

Session summary

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Session title: **FUTURE GENERATION DEVELOPMENTS: WHAT'S NEXT FOR THE GENOME?**

Problem

Since identifying the sequence of the human genome a decade ago, medical advances in the diagnosis and treatment of diseases, have long been promised. But moving from basic science to the doctor's office is not without difficulty and expense.

Session Highlights

Select assertions and opinions

- Reading the genome can become the book of human behavior and treating diseases, leading to personalized medicine and changing the healthcare systems in future.
- Progress over the last 10 years has not been as significant as expected, but near future developments could lead to the advancement of the application.
- Already in the nearest future the cost of sequencing of DNA could reach the level of thousands of dollars, not billions.
- A secure storage of genetic information and legal and ethical issues related to usage of personal information are key policy issues.
- In the future genome-based cancer treatments, diagnostics and determination of treatment can all lead to substantial cost-savings in the healthcare systems.

Select quotes

“Currently we are not in business of wellness, we are in business of sickness — we cure diseases when we discover them. Early detection of diseases, individualised medicine, personalized care is a world of wellness.” — Steven Burrill

“Researchers say that most of prescriptions currently do not work for patients. This is a ‘waste in the system’, which will be avoided with genetic engineering.” — Steven Burrill

“Innovation brings risks and often there is a ‘stigma of failure’, however best cultures accept risks and rewards and tolerate failures. Failure is a basis for building a success in the future.” — Steven Burrill

“Revolution in the biomedical industry creates opportunities. Innovation in this industry is a very good place to be.” — Evgeny Zaitsev

“We are on a verge of very interesting time in healthcare because of nanotech.” — Omid Farkhozad

Moderator

Geoffrey Carr, Science and Technology Editor, The Economist

Panelists

Steven Burrill, CEO, Burrill & Company

Dr. Omid Farokhzad, Associate Professor of Anesthesia, Harvard Medical School

Konstantin Severinov, Professor, Molecular Biology and Biochemistry, Waksman Institute of Microbiology, Rutgers, the State University of New Jersey

Konstantin Skryabin, Director, Bioengineering Center, Academician of the Russian Academy of Sciences

Maxim Uvarov, General Director, Binnopharm CJSC

Evgeny Zaytsev, General Partner, Helix Ventures

Vladimir Vidro, vice-president Geometrica

Synopsis

During the discussion, it was stressed that the human genome was decoded 10 years ago and that, since then, there have been achievements in development of technologies and, to a lesser degree, in science itself. Genome sequencing (determining the sequence of DNA proteins) provided a sort of “book of human behavior and disease” that modern scientists are only just learning to read.

Progress has not been as great as anticipated (possibly because the expectations themselves were too great), but a breakthroughs and the further development of technologies is possible. The cost of decoding the genome is going down fast and, in the near future, might cost only a few thousand dollars.

The participants in the discussion stressed the need to meet the next challenges in development genetic engineering: first to all, addressing legal and ethical problems might arise in connection with use of personal (genetic) information by insurance, medical and other institutions; second, there is the problem of storing the data – creating databases for information storage. In this respect, the participants stressed that much larger databases than currently exist would be needed to store information containing the decoded genome of populations.

The participants noted repeatedly that genetic engineering is currently in the development stages, with scientists learning to “read” the human genome and that further advances in this direction would require co-operation between all countries involved in the practice. It was further expressed that there are two possible development paths in this sphere: creation of major genome centres or development of a large number of small independent companies.

The participants in the discussion expressed the hope that, in the near future, it would become possible to decode every individual’s genome and develop personalized medicine, and that this would, in turn, change the healthcare system. The participants in the discussion agreed that genetic engineering would raise diagnosis and disease prevention to a new and higher level. As for treatment, an understanding of the human molecular structure will allow molecular treatment methods to be used. In the future, new medical technologies will provide for more precise diagnosis (sometimes even changing the very definition of the disease) and a choice of treatment that saves enormously on expenditures. The greatest achievement in genetic engineering at the moment is in the study and treatment of cancer.

It was also stated that development of medicine and the healthcare system in many countries has made it possible to prolong life expectancy and that this, in turn, has raise the GDP in these countries. Emergence of opportunities to diagnose disease in the early stages and identify a person’s potential for a disease also has a positive effect on both the healthcare system and the economic development of countries.

It was noted that nano-technologies are already impacting medicine (in particular, drug manufacturing) and that, in time, this effect will only increase.

During the discussion, Steven Burrill noted that the world confronts a number of major challenges - global warming, availability of clean water, use of energy resources, production of foodstuffs, and affordable, effective healthcare system. Development of genetic engineering might influence the solutions to all of these problems. The results of research into genetic

engineering may be applied not only in medicine, but also in agriculture (growing new crops) and development of energy-saving technologies.

The question was raised during the discussion of project finance. This is a very pressing one, since both government and private funds must be raised. It is also vital to optimize capital in order to distribute available funds to the projects with the greatest potential. In Russia, the system of venture financing for such projects is only just developing.

During the discussion, it was also noted that the state should play the leading role in developing genetic engineering. On the one hand, it should support and finance genetic engineering programmes. On the other hand, the state should be the mechanism that regulates development of research in this sphere (even going as far as halting it, if necessary, for legal and ethical reasons).

Key words: sequencing, genome, gene engineering

Recommended reading for

Employees of research institutes, healthcare system employees, venture capital specialists.

Disclosures

The views expressed are those of certain participants in the discussion and do not necessarily reflect the views of all participants or of the St. Petersburg International Economic Forum.

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