

Roles of biological resource centres in cancer research

BRCs play a number of critical roles in all aspects of biological research. The role of BRCs in biological research in general, and their impact on medical, societal and economical issues has been extensively discussed in a recent report of the OECD (OECD, 2004). This paragraph addresses the importance, justification and sustainability of developing BRCs for cancer research.

Importance of BRCs

BRCs are critical for cancer research

Human biological specimens have been used for many decades for translational purposes in cancer research, in particular for testing hypotheses and assessing biomarkers identified in experimental studies. The advent of novel technologies opens unprecedented opportunities to assess the status of the human genome, its expression, the complex networks of interactions between biomolecules and the functional consequences of their alterations. Therefore, studies on human specimens are also becoming critical in the process of discovering new mechanisms involved in causing cancer or in determining its progression, resistance/response to treatment and clinical outcome. BRCs are the foundation of three rapidly expanding domains of biomedical sciences: molecular and genetic epidemiology (aimed at assessing the genetic and environmental basis of cancer causation in the general population as well as in families), molecular pathology (aimed at developing molecular-based classification and diagnosis procedures for cancer diseases), and pharmacogenomics/pharmacoproteomics (understanding the correlation between an individual patient's genotype/phenotype and response to drug treatment).

BRCs are important for developing personalised medicine

Collecting and analyzing biological specimens is a necessary procedure for pathology-based diagnosis and is also a mechanism for allowing patients to benefit from the applications of molecular cancer research.

Close involvement of the pathology department at collecting centres is essential to facilitate the use of banked fresh frozen samples in diagnostic procedures. In the future, correct assessment of patient status and therapeutic needs may require the determination of a number of molecular parameters and will require systematic preservation of frozen biospecimens or derived biomaterial. With the continuing improvement of survival after therapy, performing such molecular-based assessment may become a systematic requirement not only at diagnosis but also at different stages of patient follow-up. While the present document specifically deals with biorepositories for research, it is recognised that developing BRCs may rapidly become part of recommended, if not mandatory, medical practice. Thus, gathering know-how and procedures for collecting, storing and analyzing human specimens is a major contribution to the development of biomedical practice worldwide. Therefore it is recommended that comprehensive cancer centres and academic medical centres have well-organized BRCs that actively cooperate in national and international networks of tissue banks.

BRCs have an impact on biotechnological and medical innovation

In the chain from laboratory discovery to medical application, BRCs have a key contribution to life science research and development (R&D). Progress in medicine is dependent upon innovation, development and translation of laboratory findings into clinical practice. Access to human biological specimens is often a prerequisite for such R&D advances. Thus, development of high-quality BRCs has the potential to accelerate and facilitate this translational process.

Importance of networking and exchanges between BRCs

Cancer is a global disease, the understanding and management of which requires comparisons between disease patterns in different parts of the world. In addition, studies on many rare forms of cancer are limited by the difficulty in recruiting a sufficient number of cases within any single collection centre. Networking between BRCs implies a multi-directional flow of information, know-how and biological materials between centres in different parts of the world, and requires that all laboratories adopt common technical standards for specimen collection, storage, annotation and data management. BRCs have an important role in facilitating such exchanges and in providing logistics and infrastructure for multi-centre research projects (epidemiological studies as well as clinical trials). It is recommended that the institution develop tools to enable up-to-date, anonymous information retrieval of clinical annotation on individuals, and set up communications between departments of (e.g.) oncology, surgery, pathology and clinical chemistry. BRCs need networking with the global scientific community in cancer research.

Issues in developing BRCs and using banked specimens

Developing and using BRCs requires the active involvement of many actors at different levels (national policy makers, institutional administrators, epidemiologists, pathologists, surgeons, clinicians, bioinformaticians, laboratory scientists) and has complex ethical and legal implications. The perception of these issues and the way they are regulated and

managed varies according to legislative, cultural and economical contexts. This paragraph does not intend to provide general answers to these questions, but to put into perspective some important challenges associated to the collection, storage and use in research of human biospecimens. The Helsinki Declaration provides the general framework in which these questions should be addressed (1964).

Firstly, the rights of the individuals whose tissues or biological specimens are to be included in the BRC should be strictly considered and protected. Crucial aspects in this process are the development of appropriate methods to obtain informed consent according to the local standards where the definition of protocols are fully compatible with the three basic ethical requirements of autonomy, beneficence (non-malevolence) and justice (The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). In this process, it is critical that individuals receive accurate information regarding the potential use of their specimens in large national and international studies as well as in collaborative studies involving third parties such as industrial or commercial partners.

Secondly, the institutions that organize and oversee BRCs have the responsibility of protecting individual information and data, to guarantee safe and adequate long-term preservation of banked specimens, to inform, train and protect staff involved in specimen management, to ensure biological and environmental safety, and to make collections accessible and available under defined conditions for research purposes.

Thirdly, the scientists who wish to use banked biospecimens for research purposes must submit their research proposals and protocols to appropriate scientific and ethical review. As custodians of the biospecimens, institutions have the duty to take into account the non-renewable nature of the specimens in making priorities for scientific use. In requesting specimens from a biobank, scientists should develop detailed power calculations and provide pilot data to ensure the optimal use of biological resources. Distribution of specimens for research should be done within clear transfer agreements. Such agreements may include return of data and leftover materials

to the BRCs. They should also make provisions for users to contribute to the economical sustainability of the BRCs (see below), and should also acknowledge the rights of the BRCs and its scientific contributors to intellectual property derived from research performed using specimens made available by the BRC.

Principles for sustainable BRCs

Developing and sustaining a BRC has a high initial cost as well as running financial cost and can strain economically underprivileged institutions. These constraints are a significant obstacle to developing BRCs in middle- or low-resource countries. Lifting these obstacles in these countries requires a significant, international solidarity effort. The public sector (local, national governments, international bodies and organisations) has a responsibility for contributing to the funding of the baseline infrastructure of BRCs. On the other hand, the responsibility for development and maintenance of sustainable and usable specimen collections lies primarily with the institutions. Institutions should make provisions towards maintenance of infrastructure, equipment, running costs as well as data management systems. In addition, users of BRCs should contribute to the general financial and structural sustainability of BRCs. Thus, access to biorepositories of human specimens should entail a contribution from researchers, either in the public or private sector, to the costs of collecting, annotating, storing, retrieving and processing of biospecimens. However, human biospecimens should not be sold in any circumstances. Regardless of the role of industry in core funding of BRCs, which is a matter of debate with serious implications, the responsibility for specimen collection and storage must remain within institutions. In defining mechanisms for BRC sustainability, there is a need to develop safeguards against exploitation and improper use of human biospecimens.