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Genomic Science for 21st century

Lee, Dae-Sil

Genome Center, Korea Research Institute of Bioscience and Biotechnology, KIST, P.O. Box 115, Yusung, Taejon 305-600, Korea

Since NIH and DOE in United States have launched Human Genome Project in 1990, developed countries have put tremendous efforts on genome analysis. Such strides enabled genome scientists to construct the primary physical map of human genome in 1994, and completed the genome sequencing of 9 microorganisms, including yeast. Scientists could not believe their eyes for the astonishing speed of the genome mapping and sequencing. And they, in turn, begin to realize that genome-based biology is practically being evolved and 21st century's biotechnology and bioindustries shaped out either. In that context, bioscientists are already preparing next step for understanding the biological functions of genome informations, rather than speculating vaguely on life phenomena. On the other hand, genome studies equip biologists with brand new and powerful tools to tackle scientific problems. New scientific developments are products of interdisciplinary approaches associated with life science. Perhaps, current tools and methods for life science could be useless in the near future, because of advents of conceptually new methods and scientific instruments. Suddenly, the word, 'post-genome era' is no longer akward to bioscientists. Evidently, genome study triggered the paradigm of life science to be shifted to interdisciplinary and cooperative manner.

Furthermore, major biotech companies in the world spent 1 billion dollars in 1996 just for the genome research. They have firm determination to grasp all genetic informations and technologies related to industrial applications, particularly genome informations including pathogens and environmental microorganisms, and to shape up the biotechnology industry in 21 century in advance. Such a prepared mind could be interpreted as a sort of survival strategy for adapting to new industrial environments and the change of global ecosystems. Those who are just watching future-oriented developments by genome studies feel empty.

Now, genome scientists are begining to enjoy the results of the functional genome comparison between organisms in terms of functional composition and gene evolution. For example, after comparing pathogen with non-pathogen genomes, additional genetic information which has been identified and assigned which could be responsible to pathogenicity. It provides another ground for understanding the structure-based disease mechanism such as molecular recognition between host- pathogen surface molecules and to find the solution for their eradication, which can be linked to new drug findings. The composition of functional genes in genome can be examined and the functional machineries can be compared between organisms, such as, transporter comparison.

The genome initiative in Korea started with the acitivities of Human Genome Research Association in 1990 by a few scientists. The association was renamed Korea Genome Organization (KOGO) in 1996. It has been known that KOGO's efforts not only provided academic forum for domestic scientists, but also advertised genome research for the public and government recognition. Finally, the Ministry of Science and Technology launched a pilot genome project in 1994 to 1995, and reshaped it into a team project and individual studies in 1996. Initially, the team project was aimed at finding tumor-related genome informations, and individual studies covered genome mapping and sequencing on the studies of human and model organisms, including microorganisms. In plant genome analysis, some efforts were put in genome mapping of rice based on domestic compilation of extensive genetic classification of rice strains, and the accumulated cDNA sequences from rices were transformed into its database and CD database. Also, we recognise the individual efforts in genomic analysis of arabidopsis, chinese cabbage, and red pepper. On the other hand, Korea Research Institute of Bioscience and Biotechnolgy (KRIBB) opened 'Genome Center, KRIBB' to support domestic research ac-

*Corresponding author: Fax +82-42-860-4597

tivities by providing genome-related resources, compiling all genetic informations for nation-wide database, and also generating genome sequences by large-scale sequencing system. Fortunately, some members of National Assembly who understands the significance of the genome project organize a 'Study Group for Supporting Genome Project', and ammended 'Biotechnology Promotion Law' to include genome research, biosafety and bioethics in August, 1997. It ensures that its ammendment greatly promote not only genome researches, but also biotechnology R&D and its industrial applications. In order to run a wide scope of domestic genome studies near future, I believe, its goal should be revised in the light of 'Post Genome Era', and an increase in the investments from public and private sectors is essential to meet the international level of the genomic science.

As you know, presently, the fund for genome study available is too limited to cover all demands for genome research including plant genome study. One possible solution for such demands is the theme to be shifted to function-based genome study, which could narrow down to certain function as a common goal by plant genome scientists here, which include photosynthesis, carbon cycle, sink mechanism, plant defense system, plant diseases, nitrogen fixation, environment adaptation, signal transduction, and so on.

Finally, the most important requirement for success of genome study in Korea is the unquestionably positive participation and determination by scientists for shaping up science in 21st century. Perhaps, scientists today should contribute themselves for build-up of genetic informations and genetic tools for tomorrow.

LITERATURE CITED

Mewes, H.W., K. Albermann, M. bahr, D. Frishman, A. Gleissner, J. Hani, K. Heumann, K. Kleine, A. Maierl, S.G. Oliver, F. Pfeiffer and A. Zollner. 1997. Overview of the yeast genome. *Nature* **387**: 7-65.

Clayton, R.A., O. White, K.A. Ketchum and J.C. Venter. 1997. The first genome from the third domain of life. *Nature* **387**: 459-462.