patients, researchers and clinicians. Moreover, BBMRI biobanks close a structural gap between clinical routine and translational research by supporting, e.g., Molecular Tumour Boards and clinical trials.	EATRIS leads the H2020 project, EATRIS-Plus, focusing on multi-omics approaches and education and training in the field of personalised medicine. EATRIS also set up a Patient Advisory Committee for personalised medicine. Development of cancer drug sensitivity and chemoresistance screening platforms that are compatible with clinical decision making.	ECRIN develops expertise on personalised medicine research methods and standards in particular through the H2020 PERMIT project. This includes expertise on platform trials.	Coordination of health economics models for genomics in healthcare. Cases studies in cancer monitoring and intervention, including the specific setting of neonatal units, will be tested in selected European Countries, allowing the development of a harmonised methodology that takes into consideration specificities of national health care systems.
Develop an EU-wide research programme on early diagnostic and minimally invasive treatment technologies	BBMRI's population biobanks and longitudinal cohorts can facilitate early diagnostics research programmes. They also enable monitoring the incidence and recurrence of individual cancers. The next step will be to pair	Define the quality and reproducibility performance metrics for minimally invasive technologies, in particular, imaging-based technologies. Access to advanced (targeted) drug delivery technologies, including ultrasound, microbubbles,	ECRIN contributes to the assessment of innovative therapeutic solutions through clinical trials.	

	molecular data obtained from samples with any type of imaging data. This will further enhance risk assessment algorithms based on genetic analysis, family history and (liquid) biopsy analysis in order to identify high-risk patients who require specific oncological monitoring.	nanoformulations in combination with multimodal and hybrid imaging platforms (both preclinical and clinical to facilitate translation into the patient). Academic translational drug development capacity to develop the next generation of targeted immunotherapies.		
Develop an EU-wide research programme and policy support to improve the quality of life of cancer patients and survivors, family members and carers, and all persons with an increased risk of cancer	BBMRI's biobanks can promote quality defined and In-vitro Diagnostics Regulation compliant cohort collections for probands / patients at increased risk for cancer, for cancer research and screening programmes as well as for developing new diagnostic tools for early detection. Through BBMRI's stakeholder forum, particular its patient pillar, patients and relatives can be involved as co-creators of personalised medicines solutions and outreach activities.	EATRIS is a partner of EUPATI to educate and empower the patient community with deep understanding of the complexities of translational medicine and personalised medicine. EATRIS participates in the European Joint Programme for Rare Diseases by providing mentoring programmes to assist Principal Investigators in their endeavours to develop novel clinical solutions driven by high medical need (HTA, regulatory, IP support).	ECRIN contributes to comparative effectiveness trials supporting HTA decisions on best treatment option to improve quality of life of cancer patients.	
Create a European Cancer Patient Digital Centre where cancer patients and survivors 23 can deposit and share their data for personalised care	BBMRI contributes with proper application of the GDPR in the sector of health research, engages to clarify and specify certain rules in practice and helps to demonstrate GDPR compliance, committed to foster transparency and trust in the use of personal data in health research.		ECRIN develops a clinical trial data sharing platform allowing secondary use of data from individual patients involved in clinical trials.	Ensure patient privacy: linking patient data should be possible without sharing identifiable information to other parties than the organizations authorized to hold such information. Support GDPR compliance via tools developed among ELIXIR Nodes.

	BBMRI coordinates the Code of Conduct for Health Research initiative. BBMRI also contributes to build cloud infrastructures suitable for processing genetic and health data. Based on our activities, BBMRI aims to provide support to the development of a Cancer Patient Digital Centre by ensuring GDPR compliance and full patient privacy.			Support federated analysis and computational methods on encrypted data. Coordinate the data management and interoperability component of the development of ECPDC as a collaboration between ELIXIR Nodes, national health data research infrastructures and national health systems.
Achieve Cancer Health Equity in the EU across the continuum of the disease	BBMRI will utilise its Europe-wide coverage through population cohorts and healthcare integrated biobanks in order to support medical research and develop healthcare for all different types of cancers, including rare cancers. BBMRI shows its commitment to this also via its participation in building the data infrastructures for rare diseases – such as the European Joint Programming for Rare Diseases.	EATRIS supports the development of next generation of ATMPs (e.g. allogeneic version of CAR-T) to make this treatment modality more readily available, at lower cost.		Coordination of a series of workshops and country exchange visits directed at key players to: improve understanding of sensitive data management (including cancer data), maturity level model(s), standards, indicators, and review processes, and promote knowledge exchange and capacity building towards the process of adoption of genomic data in healthcare across Europe. These will be focused on technical aspects developed and take advantage of examples in Europe (e.g. Genomics England and the National Health System (NHS), FinnGen and the Estonian Genome Center).
Set up a network of Comprehensive Cancer Infrastructures within and across all	The majority of BBMRI biobank collections (over 400) provide cancer samples and data.	Facilitate the cross-border cooperation between existing Cancer Centres, support the definition of common SOPs.	Support multinational clinical trials on cancer for: -development of innovative therapeutic solutions – chemical and	Provide easy linking for researchers between data and analysis, visualisation and data exploration

EU Member States to increase quality of research and care	Such healthcare integrated biobanks are fundamental to the functioning of some of Europe's top Comprehensive Cancer Centre (CCC) hospitals, including those already accredited by the Organisation of European Cancer Institutes (OECI). Quality certified biobanks have become a prerequisite for CCC accreditation by national authority bodies. Thus, BBMRI.QM training and audit programmes can be applied in full for support the development of new or the connectivity of existing CCCs. BBMRI can further support and enlarge the Comprehensive Cancer Centre Model (Accreditation and Research Excellence) to RI's members.	EATRIS supports the development and implementation of a novel Platform that enables the sharing of sample annotations from (patient-derived) cancer cell chemosensitivity screening. This improves the harmonisation, quality and collaborative capacity of the (translational) cancer research centres.	biological agents, advanced therapy including cell, gene therapy, immunomodulators and immunotherapy, including Car-T cells, therapeutic vaccines, surgical treatment, radiotherapy / hadrontherapy, and any combination thereof -drug repurposing, exploring new indications / regimens / populations for drugs already marketed for a given indication; -treatment optimization through combination of treatments (chemotherapy, radiotherapy, surgery etc), key driver for the recent progress in cancer treatment.	tools. Utilisation of cancer-relevant services from existing research infrastructures, including ELIXIR's Federated European Genome-phenome Archive Develop and implement Artificial Intelligence/Machine Learning algorithms for cancer related image analysis, genomics analysis, patient response to treatment data, clinical records.
Childhood cancers and cancers in adolescents and young adults: cure more and cure better	BBMRI has over 190 biobanks with more than 320 collections from 11 member states (AT, BE, CZ, DE, FI, IT, LV, NL, NO, PL, UK) that contain data and samples from the individuals of age <17, and 189 biobanks with 295 collections for individuals under age <12. BBMRI can provide access and share knowledge specific to paediatric patients through its ELSI Helpdesk.	Provide access to academic expertise, services and facilities of EATRIS platforms (small molecules, biomarkers, imaging, ATMP and vaccines) - particular focus on the preclinical needs of novel therapies for paediatric cancers.	Provide access to academic expertise and ECRIN European partners to support multinational clinical research (new drugs or diagnostic, repurposing treatments for paediatric cancers).	
Accelerate innovation	BBMRI can develop and share how-	Share best practices and facilitate	Access to ECRIN clinical trials	Artificial Intelligence/Machine

and implementation of new technologies and create Oncology-focused Living Labs to conquer cancer	to-guide in relation to AI/machine learning and training algorithms (e.g. EUCANIMAGE). BBMRI can connect through its National Nodes to expert centres, biobanks and clinical sites for validation and implementation of new technologies or support of Oncology-focused Living Labs conquering cancer.	the creation and the operations of innovation hubs for the preclinical development of novel cancer-centred therapies (see EATRIS-GSK hub).	metadata repository.	Learning algorithms trained on cancer related genomics data and deployed on European High-Performance Computing clouds to provide innovative technologies in cancer therapy.
Transform cancer culture, communication and capacity building	BBMRI promotes best practices and knowledge from across the National Nodes on science communication, success stories and research participant/stakeholder engagement. Hereby, BBMRI will promote biobanks as the source of sample/data collection for cancer R&D from humans for humans	Build bridges between stakeholders involved in the European research and innovation ecosystem, promoting new forms of partnerships for co-design and co-creation for patient benefit.	Promote personalised medicine research strategies and dialogue between all relevant stakeholders.	Coordination and definition of a sensitive human data (including cancer data) maturity level mode for implementation across ELIXIR to build capacity and equality of healthcare.