

## Biobanking in the Developing World; Maximum Specimens, Minimum Infrastructure

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Our most dreaded nightmare comes to life when we enter the laboratory one morning and discover that the freezers, housing our precious biobanks, have malfunctioned and their invaluable samples have been damaged or worse, perished!

**B**iobanking is a rapidly expanding, yet fragile, enterprise, which has become crucial for the advancement of biomedical research. To encourage best practices in establishment, maintenance and expansion of biologic repositories, the Office of Biorepositories and Biospecimen Research at the National Cancer Institute (NCI, USA) has issued guidelines<sup>1</sup>, which if implemented will result in higher consistency and better quality of research by creating a set-up promoting reliable sample and data pooling among international consortiums. The guidelines provide best practices for sample collection, processing and storage, informatics, quality assurance and management. They also comment on controversial and sensitive ethical, legal and social issues concerning biobanking, including informed consent and privacy protection<sup>1</sup>. The International Agency for Research on Cancer (IARC) BioBank (IBB, <http://ibb.iarc.fr/>) has succeeded in collecting more than five million biological samples from across the world, as well as to train collaborating centers in standard operating procedures (SOPs) of biobanking.

Developing countries possess the highest disease burdens and the largest target sample populations. However, the infrastructure required for standard and reliable biobanking in these countries suffers from an array of deficiencies. More often than not, shipping samples from the developing to the developed world, appears as a rational alternative, but requires proper assurances for the donor countries, which may not always be provided by the recipients. Therefore, the World Health Organization (WHO) has called for a global governance framework for biobanks across the world, in order to satisfy the needs and concerns of every stakeholder<sup>2</sup>.

Most biobanks in developing countries are byproducts of specific research grants and are therefore “hypothesis-tailored” rather than “hypothesis-free”<sup>3</sup>. In addition, the limited “shoe-string” budgets supporting such studies often dictate a “pick and choose” policy regarding the principles described above, which often results in the establishment of substandard biorepositories. The major impediment to long-term storage of fragile biological samples is the require-

ment for continuous investment. However, repositories developed using grant-dependent budgets will lack such support, once the project ends<sup>4</sup>. In order to utilize the extensive, rich, and diverse sources of biospecimens from the developing world, a number of issues have to be addressed, at both national and international levels. The most important of which is to recognize the priority of investment in establishing long-lasting infrastructures that are customized according to the particular social, cultural and ethical atmospheres of the locations<sup>3</sup>. For instance, some emerging countries like South Africa have been able to create their own working models, including international transfer of human biological materials<sup>5</sup>.

Several scientific summits and conferences are regularly held that are designed to evaluate and address the challenges facing the ever-growing field of biobanking, particularly in the emerging countries. The Asian Network of Research Resource Centers (AN-RRC, [www.anrrc.org](http://www.anrrc.org)) constitutes of 103 research resource centers (RRCs) from 14 countries, which strives to promote biobanking by exploring opportunities, exchanging information and regulations, while creating grounds for multilateral collaborations<sup>6</sup>. Such exemplary international collaborations for emerging countries ([http://ibb.iarc.fr/int\\_collab/index.php](http://ibb.iarc.fr/int_collab/index.php)), include the B3Africa (Bridging Biobanking and Biomedical Research across Europe and Africa) and LMIC BCNet (Low- and Middle-Income Countries Biobank and Cohort building Network).

The ESBB (European, Middle Eastern and African Society for Biopreservation and Biobanking, [www.esbb.org](http://www.esbb.org)) was founded in 2010, with the mission to advance the field of biobanking in support of research relating to healthcare, agriculture and the environment. ESBB members (mostly European countries

and few countries in the Middle East and Africa) have come together to identify biobanking problems, encourage professional standards, public and private partnerships, provide services and a united voice to promote support for ethical collection and storage of biological materials from all species. ESBB organizes annual meetings as platforms to address these issues<sup>7,8</sup>. In the 2013 ESBB meeting held in Verona, Italy entitled “The Life in Data,” a real-time survey was performed amongst a group of 160 biorepository representatives from across the world, using a series of biobank-related questions<sup>9</sup>. The survey gave rise to a voting-based consensus to raise awareness and provide training for the biobanks, to use management tools and standards, consistent data and sample tracking and methods exchange and ultimately implement unified standardization of biobanks.

With the advancement of health sciences technologies and the ever growing science of ‘-omics’, and the high burden of disease and biodiversity of specimens from the developing/emerging world, special attention should be given to proper establishment, financing and management of standard “hypothesis-free” biorepositories, which are required to feed any and all potential research ideations, originating from national and/or international scientific consortiums. Without such infrastructure in the developing world, the many routinely, yet poorly collected and preserved biospecimens, are in essence “wasted” as they fail to provide reliable and credible biologic sources for substantiated health research.

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**REFERENCES:**

1. Vaught J, Lockhart NC. The evolution of biobanking best practices. *Clinica chimica acta*. 2012 Oct 9;413(19-20):1569-75.
2. Chen H, Pang T. A call for global governance of biobanks. *Bull World Health Organ*. 2015 Feb 1;93(2):113-7.
3. Rudan I, Marusic A, Campbell H. Developing biobanks in developing countries. *J Glob Health*. 2011 Jun;1(1):2-4.
4. Klingstrom T. Biobanking in emerging countries. *Biopreserv Biobank*. 2013 Dec;11(6):329-30.
5. Mahomed S, Behrens K, Slabbert M, Sanne I. Managing Human Tissue Transfer Across National Boundaries - An Approach from an Institution in South Africa. *Dev World Bioeth*. 2016 Apr;16(1):29-35.
6. Lee S, Nam S, Jung PE, Kim KJ, Lee Y. Asian Network of Research Resource Centers. *Biopreserv Bio bank*. 2016 Oct;14(5):424-8.
7. Lawlor RT, Sluss PM, Langer R, Sughayer MA, Igbe MA, Siddiqui K, et al. European, Middle Eastern, and African Society for Biopreservation and Biobanking (ESBB). 2012 Conference Session on Biobanking in Emerging Countries. *Biopreserv Biobank*. 2013 Jun;11(3):176-81.
8. MacKenzie-Dodds J, Clarke A, Lermen D, Rey I, Astrin JJ, Seberg O, et al. Recent initiatives in biodiversity biobanking: summary of presentations from the ESBB 2012 Conference. *Biopreserv Biobank*. 2013 Jun;11(3):182-8.
9. Nussbeck SY, Rabone M, Benson EE, Droege G, Mackenzie-Dodds J, Lawlor RT. "Life in Data"--Outcome of a Multi-Disciplinary, Interactive Biobanking Conference Session on Sample Data. *Biopreserv Biobank*. 2016 Feb;14(1):56-64.