

FOCAL POINT ON GENOMIC MEDICINE IN KOREA

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STARTUPS AND BIG DATA SET TO FUEL GENOMIC MEDICINE IN KOREA

Genomic medicine is taking off in South Korea in a big way, **THANKS IN LARGE PART TO INNOVATIVE STARTUPS AND SYSTEMS** for collecting and analysing big data

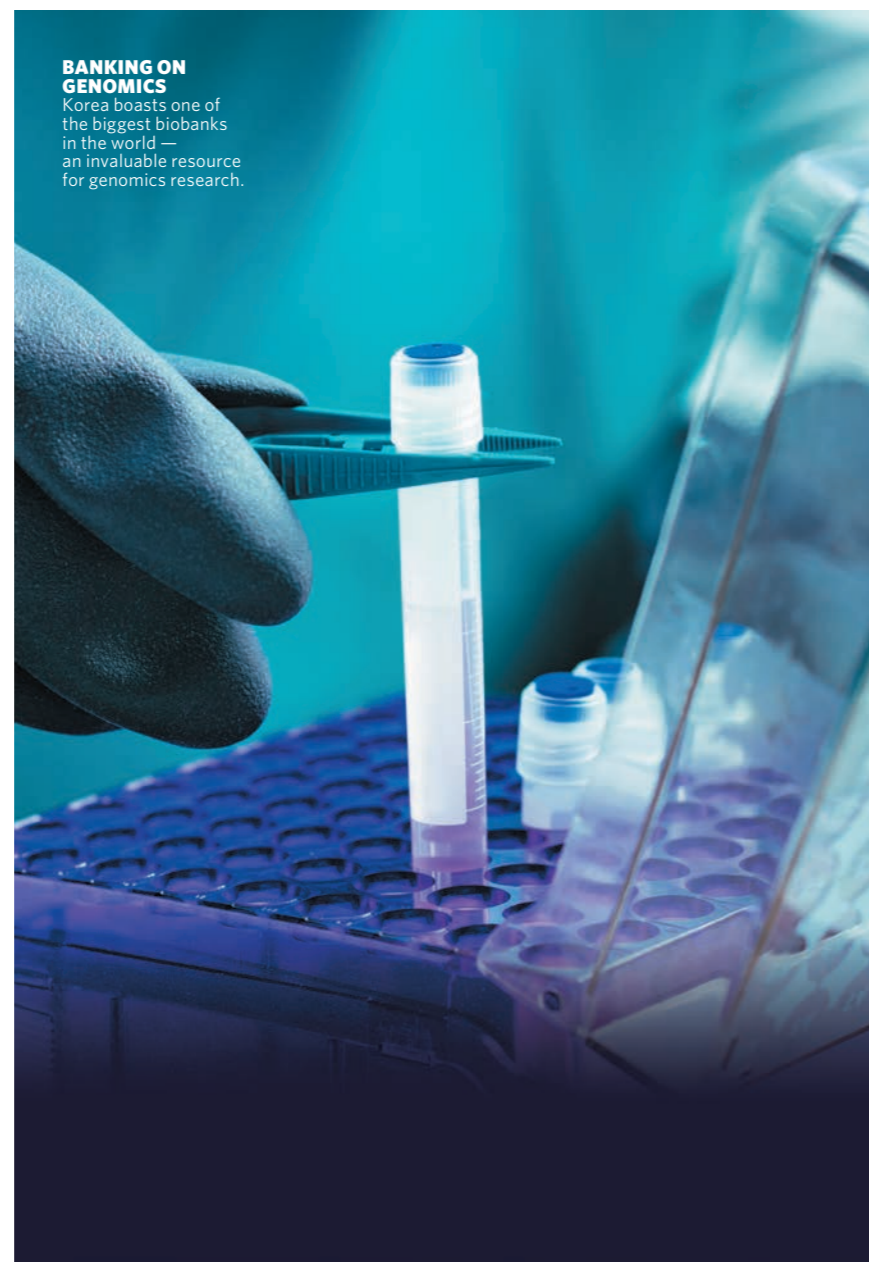
About 12 years since the first whole-genome sequencing of a Korean individual, South Korea is well placed to play a key role in advancing genomic medicine, which is poised to transform medical diagnosis and treatment.

DIVERSIFICATION BENEFITS ALL

Traditionally, genetic studies have been conducted on populations with a predominately European genetic heritage. That situation is rapidly changing, driven by the increasing availability and lower cost of sequencing technologies. The world is witnessing a democratization of genomic data, and South Korea is keen to take full advantage of this.

“As the size of genomic data grows, the amount of data on non-Europeans is getting larger, which will lead to more discoveries,” says Jong-Il Kim, director of the Genomic Medicine Institute and a professor at the Seoul National University College of Medicine. “Newly identified gene variants will help us understand the mechanisms of complex diseases and find relevant treatments.”

Kim stresses that this will not just benefit Koreans — it also promises to advance knowledge and, ultimately, treatments for all. He specializes in the genetics of rare diseases, and one criticism he sometimes encounters is that only a very small proportion of people stand to benefit from advances in this area. He counters this objection by citing the example of *PCSK9*, a gene that codes for a protein that regulates cholesterol levels in the bloodstream. “Very few people have mutations in



BANKING ON GENOMICS
Korea boasts one of the biggest biobanks in the world — an invaluable resource for genomics research.

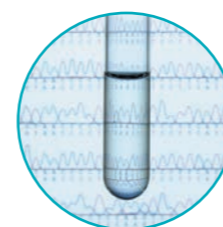
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A 2021 study found that South Korea was the only one of seven Asian jurisdictions that has adopted **LEGISLATION TO PREVENT GENETIC DISCRIMINATION.**



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Of the 1,000 healthy Korean volunteers who participated in **THE WELFARE GENOME PROJECT**, 91% said the free genetic checkups and reports motivated them to improve their health.



the *PCSK9* gene, but genomic data revealed it plays a key role in regulating cholesterol.” This has resulted in drugs being developed that block the *PCSK9* protein, which can help everyone, not just those with the rare variant.

Similarly, greater ethnic diversity in genomic data can benefit everyone. “The reason we’re interested in Asian-specific variations is not just because they’re important for Asians, but also because it offers a chance to find new variations that are important to everyone,” says Kim. “It gives us a wider window into the biology.”

SOME CHALLENGES

One challenge South Korea faces is educating healthcare providers about the latest advances in genomic medicine. “Due to the rapid advances, we lack enough up-to-date clinical genetic services in Korea,” says Kyong Soo Park, a professor at Seoul National University, who studies the genetics behind type 2 diabetes, a disease that has different characteristics in South Korea than in Western countries (for example, a higher proportion of non-obese people in South Korea have diabetes than Western countries). “Most clinicians are struggling to keep abreast with advances in genomic medicine.”

Another challenge is that the country lacks big pharmaceutical companies. “In many countries, genomic medicine is being advanced by three parties: government health agencies like the National Institutes of Health, big pharma and venture companies,” says Kim. “But we don’t have big pharma — that’s our weakness.” But what Korea lacks in big biomedical companies, it makes up for in the nimbleness, raw enthusiasm and fresh vision that startups bring. “I’m convinced new startups in Korea will make a big contribution to the future of genomic medicine,” predicts Kim.

HARNESSING BIG DATA

In addition to biomedical startups, South Korea has two other major advantages: a strong universal healthcare system and excellent infrastructure and expertise in the

areas of information technology and artificial intelligence. “One of Korea’s strengths is its prowess in information technology,” says Park. These strengths are critical for acquiring and analysing genomic data. “We have one of the best healthcare information systems in OECD countries,” says Park. “Most of our hospitals use electronic health records, and we have extensive infrastructure for gathering and harmonizing health data.”

The country boasts one of the biggest biobanks in the world: the National Biobank of Korea. In addition, the National Project of Bio Big Data is a nearly US\$900 million project that will establish a national digital library of genomic and health data by 2028.

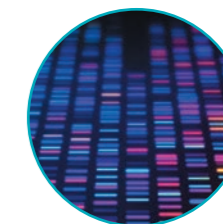
The National Project of Bio Big Data grew out of a smaller project — the Ulsan 10,000 Genome Project, which reached its target of sequencing the whole genomes of 10,000 people in May 2021. Unusually, this project started at the local-government level in the city of Ulsan. Kim notes that it can be very difficult to persuade the national government to commit to big-data projects, but the smaller scale of the Ulsan project made it much easier to garner support. “What makes the Ulsan genome project important is that researchers were able to persuade the citizens and local politicians of Ulsan,” says Kim. “That’s important because the voluntary participation of citizens is vital for this type of project.” The success of the Ulsan project played a big part in persuading government officials and politicians to back a national project.

A FASCINATING FUTURE

Big data will fuel the future development of genomic medicine in Korea, Kim predicts. “The large-scale accumulation of genomic data and associated clinical data will accelerate, extending to patients with different diseases and ethnicities. The target is moving from cancer and rare diseases to more complex diseases. It’s exciting and we’re witnessing rapid progress in technologies, which will be used more widely by researchers and clinicians. We’re looking at a fascinating future.” ■

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The Korea Biobank Network has biospecimens from **MORE THAN 820,000 INDIVIDUALS.**



Jong-Il Kim,
director of
THE GENOMIC MEDICINE INSTITUTE

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