

**Speech at Plenary Session “Summaries from Concurrent Sessions”  
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Good morning, Ladies and Gentlemen,

It is my great pleasure to present here the summaries of Session B dealing with three biological issues.

The title of the first sub-session is *Biomedical Discovery and Development in the Genome Age* which was chaired by Dr. Tan. Discussion points were the gains and risks of the progress in human genome analysis.

The human genome project developed many valuable new technologies, such as high throughput sequencing technology or data-mining computer technology for bioinformatics. These technologies gave extraordinary big impact on the biological research style, namely a percentage of biological research without touching with gene information clearly decreased, and moreover, a percentage of biological research related to human health problems through gene analysis greatly increased.

These technologies in gene analysis succeeded to identify the causal genes of many genetic diseases such as cystic fibrosis, muscular dystrophy, Huntington’s disease and so on. Recently, association studies on non-genetic diseases such as Alzheimer’s disease or Parkinson’s disease revealed susceptibility genes, which shed lights on the pathogenesis of such multi-factorial diseases. The huge databases obtained from those gene analysis studies are being mined for new drugs, new targets for drugs, new targets for vaccines and humanized antibodies. In order to use these databases as a source of better human life or human health care, the collaboration with governments, universities, and industries is extremely important.

Naturally, these analytical techniques were also applied to the infectious diseases, not only for the diagnosis but also for the treatment. As for the bacterial infections, we should employ the strategy to use molecular biology to identify genes essential to bacterial viability, in order to selectively kill causal bacteria. Moreover, we should seriously tackle with viral diseases, particularly with HIV infection, AIDS. I was very much impressed with chairperson’s comment that the HIV vaccine will come soon!

Finally, I should mention the dark side of this issue. The database construction not only of genome but also of profiling is extremely important and valuable, but needs the big budget, which brings the products, such as drug chemicals, vaccines or antibodies based on these databases, being expensive. Moreover, there are big discrepancy between developing nations and developed countries, in terms of availability of gene analytical techniques and of benefit from products based on gene analysis.

These problematic issues should be solved with the global collaboration under the slogan of harmonizing knowledge and databases with each other beyond national, geographical, or institutional boundaries. In order to realize this, it is essential to increase funds for basic researches being undertaken in all countries to collaborate in their research activities.

The topic of the second sub-session was ***Bioethics: Stem Cell Controversy***, which was chaired and organized by Dr. Desmarescaux from France. Discussion point proposed in advance is to find the invisible line to be drawn in stem cell applications to humans, not only from ever progressing technical point of view but also from regulatory, moral and religious points of view.

The news last night told us that the Nobel Prize for the Physiology and Medicine went to Drs. Capecchi, Evans and Smithies who developed the brilliant technique to make knockout mouse using embryonic stem cell, namely, ES cell, which we are going to touch here. Congratulations to them.

Now, ES cell is a representative of pluripotent stem cells which are able to differentiate to any kind of cells. Therefore, the usage of ES cells is variously regulated by the ethical guideline different from nation to nation. For example, in US it is strictly prohibited to use human ES cells if the governmental funds are used, and in Canada a law of criminal prohibition of using ES cells was applied to the lawbreakers. On the other hand, in Japan it is allowed to use human ES cells at the laboratory level. Therefore, the harmonization of the ethical guidelines among different nations is urgently necessary, because the current situation is extremely unhappy and inconvenient for the international collaborative studies. The very first step should be the international communication in scientists. The second step for making consensus will be the public debate based on enough level of general knowledge, because there must be several different opinions on this matter depending upon culture, social background, occupation, race and so on. Presumably, a long time will be needed to reach to the consensus.

In this respect, technically speaking, the progress of the stem cell research reached to the point that embryonic cell-like iPS cells were produced. Since iPS cells are not derived from embryonic cells but from adult somatic cells, there is no ethical regulation to use these cells for repairing the defected tissues or for screening drug candidates. However, since iPS cells have potency to be a human being just like ES cells, a new guideline will be needed. Therefore, even iPS cells can't be avoid the ethical problems.

There are indeed some opponents against applying stem cells for therapeutic purpose to human body. However, since stem cells have extremely potent capacity for repairing the damaged tissues or cells, and for being used as a very good tool for discovery of new drugs, the constant financial support and the encouraging international consensus formation will be urgently necessary.

The topic of the third sub-session was ***New Opportunities opened by Genetically Modified Organisms*** which was chaired by Dr. Fedoroff from US. The proposed discussion points were the knowledge of newest achievements in the area of genetically modified crops, the method for ensuring their safety and the opportunities for the developing nations facing large needs for food procurement.

Domestication of certain animals such as pigs or horses, and breeding of plants such as beans or corns have been performed from some 10,000 years ago. This is called "spontaneous gene modification and selection". In this respect, GMO is the newest and most sophisticated form of breeding based on "specific modification of interested gene". Also, GMO is the new technology introducing into many nations world-wide. The first commercial launch in 1996, today more than 10.6 million farmers in 64 countries grew transgenic crops on over 100 million hectares in 2006.

By the way, many developing countries are currently facing serious challenges related to hunger and poverty. These challenges are particularly difficult for the rural poor, who make up an estimated 80 % of the world's 852 million hungry people. Taken together, and in the context of increasing climatic adversity and decreasing natural resources, these

figures emphasize the urgency with which we must deploy new technologies in the food and feed sector. Biotechnology is the key to helping meet the challenge.

In this respect, GMOs, particularly GM crops, are very much valuable and useful in many ways; for example, to produce much higher yielding crops such as cottons or corns, to produce crops more nutritious, to produce biofuels from cellulose more efficiently, to make bio-based materials including human insulin. Policy makers around the world are beginning to realize the importance of plant biotechnology in economic revival, growth and competitiveness.

Whilst decision making continues to ignore a science-based rationale, threats to food security and health problems will remain in the developing countries, and the brain drain will continue in parts of the industrialized world. Despite of this, there is a growing optimism that GMO is a powerful tool for creating sustainable solutions essential to a better, safer, healthier life for people everywhere.

Finally, we should touch with problematic issues of GMOs. The first point is the high cost of GM crops. This is a serious problem when GM products are exported or transferred to the developing countries. The second point is the safety issue. There is a long history of more than 20 years for the GMOs in US, and there was no adverse event at all. Based on this evidence, a safety of GMOs is scientifically accepted. However, this is not widely well known in the public sector. Indeed, some perfectionists still express skepticism. In order to solve this problem, making an attractive Website is recommended, but much more importantly, political campaign should be reinforced.

I would like to finish here. Thank you very much for your attention.