Brain Banking In Taiwan: Current Situations and Strategies toward Solutions

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Abstract: Sampling of biopsies from almost every human organ is possible, except the brain. To study the molecular changes brain, use of post mortem samples are the only option. The main issues of brain banking in Taiwan are the difficulty in obtaining sustainable funding and humanly issues. A collaborative primitive setting that stores the previously collected and newly collected brain samples, is the first step to start. The second issue is to maintain the sense of glory and nobleness for the donators and their relatives, as this is more important than the knowledge that the brain creates.

Key words: biopsy, post mortem, belief, religion, Buddhism

Introduction

Medical science is a professional in which the knowledge and skills are accumulated, verified and improved systematically. Some of the discoveries and improvements have been the results of direct clinical observations, and some are extensions and applications of laboratory findings. Modern medical technology allows sampling of biopsies from almost every human organ, except the brain. This is because we have little understandings on human brain, and sampling procedures under such immature conditions may cause damage to the organ, and likely to cause further abnormality, or even death. So far, most human molecular studies of brain diseases are based on the analyses of substrates and metabolites in cerebrospinal and peripheral fluids (blood and urine), and, DNA and RNA obtained from non-central nervous systems. The findings are basically suggestive in nature, and may explain the disease of interests partially.

Imaging technology has been very helpful in assisting the diagnosis of brain diseases or locating the nidus for surgical procedures. However, imaging technique alone cannot reveal the molecular changes in a diseased brain. This problem can be partly resolved when molecular probes are available to the target molecules of interests, e.g., \(^{18}\)F-fluorodeoxyglucose for metastatic tumors and malignant gliomas\(^4\), and Pittsburgh compound B for amyloid plaques\(^2\), imaged by using the positron emission tomography. There is no doubt that imaging by molecular probes will become a common practice in the future but currently, the state of art that reveals the molecular changes are in vitro analyses of

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protein, antibody RNA. The experiments may be designed to detect specific substrates, or overall changes using array technology. The array technology has not only been adapted to detect overall RNA changes using cDNA probes, but can also be used to detect antibody using antigen array^a and protein using antibody array^b. Since routine biopsy brain sampling is impossible, the only alternative is to use post mortem brain as research materials. A few tens of brain banks have been established for different research purposes (http://www.brainnet-europe.org/). One of largest brain bank is run by the Stanley Medical Research Institute (http://www.stanleyresearch.org/). This research foundation has collected several hundred of brains donated by volunteers, free for research purpose, and represents one of the most contributive brain bank and brain research institute in the world. In Asia, researchers have started to establish regional brain banks. Although the starting sample size of brain samples collected by brain banks in Asia is relatively small, it is essential that to have the first step out. In Taiwan, as we understand, individual researchers have been receiving brain donations from volunteers concomitantly, without proper planning. For a better research environment and development in the molecular brain science in Taiwan, brain bank must be established eventually.

Funding

The very first question that rose among Taiwan researchers was, “Why shall we set up our brain bank while other countries may supply the research materials we need?” The answers are simple: (1) to maintain a stable supply and easy access of the brain tissues and (2) unique physical environment and genetic background may have different impacts to a same disease. We called for 3 regional expert meetings in 2005, 2006 and 2007, inviting Taiwan researchers interested in brain diseases to express their concerns and suggestions on the establishment of Taiwan Brain Bank. The first difficulty of Taiwan brain banking is the funding resource. Establishment of a biobank (http://www.twbiobank.org.tw/) that aims to link the clinical information of major human diseases (with specific emphasis on main causes of death) and the genetic materials together has been formally promoted in Taiwan. Substantial financial support to the establishment of biobank is less a problem because genomic medicine has been included on the list of national promotion project by the National Science Council Taiwan since 2000. The National Health Insurance Statistics on 2007 showed that 9.49% of the budget has been spent on neoplasm, 3.86% on mental disorders and 4.46% on diseases of CNS and sense organs. Although the latter two disease categories may be attributed to brain dysfunctions, so far, it does not alert the governmental decision makers to set up funding for scientists to investigate the molecular mechanisms of this complicated human organ directly. Nevertheless, a primitive form of brain bank with fundamental hardware and samples from different settings concomitantly collected following simple guidelines by members who joined the consortium, have been agreed in the expert meetings as the first step of Taiwan brain banking. Certainly, we cannot ignore that the ongoing research efforts on brain functional imaging and physiology have been contributing to the understandings of brain functions and brain diseases. One alternative of obtaining substantial funding for brain banking is to seek support from private sectors. Although such a big funding had not been very common in the past in Taiwan, it is still a possible solution.

Sense of Glory and Nobleness

In general, Taiwan economics count on the
benefits on industry and commerce activities, and is relatively well developed in Asia. However, traditional belief that human body should be kept intact after death, is still deeply rooted in the culture. Faith in Buddhism that stresses in coming spiritual life makes organ transplantation or further donation for research purposes easier in Buddhist religion hospitals, e.g., the Buddhist Tzu Chi General Hospital. One major achievement of the Buddhist Tzu Chi General Hospital in voluntary organ and tissue donations has been the establishment the Buddhist Tzu Chi Stem Cell Center and successful implementation of the collection. Professor D.H. Yue of the Institute of Religious & Cultural Studies, Tzu Chi University indicated in the expert consensus meeting 2004 that the potential organ donators and their relatives value the spiritual trust more promises and guarantees printed on papers. It is not important to them that what kind of knowledge may be created from the donation: what is important is a sense of glory and nobleness when they do so. In this point of view, researchers of non-hospitals and academic units may have to pay more efforts on religion virtue issues when establishing the brain bank and collecting the tissues.

Conclusions

Establishing brain bank in Taiwan confronts more problems that we initially thought. The nature of the problems is not about technology, but about sustainable funding and humanly issues. In addition to scientific investigations, researchers should start thinking of practical issues instead of waiting for brain donations in laboratory, including collaboration with hospitals and personally involved in the creation and maintenance of the glory and nobleness of brain donation. Seeking sustainable funding from private sectors is equally important to gaining funding from governmental agents. Although private sectors in Taiwan have not been actively supporting basic medical research, there have been a few successful pursues on cancer treatment and research program which potential brain bankers may refer. With the approval of The Act for The Development of Biotech and New Pharmaceuticals Industry by the parliament in 2007, the significance of brain banking for research will gradually be seen by public in very recent future.

References