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A discussion on biobanking

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ABSTRACT
A biobank is an organized collection and storage of human biomaterial and other associated information for medical research purposes. Biobanks by their nature collect, store, and disseminate specimens from human bodies. Biobanking is a lively and growing area in medical research. It has become the subject of international interest. In this article, the term "biobanking" is introduced.

KEYWORDS
biobank; biobanking; biospecimen; personalized medicine

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INTRODUCTION

Biobanking is a new frontier for health research and will provide important tools for the current era of individualized medicine. A biobank or life bank is a biorepository that accepts, processes, stores and distributes biological samples for use in medical research and clinical care. Biobanks may range in size from individual refrigerators to warehouses. They are maintained by hospitals, universities, nonprofit organizations, and pharmaceutical companies. Before the advent of biobanks, researchers struggled to acquire sufficient samples and data usually stored in one laboratory. With biobanks, researchers have access to data on a large number of people and share data [1].

Biobanks are organized collections of human specimens and associated health data obtained from a population and stored in an organized system. Biobanking has been identified as a key area for development in order to accelerate new drug discoveries and drug development. Biobanking services must improve rapidly to meet the needs of personalized medicine [2]. The primary goal of a biobank is to collect, store and disseminate biological specimens and related data. Like other DNA databases, biobanks must carefully store and document access to human specimens. Specimen types include blood, urine, skin cells, organ tissue, and other things taken from a body. Biobanking for research purposes includes the collection, processing, storage, and analysis of specimens. Biobanking cannot succeed without strong social, and political support [3]. Biobanks are essential tools for facilitating biomedical research. They have become critical components in the efforts to cure, treat or prevent cancer, diabetes, and several other diseases. They have applied in the routine practice of cancer, urology, pathology, genomics, organ transplantation, forestry, rheumatology, and proteomic. Biobanking has evolved from pathological laboratories to international networks [4]. Biobanking 1.0 refers to earlier stages of biobanking. Biobanking 2.0 focuses on the quality of biospecimens and data. Biobanking 3.0 improves on understanding value across different stakeholders [5].

BIOBANK TYPES

Biobanking has evolved from a simple collection of frozen human specimens to a virtual biobank. There are several types of biobanks including those that are population-based, project-driven, disease-centric, tissue type, government-based, commercial, networked, and virtual biobanks. Biobanks may be classified by purpose or design. Popular types of biobanks include [3,6,7]:

- ***Virtual biobanks***

These are developed to assist investigators to locate biospecimens for testing and data mining from multiple biobanks in dispersed locations. A virtual biobank is an electronic database of biological specimens regardless of the location of the actual specimens. Such virtual biobanks are accessed using specialized software.

• Tissue banks

These harvest and store human tissues for transplantation and research. Tissue types include tumor tissue, cells, blood, DNA, or DNA array. As biobanks become more established, it is expected that tissue banks will merge with biobanks. The stored tissue samples have been used by the biomedical community for educational and research purposes.

• Population banks

These store biomaterial as well as associated characteristics such as lifestyle, clinical, and environmental data. Population-based biobanks focus and study the development of diseases over a portion of the population for a long period of time. Population biobanks have become common over the past two decades. They enable longitudinal studies such as disease monitoring, aging studies, and biomarker discovery. Population-wide biobanks have been developed in several countries such as the US, UK, Sweden, Denmark, Canada, South Korea, and Japan.

• Disease biobanks

These are taken from patients suffering from a specific condition. Disease-oriented biobanks are also referred to as clinical biobanks. They are usually established in hospitals and research institutions. Disease banking implies informing patients and obtaining the proper consent. Biobanks may be of different formats based on collections of DNA, tissue, cells, blood, and other body fluids. They also differ in scale, nature, contents, participants, and ownership. Ownership may be private, public, government, academic institutions, pharmaceutical companies, hospitals, or standalone organizations. Standard operating procedures and quality control programs are implemented in the majority of biobanks.

BIOBANKS DEVELOPMENT

The essentials of specimen banking include processing, storage, and providing high-quality specimens. Typical biobanking involves the following major steps [6,8]:

• Specimen Collection

These biospecimens are typically collected during clinic visits, therapeutic or diagnostic procedures, or post-mortem at autopsy. People are asked to donate biospecimens and their consent is obtained prior to collection.

• Preservation

These biospecimens are processed and preserved by fixation, freezing, and live cell banking.

• Labeling

This is also known as annotation. Labeling encompasses linkage to health data associated with the patient and their condition.

• Specimens to Investigators

This involves availing the biospecimens for research purposes the success of a biobank project begins with collection to ensure the quality of samples. Successful biobanks are eventually empty since their biospecimens are used for research and not stored in freezers for years without attention.

BIOBANKS BENEFITS AND CHALLENGES

Biobanks have become indispensable in medical research, supporting many types of contemporary research such as genomics and personalized medicine. They are an essential tool for new drug discoveries and drug development. They are used for various purposes such as diagnostics, pharmacology, or research. Biobanks serve as valuable tools for studying complex diseases such as cancer, cardiovascular disease, and diabetes. One issue with large databases like biobanks is the question of ownership of samples. National biobanks are often funded by public/private partnerships and are expensive to set up and maintain for long-term studies. Long-term sustainability is a major issue for biobanking. Biobanks have provoked concerns on privacy, research ethics, and medical ethics. Since biobanks involve human samples and invade individual autonomy, it raises a lot of ethical, legal, and social issues. Breach of confidentiality and loss of privacy can be a major risk in biobanking. Public trust is also crucial for biobank governance.

People volunteer to participate in biomedical research because it is the right and fair thing to do. The inclusion of different ethnic groups in the creation, design, and rationale of biobanks raises some problems [9]. There are no internationally accepted guidelines designed to work with biobanks. Biobanking is also lacking harmonization, standards, agreed vocabulary, common data elements, and best practices for collecting and processing samples [10]. These challenges must be addressed in order to realize, mobilize, and sustain the promise of biobanking to biomedical research.

CONCLUSIONS

Biobanking is a new, dynamic, and emerging field. It has been identified by many scientists as a key area for infrastructure development in order to promote drug discovery and development. Biobanks hold significant potential to facilitate medical research. The scope of biobanks is expanding globally. Millions of previously collected tissue samples are stored all over the world waiting to be used for research, healthcare, teaching, and quality control [11]. As biobanking is developing to the science of biobanking, it becomes necessary to collaborate and share knowledge in the biobank community which consists of investigators, biobank managers, patient advocates, lawyers, and others with interest in biobanking. It is incumbent on biobanks to seek educating and engaging the public and getting consent.

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