

Dokuz Eylül University Breast Tumor/DNA Banking: A pilot study

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ABSTRACT

A pilot study was performed by the collaboration of Dokuz Eylül University Breast Tumor Group (DEBTG), Departments of Medical Biology and Genetics and The Institute of Oncology between 2004 and 2006 for setting up Dokuz Eylül University (DEU) Breast Tumor/DNA Bank, İzmir, Turkey. The DEU Breast Tumor/DNA Banking aims to facilitate the sharing of tumor DNA/RNA samples and related data from cases collected by collaborators specialising in the breast cancer diseases. We want to share our acknowledge about the breast tumor/DNA banking concept below. [Turk J Cancer 2007;37(2):66-68]

KEY WORDS:

Breast cancer, biobanking, tumor banking

TUMOR/DNA BANKING

Together with the advances in genomic research, information technology, molecular diagnostics and other biotechnology areas, cancer therapy seems to be shifting towards a more “targeted medicine”. To achieve and accelerate this vision requires broadening our understanding of the genetic and biomolecular mechanisms of healthy and diseased states. “Biobanking” is becoming an essential part of this transformation as evidenced by a growing number of such initiatives and organizations around the world. Biobanks provide a natural focal point for both molecular and clinical streams of information, thereby serving as a critical bridge to enable fundamental and translational research (1).

Thus, tumor/DNA banks play a central role in oncologic translational research (2). The design of tumor/DNA banks should be such that significant effort is devoted to obtaining data on the combination of genetic, clinical, lifestyle information and clinical outcomes which permits investigators to know that such data are available for analysis as they pursue their molecular studies on bank-derived specimens (3). Stored tumor tissue/DNA without linked information about diagnosis, treatment, and follow-up is much less valuable, while a clinical dataset without a stored genetic material is incomplete. Unlike other research tools such as cell lines and mouse models, the tumor/DNA banks incorporating human tissues and data invoke more complex social, medical and multidisciplinary issues. These issues include:

- a) An appropriate balance of tissue and data acquisition and utilization helps in ensuring maximal opportunity for future improvements for their families, relatives and the whole population while providing optimal delivery of health care for individual patients
- b) An expert interpretation of epidemiological, pathological and clinical data, the evolving clinical practice patterns and clinical decisions for acquisition of data
- c) Recognition, adherence and input into ethical standards and privacy laws
- d) Keeping the data organized and readily available in a standardized and expandable form

A great variability exists in the identification of the samples used, depending upon the source of the material and the purpose of the research. But whatever the type of the sample identification, it is possible even in anonymous collections to link a sample with an individual.

Tracking and cataloguing informed consent is the key to banking informatics. Risks posed to subjects from research with their tissues are strongly related to the identifiability of individual sources of those tissues. There must be compliance with all applicable national consent and privacy laws and ethical standards (4). Observance of other applicable international standards or regulations concerning the collection, processing, transport and storage of human tissues is also recommended. Tissue donors must be guaranteed anonymity, and protection of privacy, and protection from the misuse of information generated as a result of their participation (5).

Results of assays performed on tumor tissue are dependent on the characteristics of the initial specimen. Therefore, the details of specimen acquisition, handling, processing, and storage (the “pre-analytical phase”) are particularly relevant to the functionality and integrity of tumor/DNA banks (6).

One of the ways to achieve this is through the establishment of “biobank-specific” standards that could be enforceable by regulatory authorities.

Tumor/DNA biobank data standards need to address three main categories, each with specific requirements:

1. Clinical data: Clinical patient information (family genealogies, family health histories, lifestyle - tobacco, nicotine, alcohol dietary status, etc., parity, menopausal status, pregnancy status, lactation status, oral contraception status, hormone replacement therapy administration history, etc.)

Disease status (mammogram date and data, diagnosis date, TNM classification, treatment diagram, surgery, radiotherapy, chemotherapy, hormone supportive therapy information, etc.) and follow up information

2. Pathological data: orientation, type and size of the specimen, histological calcification, grade and extent of invasive carcinoma, presence or absence of lymphatic or vascular invasion, type, grade, and extent of in situ carcinoma, multifocality of either the invasive or in situ component, relationship of carcinoma with marked margins, number of nodes sampled and number of nodes involved, presence or absence and extent of extranodal spread of carcinoma in axillary fat, estrogen and progesterone receptor status, HER2/neu testing by IHC and/or FISH, etc.
3. Sample data: Tissue collection, DNA, RNA isolation procedure and quality standards

Many valuable insights into the biology of breast cancer have come from laboratory based research. In order for discoveries made in the laboratory to be translated into clinical practice, it is imperative that patients’ samples be available for testing. The tumor/DNA banks manage and maximize the scientific use of the bank.

THE DOKUZ EYLUL UNIVERSITY BREAST TUMOR/DNA BANK

The DEU Breast Tumor/DNA Bank store and collect a wide range of DNA and RNA samples from breast tumor and adjacent normal tissue and constitute a database of pathological and clinical data. Approval for the establishment and maintenance of the tumor bank was given by the Clinic and Laboratory Research Ethics Committees of DEU Hospital. The informed consent which complies the statements of Helsinki Declaration, allow for the patient to designate whether their DNA/RNA and clinical data may be used for: (i) cancer research; (ii) general medical research; and (iii) future patient contact for needed clinical follow-up. Volunteer accepts to share his tissue sample and clinical information with other research centers at signing up; but is informed that he can withdraw his remaining tissue sample from the bank at any time. The portion of samples cannot be withdrawn once assigned for a research project.

The procedures for collection, storage and distribution of the samples are being developed with a staff of clinicians, surgeons, scientists and the pathologists, so that new samples can be collected in the fastest and easiest way with less interruption of the routine daily work.

All the procedures are continued under a random code

number assigned at the time of receiving the informed consent from the volunteer, which anonymizes the sample from then on. There are two different permission levels of access to medical records. The only access to the patient name and contact details is over the administrator password and on demand. Queries by all other users return every information but the patient ID details.

The surgical specimens were brought to the macroscopy laboratory in the department of pathology in an hour in the unfixed form and tumor and normal tissue samples were obtained here. Both samples were for processed for DNA/RNA isolation. Each party of DNA and RNA isolations were aliquoted as 20-30 tubes according to their concentrations. They were stored in -80°C with their ID codes and a registry is kept for the freezer stock. Pathology reports, clinical annotation (hormonal and lifestyle information), medical history and family history, lifestyle data and management scheme and follow up notes are stored in a database with an easy to use interface with multiple query and sorting possibilities.

The first samples were used from the bank were for a research project in the university, when the number of volunteers (volume of the bank) reached to 64 cases.

CONCLUSION

Cancer is caused by complex interactions between genes, environment, and lifestyle. As a place to store and analyze data on these three dimensions, tumor biobanks have become an increasingly critical resource to help advance our understanding of disease and health. The organized data combination of genetic, clinical, and lifestyle information of a large number of patients available as a result of tumor biobanking efforts is essential to achieve the promise of targeted medicine. Basic researchers will utilize this information to understand the molecular basis of disease. Pharmaceutical companies will leverage these resources to ultimately develop more targeted treatments and companion diagnostics. Governments will use data from population based initiatives to understand the impact of environment and lifestyle in order to improve diagnosis, treatment, and prevention, thus impacting the quality and cost of healthcare at national levels. This promise is widely recognized, but the realization of this promise still faces many ethical, legal, social, scientific, financial, intellectual property, and information technology challenges.

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