

Futuristic biobanks

The invention of biobanks will revolutionize the healthcare industry by configuring the causative factors that ail the human body. Disease treatment will soon transcend to personalized medicines from the age-old diagnose-and-heal domain. The risk factors for diseases are being determined by the way of DNA and blood samples along with the medical history of an individual and his family. Biobanking projects have been launched all over the world in countries like USA, UK, Sweden, Estonia, China, India and Mexico among others¹.

The call for biological samples along with clinical data has led to the materialization of biobanks, a new discipline supported by institutions, hospitals, pharmaceutical companies engaged in clinical trials, and government-funded programmes supporting healthcare-based initiatives. Of late, governments world over, have started or sponsored biobanks, to help understand/manage the health of their populations².

DeCODE Genetics, a biobank in Iceland has so far collected DNA and blood samples from 120,000 Icelandic citizens, with majority of them having given an approval for their DNA use by the national bioethics committee¹. The UK Biobank is collecting information on the health and lifestyle of 500,000 UK volunteers aged between 40 and 69. The aim is to build the world's largest information resource on the genetic and environmental factors that cause or prevent human disease. The official website of UK's Parliamentary Office of Science and Technology propounds the 'idea to collect genetic and environmental (including lifestyle and medical) information from a large number of people and make this available to researchers studying the causes of common diseases of adult life'³.

The Taiwan Biobank launched in 2006 plans to use prospective cohort studies based on ethnicity (population-based) to unravel the effects of the environment on gene and gene-environmental factor interactions in common diseases⁴.

Biobanks are also referred to as biorepositories or tissue banks. The mandate of a biobank may differ from organization to organization. It serves either a diagnostic or therapeutic purpose or merely exists for research of specific diseases or specific populations². Biological samples as

well as clinical and phenotypic data, including general patient information, medical history, family history, lifestyle data and geographic information are stored as a resource to determine risk factors for diseases such as asthma, heart disease, diabetes, cancer, etc.¹. Simon O'Neill, Director of Care, Information and Advocacy at Diabetes UK, opines that 'the more information we can arm ourselves with about serious conditions like diabetes, the more chance we have of finding new treatments and even cures'⁵. Though there has been a burst in research on both molecular and clinical data in recent times, only an accurate integration of both can serve the purpose of producing effective personalized medicines.

Biobanking will play a critical role of a transformer with inputs from information technology (IT) to improve existing pharmaceutical and medical practices with knowledge generated from diverse clinical and biomedical data². The resultant database can be utilized by the pharmaceutical companies to design novel drugs that will match a specific gene profile, thus enabling the doctors to offer individualized treatments and prevention programmes⁴. Hoffman LaRoche, a drug firm based in Basel, Switzerland, made a deal worth US\$ 200 million to develop drugs based on DeCODE's data. The US-based IBM Healthcare and Life Sciences has collaborated with IDC Life Science Insights². The Joondalup Family Health Study, a Western Australia-based project that undertakes detailed phenotyping, is being tracked by Merck, GSK (GlaxoSmith-Kline) and AstraZeneca¹ for possible R&D gains.

While biobanks could lead to significant breakthroughs in medical and pharmaceutical research, they also arouse anxiety and distrust⁶. The development of biobanks is still faced with many ethical, legal, social, scientific, financial, intellectual property, and IT challenges². Skeptics fear increase in genetic discrimination as well as genetic exploitation by private companies⁷. As a result, private companies, international organizations such as UNESCO, WHO and OECD, as well as various governments have developed, or are developing ethical policies regarding the regulation of biobank research and management. In the wake of scientific advances, harmonizing such

policies and establishing standards at the international level are considered crucial². The International Consortium, Public Population Project that monitors 123 biobanks, ascertains that members follow basic legal and ethical guidelines¹. They aim to facilitate genetic research by exchange of research methodologies among different countries and enforcing security measures to protect genetic data⁸.

A Women's Health Biobank in India intends to study gene regulation and female fertility for the purpose of designing effective contraception methods, thereby providing an opportunity for researchers as well as the industry to study a range of debilitating conditions⁹. The Indian Society of Human Genetics, during its 33rd Annual Conference, has recommended the creation of a national biobank to study phenotypic diversity¹⁰.

Biobanks are increasingly considered an important component of the national health strategy because understanding the genetic and environmental bases of disease and therapy response is critical to managing the healthcare of a population. As Sally Davies of the UK biobank puts it, 'Though it may not directly benefit those who take part, it will help us understand how our children and our children's children can live longer, healthier lives'⁵.

1. Trivedi, B., *Nature*, 2008, **452**, 926–929.
2. IDC, November 2004; www.idc.com
3. The UK Biobank, July 2002; www.parliament.uk/post/home.htm
4. Ou, C. H. and Shen, C. Y., *Acad. Sin. E-news*, No. 12; newsletter.sinica.edu.tw/en/news/read_news.php?nid=136
5. E-healthInsider, 21 September 2007; www.e-healthinsider.com/News/3050/uk_biobank_begins_recruiting_using_nhs_data
6. Nationaler Ethikrat, German National Ethics Council, 2004; www.ethikrat.org
7. ISIS, January 2002; www.i-sis.org.uk/DNAdatabaseproblems.php
8. Doyle, A., www.p3gconsortium.org/events/2003Manchester/Alan%20Doyle%20-%20UK%20UK%20
9. Kennedy, S., *Indian J. Med. Res.*, 2004, **120**, 131–132.
10. *The Hindu*, 12 February 2008; <http://www.thehindu.com/2008/02/12>

Neelam Pereira (*S. Ramaseshan Fellow*), W/o Dr Abhijit Mazumder, National Centre for Antarctic and Ocean Research, Headland Sada, Goa 403 804, India. e-mail: neelam.pereira@gmail.com