



Rapid whole genome analysis technology which is possible to respond to mutated and similar animal viruses

Possible to respond to variant and similar animal viruses
Rapid full-length genome analysis technology

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Patent title Human beta-Corona virus universal primer set for whole genome amplification and diagnostic kit using same

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Authority status Unpublicized

Technicality

Technology overview

- This technology is a technology which can obtain whole genomes at a high speed without separate culture in clinical samples. Through a phylogenetic analysis of a Corona virus genome, the nucleotide sequences of amplified bodies obtained using a primer set universally applicable to human Corona viruses and similar viruses are analyzed. Thus, whole genomes can be obtained rapidly from clinical samples.

Development background and problem to be solved

- As a result of comparing a gene and an amino acid sequence between a domestic isolate and a foreign virus to identify the characteristics of the domestic MERS Corona virus, it has been confirmed that there was no mutation in the E gene and there were some mutations in the S gene. However, it is difficult to determine the association between virus pathogenicity or human infection only by a mutation analysis at the genetic level.
- For the analysis of the characteristics of gene regions known to be important for viral infection transmission and pathogenicity, in experiments such as virus self-replication and infectivity analysis utilizing sensitive cells, and pathogenicity analysis experiments using animal models, the need for the multifaceted analyses of biological characteristics and R&D is emerging.

Excellence and discrimination of technology

Excellence of technology

- A viral genome is specifically amplified by utilizing a primer panel specific to the viral genome, and thus viral genome information can be efficiently obtained directly in clinical samples.
- A primer panel is produced on the basis of a systematically conserved nucleotide sequence, and thus is expected to be able to respond to new mutated and similar animal viruses.
- The technology can be used for a primer panel for high speed identification of Corona viruses and genome analysis services using the same.

Discrimination of technology

- Virus propagation using culture or the like is not needed, and thus there is an advantage in terms of cell culture costs and time.
- Since the base sequence analysis of an amplified body using a primer panel can be directly applied to an existing base sequence analysis method, no additional cost or action is required for a genome base sequence analysis.
- The technology can be provided as a product in the form of a primer panel. A primer panel, due to the characteristics thereof, occupies a very small proportion compared to the entire genome sequence analysis costs, and thus can have sufficient price competitiveness.



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Implementation method

- One or more normal and reverse primer sets complementary to a Corona virus full genome are produced. RNA is separated from a sample. A reverse transcription reaction is performed by using the separated RNA. A polymerase chain reaction is performed by adding one or more primer sets to the sample on which the reverse transcription reaction has been performed. Then, the sequence of an amplified product is analyzed using a next generation base sequence (NGS).

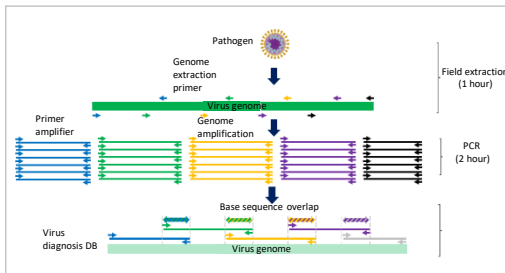


Figure 1 Conceptual diagram of virus whole genome analysis

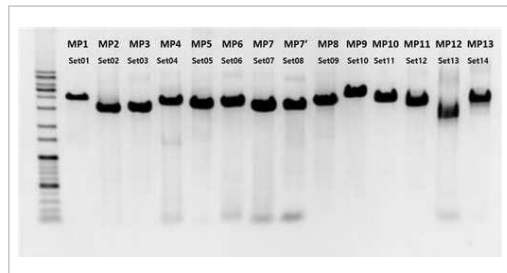


Figure 2 Whole genome mapping with respect to primer set

Degree of technology completion (TRL)

Degree of technology completion: TRL6 (Full Scale prototype development)

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Technical principle presentation	Technology concept setting	Technology concept verification	Lab Scale prototype development	Implementation environment application experiment	Full Scale prototype development	Quasi-commercial product development	Commercial product development	Commercial product implementation

Utilization

Utilization field and applied product

Utilization field

- Novel virus diagnosis platform
- Virus genome analysis service



Figure 1 Genome analysis

<Data: Electronic Times>

Applied product

- Genome analysis
- Genome diagnosis



Figure 2 Genome diagnosis

<Data: JoongAng Ilbo>



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Technology trend

- As the price of a genome analysis technology continues to decline due to competition among related companies, it is expected that it will be possible to decipher the entire genome base sequence of a person at a cost lower than \$10, not \$100 genome.
- With the recent increase in medical costs, the expansion of a new genome analysis technology, and the increase in diseases due to the aging population, the popularization of the genome analysis service has been accelerated, and R&D and application activities of genome researchers and companies are expected to increase.
- If whole-genome sequencing (WGS) is expanded, it is expected that it will be possible not only to analyze multiple genes simultaneously after genome decoding, but also to diagnose diseases of unknown causes.
- By establishing a cooperative system to integrate the sequencing system of a Philips' IntelliSpace Genomics clinical information science platform and an Illumina's gene mutation and functional analysis technology, it is planned to develop an oncology-based precision medical platform. Likewise, major players in the genome market seek to promote innovative technology development through strategic alliances.

Family patent status

Application nation	Application No. (Application date) / Registration No.	Title of the invention
KOR	KR 10-2020-0057804 (2020.05.14)	Human beta-Corona virus universal primer set for whole genome amplification and diagnostic kit using same

Market prospect

Target market size and prospect

- The global genome market is expected to reach USD 26.96 billion in 2023, growing at a CAGR of 10.6% from USD 14.7 billion in 2017.
- In the technology-specific genome market, the PCR technology occupies the largest share with USD 10.62 billion in 2023. However, the sequencing technology is expected to grow the fastest by 2023 at a CAGR of 18.3% due to technological advances, reduced analysis costs, increased demands for analysis equipment, and wide-ranging applications such as cancer disease-related tests.

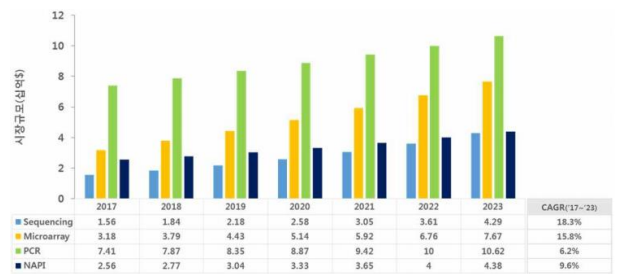
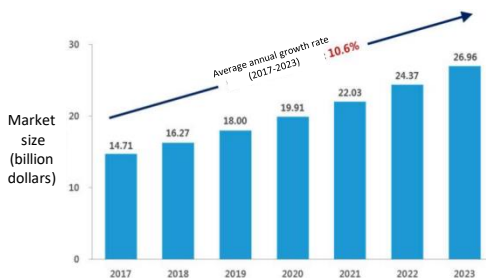


Table Global market trends related to the genome market [billion dollars]

<Data: In Vitro Diagnostics/IVD Market, MARKETSSANDMARKETS, 2018>

Technology transfer query

Technology transfer process

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Explore promising technologies → Contract consultation → Apply for technology transfer → Negotiate and sign contracts → Follow-up support