The Closure of the National Bio-bank in Singapore

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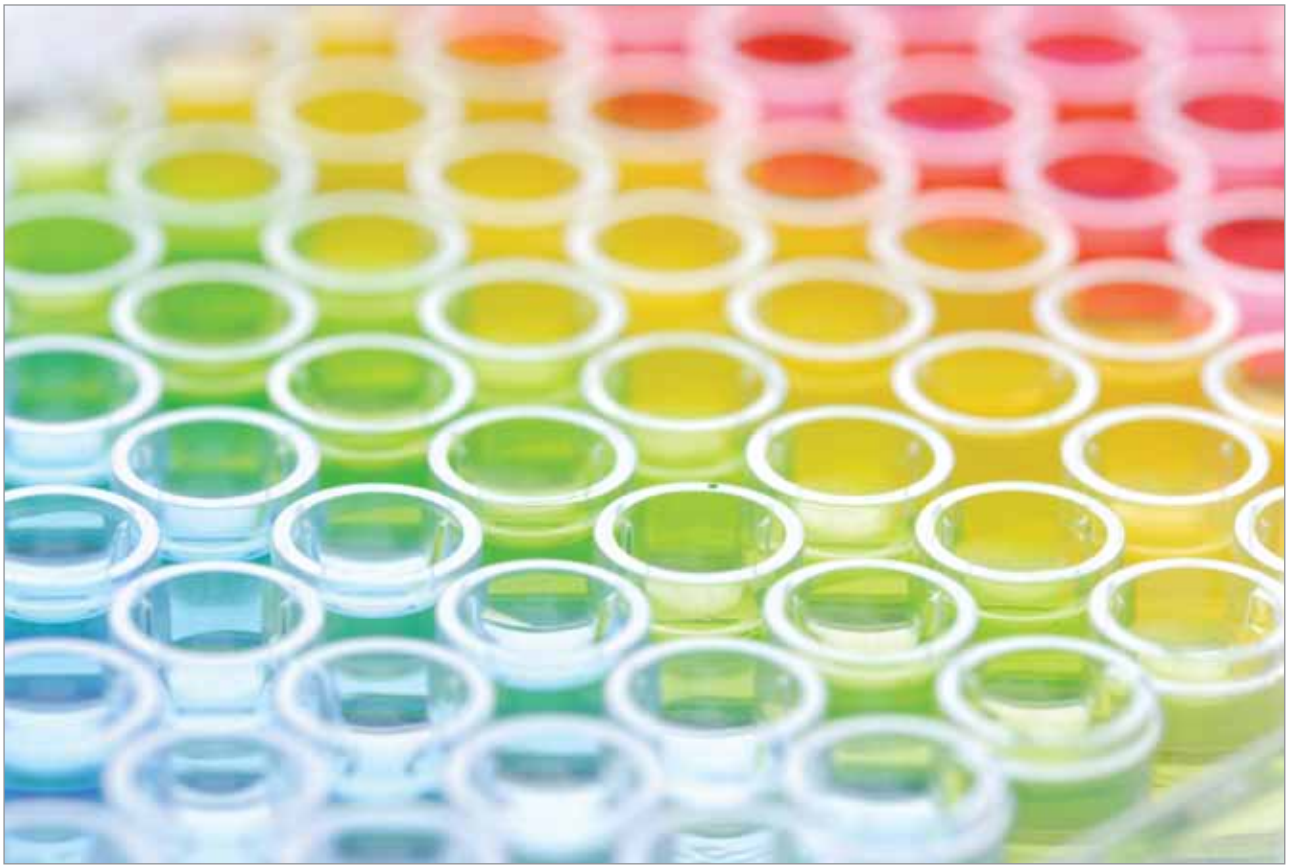
Abstract: The Singapore Bio-Bank (SBB), originally known as Singapore Tissue Network (STN), was established in 2002 as a national non-profit tissue bank under the auspices of the Ministry of Health and the Agency for Science, Technology and Research in Singapore (A*STAR). The SBB served as the only public level bio-specimens and DNA repository in Singapore with the objectives to facilitate the conduct of the highest quality of translational and population research. In 2011, the SBB was closed down and more than a million vials of stored tissue samples have been returned to the researchers and their research institutes. This article considers demand-side problems that led to the closure of the SBB.



The Singapore Bio-bank (SBB) was established in 2002 as a national non-profit tissue bank by Singapore's government-lead Agency for Science, Technology and Research (A*STAR) and the Ministry of Health. The SBB was formerly known as the Singapore Tissue Network (STN) and changed its name to SBB on 1 April 2010. It served as the only national bio-specimens and DNA repository collecting bio-samples directly from the researchers and two other institution-based tissue banks, namely, the National University Health System Tissue Repository (NUHS TR) and the SingHealth Tissue Repository (STR). SBB was designed to be a core research infrastructure to support Singapore's Biomedical Sciences Initiative and to facilitate bench-to-bedside translational research, as well as population-based epidemiological research.

In September 2011, the closure of the SBB was announced to the surprise and dismay of some biomedical researchers and research institutions in Singapore. Most of the biomedical researchers that SBB served were from the National University of Singapore, as well as clinicians from various hospitals in both the Singapore Health Services (SingHealth) and the National Healthcare Group (NHG) clusters of healthcare institutions. Various issues have been identified for the closure of SBB. These include funding shortage, low utilization rates, possible problems in the collection and, more generally, an issue of trust.

Funding of SBB

The SBB was funded through a Biomedical Research Council (BMRC) grant of S$8.7 million in March 2002. It had intended to implement a cost recovery model for the storage and drawing down of the biological samples by researchers. Most of the costs of running the SBB were from the collection, processing, distribution, archiving and storage of bio-specimens and the relevant associated clinical data that support biomedical research. The maintenance of machineries and equipments also drained public funds substantially. Due in part to the failure of the SBB to be self-financing and also to the decision of BMRC to cease funding, the SBB ceased its operations in 2011.

Under-utilisation of SBB samples

Besides SBB, there are two other similar facilities that were available to researchers, namely NUHS TR and STR. The research projects listed on the SBB's website (in June 2011) before its shutdown indicated that the bio-specimens have been used in 25 specific research projects. It was unclear whether this list reflected all the projects that SBB had supported from 2002 to 2011 or on a yearly basis. Twenty five projects, even in a year, would appear to be below the operating capacity of the research that the SBB could support. The figures were higher in a newspaper report[1]. It indicated that the SBB had supported about 30 research projects and processed about 10,000 donors'

samples in a year, with a total of around 1.2 million vials of bio-specimens stored at the bank. Even then, this figure was considered to be low compared to the number of tissue research that was funded during the same period. With storage of more than 1 million vials and little or no withdrawal, it could be surmised that the storage and operating cost per month would have been substantial.

There are many reasons for the SBB's "unpopularity" among researchers. As earlier noted, most of the biomedical researchers were clinicians, or otherwise basic science researchers who were working either collaboratively with clinicians, or in a hospital-linked research institutes. For researchers working in a hospital, they would first approach their own institutional tissue repositories out of convenience. Alternatively, these researchers could also recruit hospital patients as their subjects since they have a clinician in the research team. Although it may take more time to recruit a suitable donor, most clinician-scientists viewed approaching the patients directly to be more accessible. They would also be able to control the quality and handling of the bio-specimens and collect the necessary specific clinical information from each subject. This direct approach enabled the avoidance of administration hassle and "political turfing" entailed in requesting for bio-specimens from a secondary source.

Sources of biological specimens

Bio-specimens stored in the SBB originated from many sources. The SBB provided storage space for specimens collected for population-based epidemiological cohort studies in exchange for the research use of these specimens. These cohort studies required long-term storage spaces where the specimens collected (normally blood or genetic material) had limited use beyond the immediate research, with the exception of related studies or further investigations into the research for which the specimens were initially collected. In addition to this source, the SBB also collected disease specific bio-specimens from the existing tissues repositories (i.e. NUHS TR and STR) and from researchers conducting disease specific research e.g. cancers. These bio-specimens included left-over tissues from surgery, blood and blood components, DNA or RNA, urine, buccal samples or saliva and primary immortalised cell-lines.

In the case of a researcher's specific project, informed consent would have been obtained from the patients for the research use of their tissues as well as specific consent for storage in the SBB and future research use. The practice was for the bio-specimen collected (i.e. left-over tissue after clinical diagnosis which would otherwise be discarded) to be divided into two portions. The first portion was stored in the SBB for that research team to use. The second portion was donated to and stored by the SBB for future use by other researchers. For all bio-specimens collected from the NUHS TR or STR, a portion of the tissues collected by hospital-based tissues repository would be donated to the SBB for storage. With the closure of the SBB, these "duplicated" samples were returned to the two tissues repositories.

A matter of trust

Biobanking is an expensive long term investment[2]. For it to be economically sustainable in the long run, it would be necessary to have a gradual increase in the utilisation rate of its services over time in order to achieve economies of scale. If successful, a return on investment would be in the form of efficient knowledge production that could benefit population health. Unfortunately, the low utilisation rate imply that the initial objectives of establishing the biobank were not met, and that it was not economically viable beyond the initial funding cycle.

A viable cost-recovery model was necessary even for a not-for-profit organisation. It appeared that the cost recovery charges for specimens at the SBB may be too high, thus discouraging the use of the service. Apart from cost concerns, researchers needed sufficient assurance that the biobank would provide bio-specimens of high quality, with reliable clinical information. While biobanks can be viewed as a "short-cut" to accessing bio-specimens by saving the researchers' time in the collection and storage of samples, many researchers may not find the stored bio-specimens biologically suitable for their research, and the relevant medical data may not be available with the bio-specimens.

A demand-supply analysis could be broadly applied to aid in evaluation. On the supply-side, biobanks depend on willingness of the public to donate their bio-specimens for research use. Research indicates a number of factors that could limit supply. These include donors' concerns about their privacy interests and confidentiality, the use of genetic information for non-research purposes and commercialisation of genetic material. It is well demonstrated that a loss of public trust will jeopardise biobanking and precludes the potential benefits that could be gained from this set-up. In this paper, we have focused on the demand-side problem. As we have considered, the SBB was likely to have failed because it was unable to generate sufficient demand for its services and resources, due to a variety of reasons, including the high opportunity cost of access to its services and resources.

I elaborate on the dampening of demand by high opportunity cost. Access to specimens in a biobank normally requires a documented application which outlines the ethical and scientific justification for use, before the biobank will approve the withdrawal and utilization of such bio-specimens. For most biobanks, applications are usually reviewed by a Tissue Allocation Committee, which will then decide if the use of the bio-specimen was in-line with the donor's consent and that the results of the research or innovation would benefit the health and welfare of the population. The application will also be reviewed for the amount requested, in order to prevent wastage. The Committee may recommend collaboration between researchers (especially if they are requesting tissue for the same research), since these samples are usually considered to be limited resources, and their use should be optimised. It is possible to think that these standards of access and use may be unacceptable to researchers who find the additional scrutiny or administrative "bureaucracy" for projects already funded and peer-reviewed by their

institutions to be too burdensome in terms of opportunity cost. In addition, some researchers may not trust biobanks with their intellectual property and scientific designs required in the review process, especially if there are concerns over possible conflicts of interest (e.g. where a reviewing member might have been doing a similar research). These may have been some of the challenges that researchers encountered with SBB, and they are not easy to resolve.

The closure of SBB could perhaps be attributed to a lack of understanding of the objectives of its establishment and difficulties in coordination. Thus, SBB was unable to satisfy the needs of the research community, with the researchers opting to use other facilities instead. If researchers perceived the SBB as having only stored duplicate bio-specimens that could already be sourced from the existing two tissues repositories, with no additional value-adding facilities or technological enhancements, there would have been no incentive to utilise the services or resources of the SBB. Additionally, if the SBB was meant to be a large storage warehouse for bio-specimens collected for large cohort studies, it would only benefit certain groups of epidemiology researchers.

This paper argues that while a loss of public trust could reduce the donation of bio-specimens to biobanks, a failure to generate trust among researchers contributed to a demand-side problem. The lack of communication and coordination between research establishments, such as a biobank, and the research communities could result in a "lose-lose" situation for both parties.

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About the Author

Mr. Chan Tuck Wai is the Senior Associate Director and Secretariat of the NUS Institutional Review Board (NUS-IRB). He is also appointed as Human Protections Administrator of the National University of Singapore (NUS).

Mr. Chan is a Singapore Registered Pharmacist, with Masters of Business Administration from the Golden Gate University, San Francisco. He was also the first Certified IRB Professional (CIP) by the Applied Research Ethics National Association, USA (ARENA) in Asia, and has presented papers during their 2004, 2006 and 2011 annual conferences. Mr. Chan was appointed as temporary adviser to World Health Organisation in 2005 and was invited to attend the WHO Conference on Ethical Aspects of International Collaborative Research and Health Ethics. He is currently pursuing doctoral studies in Biomedical Ethics with the NUS Centre of Biomedical Ethics.

Mr. Chan is a member of the Hospital Ethics Committee at Singapore Institute of Mental Health, member of the Code of Ethics Committee of Singapore Pharmacy Council, member of the NUHS Tissue Repository Steering Committee, consultant to Ministry of Community Youth and Sport and Singapore Polytechnics on research ethics.

Mr. Chan was the Head of Medical Affairs at the National University Hospital and was instrumental in the establishment of the first university IRB-NUS-IRB, and the first Nursing and Paramedical IRB (NUH NP-IRB) in Singapore.

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Mr. Chan was the Editor-in-Chief of HealthWorld Asia, a health magazine published in USA and Asia, and the Editor of bulletins of the Pharmaceutical Society of Singapore and NUS Pharmaceutical Society.