

Blockchain based Molecular Healthcare Platform



White Paper v1.0

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Executive Summary



CDBIO is a medical foundation based in the Republic of Seychelles that provides molecular-medical/healthcare services based on advanced molecular physics.

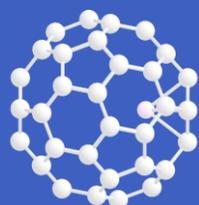
The world's first commercial research co-worker, Yasama Yasuhiko (Yasama), the CEO of Idea International, is working at the Tohoku Univ Research and Analytical Center for Giant Molecular Studies, currently CTO of the CDBIO Foundation.

Molecular sensors using lithium-resistant fullerene are extremely high-precision technologies that allow one electron to flow per molecule and can diagnose diseases and monitor health conditions according to medication effects. Based on this, it is a future advanced medical technology that enables customized prescriptions and treatments optimized for patient characteristics.

Based on this technology, CDBIO is working on the Molecular Medical & Healthcare Platform to create the world's only blockchain healthcare ecosystem that combines the expertise of global molecular physics and electrochemical scholars with the collective intelligence of professional medical communities and patient communities.

Based on this molecular-medical/healthcare platform, we want to help overcome diseases by early diagnosis of all diseases and providing optimized personalized medical services to individual patients, and further contribute to human health and prolongation through disease prevention and systematic health care.





1

Prologue

1. Shifts in the Healthcare Market
2. The Necessity of Healthcare Blockchain

Paradigm Shift

Shifts in the Healthcare Market

01

For a long time, traditional medical paradigms have been defined as technical medicine, empirical diagnosis and treatment, disease classification by long-term location, uniform treatment, and post-disease diagnosis and treatment. However, this medical paradigm is facing a new change amid an unprecedented crisis caused by the global pandemic of the new strain of the Coronavirus-19, first reported in Wuhan, Hubei Province, China, in November 2019. This new trend of change is preventive medicine, non-face-to-face care, big data-based healthcare, and patient personalization.

If medical care has been focused on treatment so far, preventive care is now attracting attention in all areas of healthcare. As medical expenses increase due to the aging population and the increase in chronic diseases, the importance of simple and efficient diagnosis and prevention devices is emerging.

In the past, diseases called non-communicable chronic diseases, degenerative diseases, and otolary diseases are unified in the academic term "complex disease," because the causes of the disease are diverse and complex. The pattern of disease during the 21st century is expected to be this "era of complex diseases." Complex diseases go through irreversible processes once they occur, so even if they are treated, it is difficult to return to their original state, and effective treatment methods are still insufficient. Therefore, preventive medical care is the most required in the current era when people are directly experiencing COVID-19 through early treatment or prevention of outbreaks by early detection.



Prevention



Untact



Big Data



Personalized

Paradigm Shift

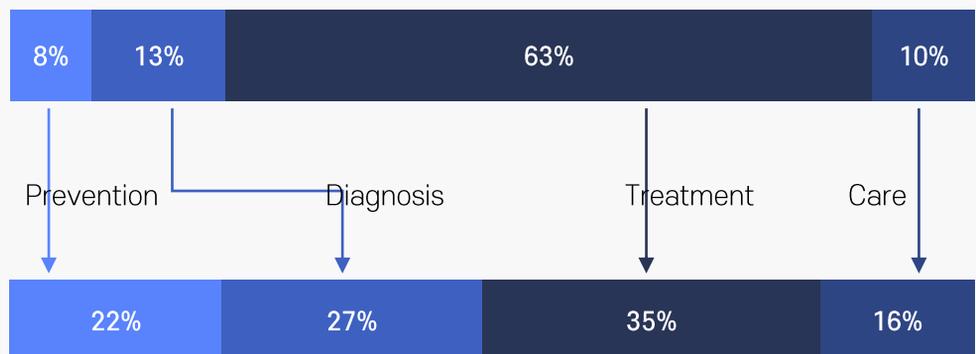
Shifts in the Healthcare Market

01

Among the changes in the medical paradigm caused by COVID-19, another big trend we are experiencing directly is non-face-to-face treatment services. With the COVID-19 incident, non-face-to-face medical care is showing effective results in protecting the safety of patients. Elderly patients aged 60 or older, high blood pressure and diabetes patients, who are forced to lose medical access due to COVID-19, were able to receive treatment through non-face-to-face treatment services, and it has also helped medical staff safety.

Accordingly, governments are promoting IoT and AI-based integrated medical platform projects such as providing mobile healthcare and distributing wearables to patients with mild chronic diseases and presenting non-face-to-face medical service strategies as post-COVID-19 medical policies optimized for the post-COVID-19 era.

As major countries around the world, except for some developing countries, enter an era of super-aging and low birth rates, the burden of elderly support, including medical expenses, is increasing rapidly in the mid to long term. In addition, the direction of macroeconomic and socioeconomic changes is also changing, such as changes in the population structure, low growth due to a decrease in the production population, and changes in the production/labor environment due to the 4th Industrial Revolution and the advent of artificial intelligence.



(출처: Ministry of SMEs, Technology Roadmap 2022-2024)

Paradigm Shift

Shifts in the Healthcare Market

01

In this environment, the standardized evidence-based medicine paradigm is changing as well. It is transforming into personalized medicine that provides customized treatment and medication guidance by proactively recognizing environments with different characteristics, genetic factors, disease history, and health lifestyle, as well as precision medicine that introduces molecular profiling technology into clinical pathology.

In particular, the shift to preventive and early management-oriented healthcare system is being driven around digital technology with 4P strategies of prevention, predictive, participation, and personalized, expanding the field of healthcare. In addition, by differentiating and linking traditional medical business models by process, new medical markets such as Point of Care, telemedicine and pharmacies, precision medical and diagnosis, and health care for prevention are being created.

Representatively, in the field of precision medical care and diagnosis, various medical services using artificial intelligence technologies such as global SW companies, telecommunication industries, and start-ups are being introduced. Regarding data, technologies that standardize, link, and de-identify various data have been under discussion and development since 2017 through the Health and Medical Big Data Promotion Team, which encompasses government departments, public institutions, related academia, medical circles, and experts.

However, the lack of medical staff is increasing the burden of reading the medical staff compared to the spread of precision medical devices and the number of tests, so it is necessary to prepare measures for standard quality management of medical services. In each diagnostic area, the number of highly skilled specialists is always insufficient compared to demand, and there is also a limit to not being able to respond to demands such as islands or mountains in space, and late at night or weekends in time.

In this situation, evidence-driven medicine based on individual cases is being transformed into data-based medicine that is integrated.

By learning a large amount of reading data into an artificial intelligence model, it supports consistent and accurate medical judgment by medical staff and provides medical diagnosis services without time and space constraints with a miniaturized mobile medical device to maximize patient convenience and treatment efficiency.

Ultra-precise diagnostic technology and big data-based precision medicine, which can create value from a large amount of medical data through it, are becoming the centerpiece of the next-generation medical paradigm.

Paradigm Shift

Shifts in the Healthcare Market

01

The end point of the change in the medical paradigm, which is shifting to non-face-to-face preventive medicine and data-based precision medicine, is ultra-personalized customized medical services optimized for individual patients.

The advancement of precision medicine through medical big data, including understanding disease mechanisms and early diagnosis and treatment based on them, classification by molecular biological causes, and assessment of relative disease risk, has greatly improved the accuracy and effectiveness of personalized medical services.

Personalized precision medical technology through multiple omix analysis, which has recently attracted attention, is also making great progress. Omics refers to the field of biology based on a holistic conceptual dataset that encompasses biological materials such as individual genes, transcripts, proteins, and metabolites. The emergence of omics stems from the development of Next-Generation Sequencing (NGS) or Massively-parallel sequencing, and the probability of developing individual diseases and the effectiveness of drugs can be predicted in advance through genetic analysis.

Molecular diagnostic technology has recently emerged among personalized precision medical technologies through multiple omix analysis. Molecular diagnosis is a method of testing genes (DNA, RNA) containing genetic information of infectious substances (bacteria, viruses) or causative substances (proteins) by applying techniques and methods such as molecular biology and molecular physiochemistry from samples derived from the human body.

With various methods of molecular diagnostics currently being developed around the world, the most notable technology recently is Liquid Biopsy.



Paradigm Shift

Shifts in the Healthcare Market

01

Liquid biopsy technology was developed for cancer diagnosis and treatment monitoring through sample pretreatment (separation, purification, concentration) and extraction of DNA or exosomes from liquids such as blood, and then genetic information-based amplification.

The development of liquid biopsy technology has reduced the pain, cost, and time-consuming inconvenience of patients compared to conventional tissue biopsy, but liquid biopsy also requires examination and analysis by professional medical staff and requires advanced accuracy and precision. In response to this demand, the next-generation precision medical technology developed by the CDBIO Foundation based on molecular physics and electrochemical technology is a molecular diagnostic technology using lithium-resistant fullerene. Molecular sensors using lithium-resistant fullerene can now check the presence/absence of diseases and health status of individual patients in real time.

Recently, the Institute for Health and Social Affairs predicted that the life expectancy of Koreans will rise to the top in the world in 2030 with 90.8 years for women and 84.1 years for men. However, nine out of 10 elderly people have chronic diseases, and unlike life expectancy, the actual gap in health life expectancy is about nine years.

In the past, treatment methods were intuitive based on symptoms, but now, the accuracy and effectiveness of treatment methods are expected to be greatly improved through the development of personalized precision medicine such as omix analysis and molecular diagnosis technology, which is expected to greatly reduce the gap between life expectancy and health life.

Blockchain Based
Molecular Healthcare Platform



The Needs of Blockchain in Healthcare

The Necessity of Healthcare Blockchain



With the development of advanced technology, the need and importance of "blockchain" is emerging as the paradigm of medical care gradually shifts to patient personalized medical services through preventive medicine and non-face-to-face treatment and big data-based precision medicine.

In particular, with the development of precision medical technologies such as molecular diagnosis, a large amount of electronic medical records (EMRs) and electronic health records (EHRs) such as diagnostic records and treatment records are being generated every day. In addition, health-related mobile apps via smartphones and personal health data (PGHD) generated by various wearable devices are increasing day by day.

Although a huge amount of health-related data, ranging from molecular diagnostic precision medical data to dry-use information, has been difficult to access while systematically managing and safely sharing sensitive medical data.

In order to further advance ultra-precise medical technology based on medical big data and provide more optimized medical services to individuals, the most important thing is to be able to safely manage accurate medical data and freely exchange medical information based on mutual trust. It can only maximize its value if hospitals, related industries and government agencies, as well as the medical community struggling with disease, and from pharmaceutical companies developing treatments to precision medical device manufacturers. If wrong medical information is distributed indiscriminately, it will only damage all of us, including patients who provided it and companies that develop treatments and medical technologies.

This is why the necessity and importance of blockchain are emerging in the medical industry, and it is also the reason why many types of blockchain related to medical care are emerging recently.

It is essential to establish a medical blockchain ecosystem that protects personal information by preventing individuals from identifying sensitive and important medical data through DID (Decentralized Identifier) and ensures consistency and transparency of data. In addition, ecosystem scalability and transaction speed must be ensured to enable efficient operation in the age of complexity and complexity, and a fair compensation system for data delivery must be applied.

However, the most important thing is the accuracy and precision of the original data itself. CDBIO's molecular-medical/healthcare blockchain based on ultra-precision molecular diagnostic technology presents the direction of post-COVID-19 era and future medical care.

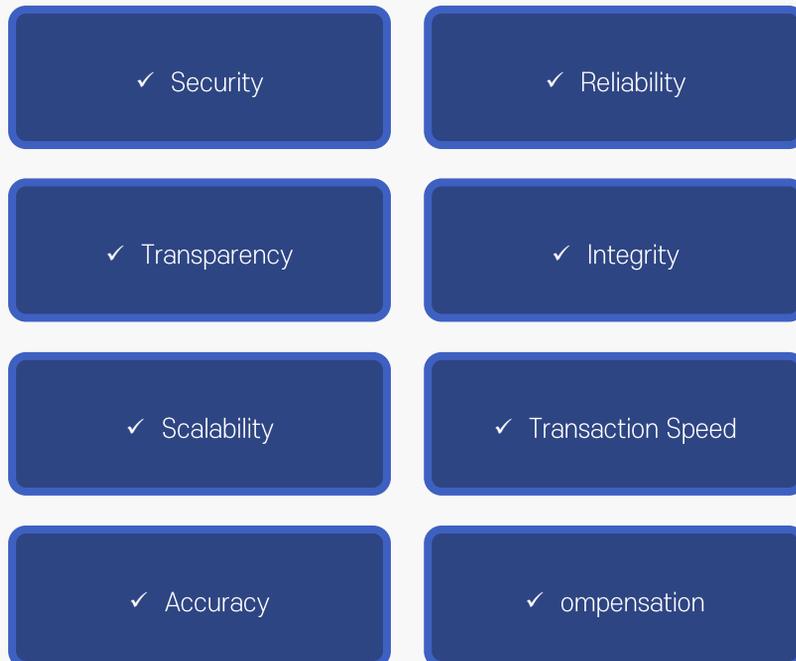
The Needs of Blockchain in Healthcare

The Necessity of Healthcare Blockchain



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Molecular

3. Fullerene Containing Lithium
4. History of Molecular Tech Development
5. Patent Status
6. Biopsy through Breathing
7. Molecule Bio Data
8. Molecule Bio Code

Li⁺@C₆₀ Lithium endohedral fullerene

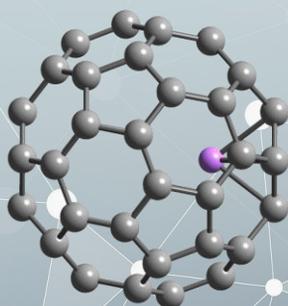
Fullerene Containing Lithium

03

The core technology of the molecular-medical/healthcare platform presented by the CDBIO Foundation is molecular sensor technology using lithium-resistant fullerene. Dr. Yasuhiko Kasama, a co-worker of Tohoku University and CEO of Idea International, is the first to emerge as a co-prosperity material and become a successful carbon pooler in international research.

Lithium-resistant fullerene has the lowest energy level of any substance ever developed or discovered. Energy levels are the energy values of quantized states in which electrons formed in quantum mechanics, such as atoms, molecules, or solid materials, can exist.

Lithium-resistant fullerene also has electrochemical properties and is a state-of-the-art diagnostic sensor combining molecular-physics and electrochemistry that can utilize these properties to diagnose disease-causing substances in molecular units.



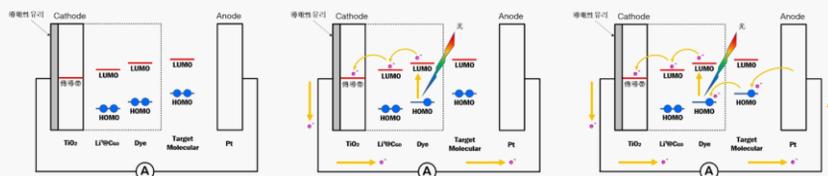
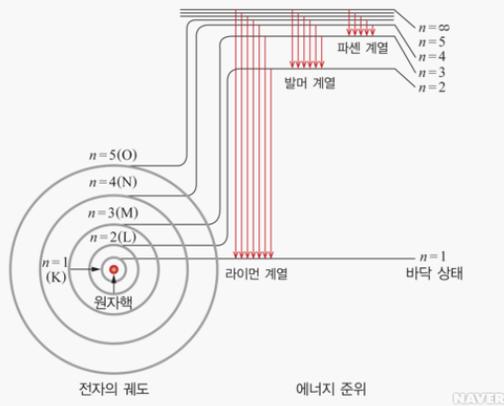
Li⁺@C₆₀ Lithium endohedral fullerene Fullerene Containing Lithium

03

Molecular sensors using lithium-resistant fullerenes can measure the energy level of disease-causing substances generated by diseases to check the occurrence and progress of diseases.

When applying typical lung cancer cases among diseases that are difficult to diagnose early, energy levels such as target cancer, dye, and Li⁺@C₆₀ are set to prevent electrons from moving from anode to cathode in the initial state. Here, when the light energy is irradiated to the dye, the electrons in the homo of the dye are excited to the lumo, and the electrons in the lumo of the dye move through the lumo of Li⁺@C₆₀ to the TiO₂ cathodes. On the other hand, electrons present in the homo of the lung cancer material move to the hole generated in the homo of the dye, and the electron is supplied from the Pt anode to form the current closed circuit.

By measuring the current flowing, the presence of lung cancer is detected on a molecular basis. Since one electron flows per molecule of lung cancer, it is an advanced diagnostic technology that can monitor not only the initial lung cancer but also the sensitivity of lung cancer according to provide patient-specific prescriptions and treatments.



Molecular Technology R&D Milestone

History of Molecular Tech Development



2006	<ul style="list-style-type: none"> • Dr. Kwon Eun-sang developed a lithium-resistant fullerene at the University of Tohoku, Japan, and registered a new substance
2009	<ul style="list-style-type: none"> • Success in commercialization
2017	<ul style="list-style-type: none"> • Development of molecular sensor
2018	<ul style="list-style-type: none"> • Development of sensor electrodes • Development of primary prototype of lung cancer diagnostic system with molecular sensors in Korea • Participation in exhibition in Tokyo Bigsight, Japan Tokyo
2019	<ul style="list-style-type: none"> • Patent application including lung cancer diagnosis system • The 2nd Prototype Development of Lung Cancer Diagnosis System
2021	<ul style="list-style-type: none"> • Upgrade of lung cancer sensor and establishment of Li⁺@C60 production system
2022~	<ul style="list-style-type: none"> • CDBIO Foundation established • Completed development of lung cancer diagnosis system and scheduled clinical trials • Completion of mass production system and SW development will be completed • Development of Blockchain-Based Molecular Healthcare Platform

Patent Overview

Patent Status

05

The CDBIO Foundation currently owns patents for four key patents, including molecular sensors and lung cancer sensors that utilize the characteristics of 'lithium-resistant fullerene (Li@@C60). Among them, <Molecular Sensor> patent, an ultra-precise technology that detects the presence, type, and the amount of substances to be detected on a molecular basis, is being applied for an international (PCT) patent.

In addition, two designs and two trademarks are registered, and six patents are being applied, including data generated from portable cancer diagnosis devices under the cancer diagnosis sensor and diagnostic solutions using artificial intelligence.

In addition, number of patents for cancer diagnosis and treatment using the characteristics of lithium-resistant fullerene (LiL@C60) will be filed, and AI-based blockchain platform patents will be applied to customize medical (diagnosis, treatment) and healthcare services optimized for patients (customers).

Patent Application Number	Patent Name	Patent Detail
10-2019-0104071	Arm Sensors Using Energy Levels	Sensors designed using the energy level of redox potential so that electrons can travel through electrons donated from memorizing substances (caused by cancer)
10-2019-0104073	Portable Cancer Diagnostic Device Using Energy Level	Accurately diagnosed with accuracy above the PPT I evel using energy levels of redox potentials such as Li@C60, pigments, and electrodes. Can detect any t ype of cancer
10-2019-0104074	Portable Cancer Diagnostic System Using Smartphones	Portable cancer diagnosis system to detect cancer using smartphone
10-2019-0104075	A Portable Lung Cancer Diagnostic Device Using Ventilation	A lung cancer sensor that detects the occurrence and progression of lung cancer by detecting substances contained in exhalation
10-2019-0104078	Cancer Diagnosis System Using Big Data and Artificial Intelligence	A system that provides information on the occurrence of cancer, the type of cancer, and the progression of cancer by analyzing cancer screening data using artificial intelligence
10-2018-0117028	Exhalation Collecting Device for Cancer Diagnosis	Exhalation Collecting Device Capable of Diagnosing Cancer by Collecting Material Contained in Air

Patent Overview

Patent Status

05



Molecular Sensor



Lung cancer sensor using exhalation



Cancer Diagnostic System Using Energy Levels



Portable Lung Cancer Diagnostic System Using Smartphones

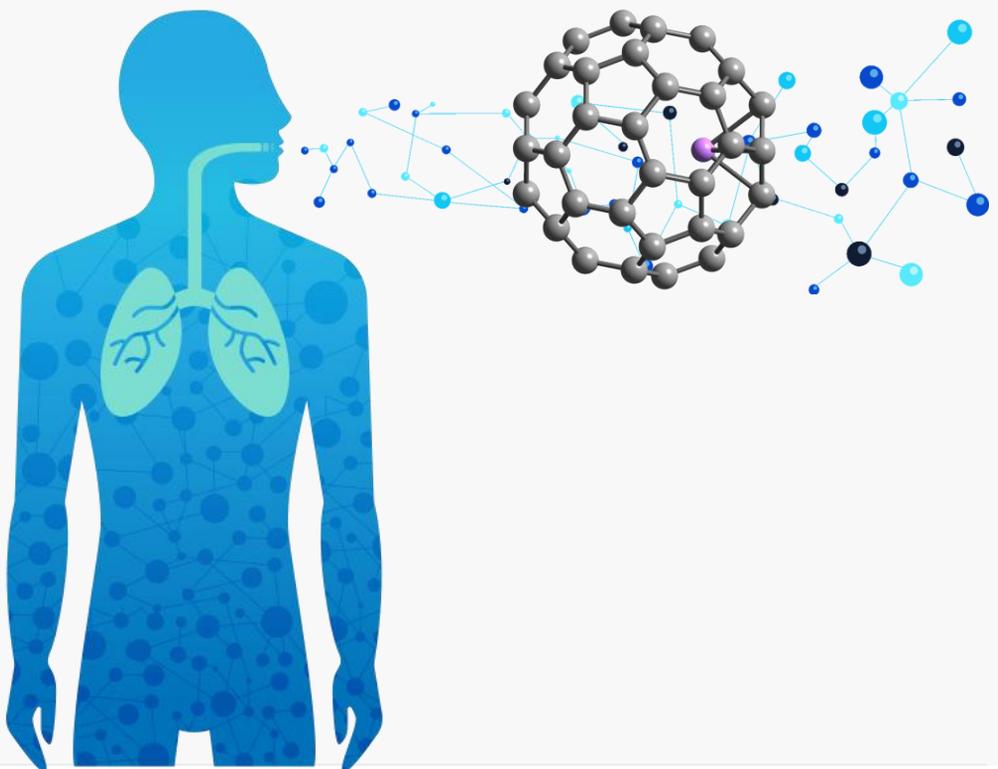
Molecular Technology R&D Milestone

Biopsy through Breathing

06

Human respiration contains more than 1,000 different Volatile Organic Compounds (VOCs), which occur in endogenous metabolism or exogenous sources such as dietary, environmental, and microbial communities.

Liquid biopsy, one of the molecular diagnostic technologies, requires a process such as body blood or saliva collection, but VOCs are safer and more convenient molecular diagnostic technologies because they can be diagnosed with just one breath. Advanced diagnostic technology with molecular physics also eliminates the need for expensive precision measuring instruments and data analysts, enabling diagnosis without time and place constraints.



Molecular Technology R&D Milestone

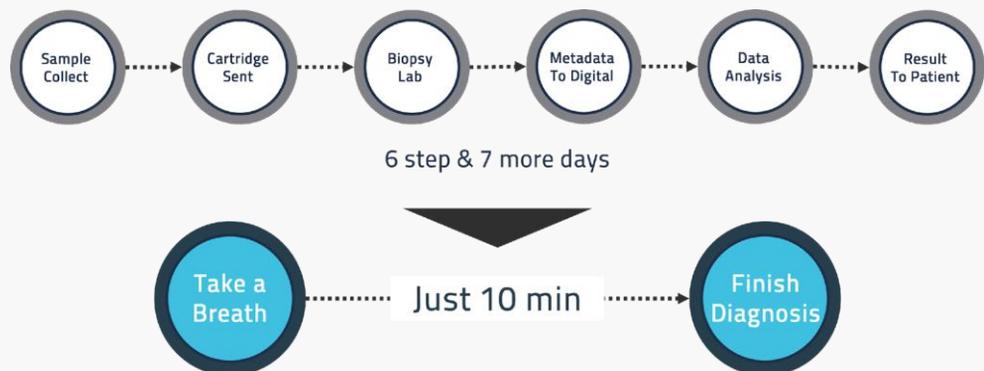
Biopsy through Breathing

06

Currently, the medical community around the world is developing technologies to diagnose diseases by analyzing volatile organic substances through breathing by applying various methods. Owlstone Medical, a respiratory analysis specialist based in Cambridge, England, which is relatively successful in this field, can only measure the level of ppb, and even if various technologies such as semiconductor sensors and biochips are applied, it is impossible to have more accuracy than ppb.

However, for molecular sensors using lithium-resistant fullerene, it is the only ultra-precision molecular diagnostic technology in the world at this time when ppt-level accuracy is possible.

Development Accuracy (Company/Institution)	Diagnostic Technology	Accuracy
NIMS	Cantilever	ppm($1/10^6$) ~ ppb($1/10^9$)
AIST	Semiconductor Sensor	ppb
Panasonic	Bio Chip	Concentrate 10 million times before using
Owlstone Medical	GC-MS analysis	ppb
CDBIO	Li⁺@C60 Molecular Sensing	ppt($1/10^{12}$) level of accuracy (Can be detected through 100cc ~ 300cc)



Molecular Technology R&D Milestone

Biopsy through Breathing

06

Compared to competitors in the existing cancer market using Liquid Biopsy technology, which has attracted the most attention in the world since it was announced as "Innovation New Technology of the Year" by MIT in 2015, it is 40 to 58 times cheaper than the current test.

Company/ Institution Name	Product Name	Technology	Detail	Fee
Biocept	Target Selector	Sequencing /FISH	Identification of 13 genetic variants using ctDNA and CTC	N/A
Grail	N/A	Sequencing (Deep seq)	Developing Illumina-based diagnostic technology	\$ 1,000
Guardant	Guardant360	Sequencing (Digital seq)	70 gene mutations identified	\$ 5,800
Oncocyte	Oncocyte DX test	Sequencing	diagnosis of lung, breast and bladder cancer	\$ 4,000
Genomic Health	Ocotype SEQ	Sequencing	17 genetic variants identified	N/A
CDBIO	CANCERBOX	Li⁺@C60 Molecular Sensing	Measurement of the energy level of cancer-causing substances using Li⁺@C60 (lithium-resistant fullerene) characteristics	Less than \$ 100
Myriad	myRisk	Sequencing	28 Cancer Genes Panel	\$ 4,500
Foundation Medicine	FoundationACT™	Sequencing (Deep seq)	Perform deep seq using ctDNA (61 genes in total)	\$ 5,800
Qiagen	REPLI-g Single Cell Kit	PCR	Development of separate kits such as ctDNA, MIRNA, RNA, etc	\$ 800
Trovogene	Trover Test	Sequencing	Cancer gene mutation monitoring using Urine (EGFR, KRAS, BRA)	N/A

Molecular Unit Bio Data

Molecule Bio Data

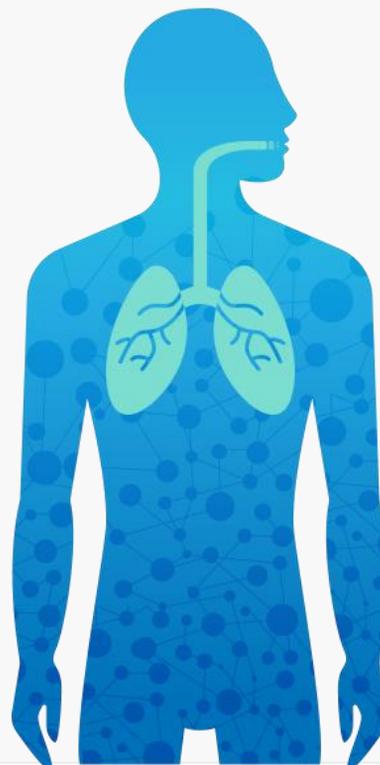
07

The CDBIO Molecular-Medical/Healthcare platform's bio-data is largely classified into endogenous and extrinsic data, which in turn consists of five categories: environmental factors, lifestyle, medical records, medication (including dry) history, and VOCs.

We collect endogenous data through partners who participate in the platform as a consortium, collect EVOCs data using ultra-precise molecular sensors, and exogenous data through various apps/web services to build AI-based integrated medical/healthcare big data.

Endogenous Sources

Genomics



Exogenous Sources

Environment

Lifestyle

Medical

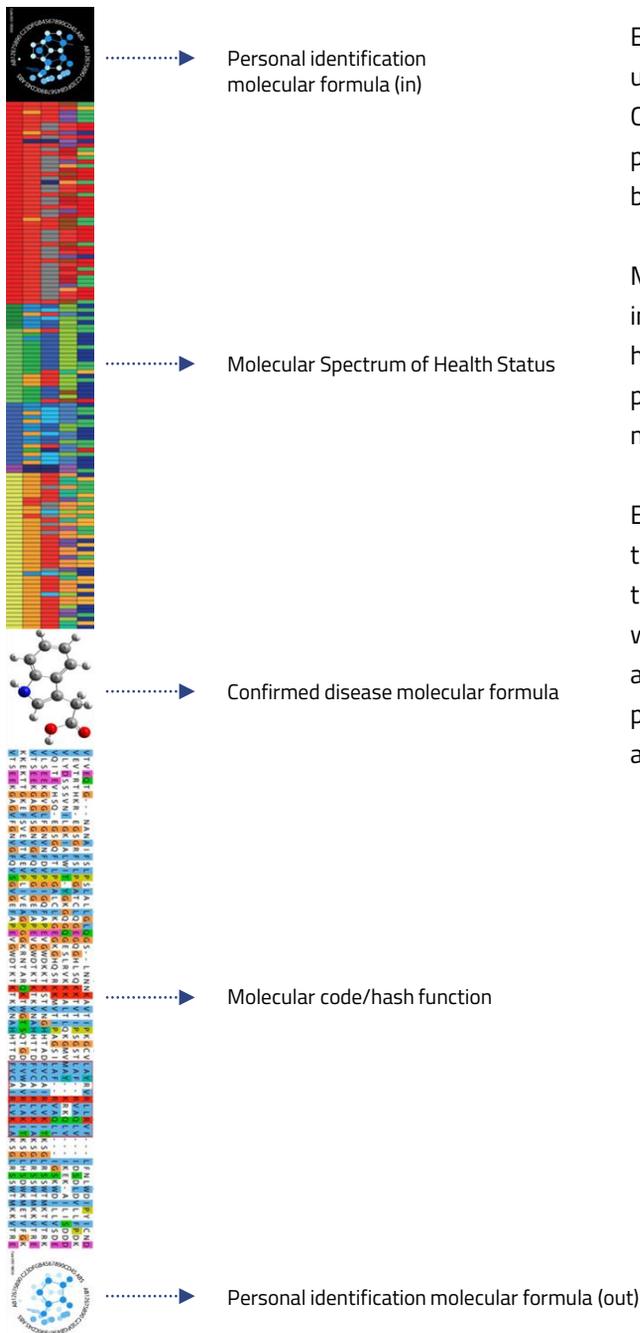
Drugs

EVOCs

Molecular Bio Code

Molecule Bio Code

08



Big data integrated through AI again uses the molecular spectrum of the CDBIO molecular-medical/healthcare platform to generate visual molecular biocode with hash functions.

Molecular bio-codes will have an integrated dataset containing individual health and medical status within the platform and each individual's unique molecular identification function.

Each molecular biocode will be NFTed in the future, used for health data transactions between stakeholders, and will be a work of CDBIO's own molecular art to showcase a new type of NFT product that combines health, data and art.



Platform

- 9. Platform Concept
- 10. Platform Ecosystem
- 11. Molecule Diagnosis
- 12. Molecule-synthetic Treatment
- 13. Molecule-synthetic Antibody-drug Conjugates
- 14. Personalized Healthcare Service

Molecular Platform Concept

Platform Concept



CDBIO's Molecular-Medical/Healthcare platform consists of a platform that enables safe collection/classification/analysis/sharing/transaction/management of patient sensitive medical/health data based on trust among participants. It also provides a variety of medical and healthcare services using data, as well as simple medical and health data.

The platform consists largely of a Data domain, Blockchain domain, AI domain, and Service domain under the Internet of Medical Things (IoMT) environment

As mentioned earlier, the Data Domain is an area for collecting/managing various molecular-level endogenous data. Extrinsic data consists of PGHD, and professional medical records generated by individual patients.

Individual patients provide molecular data, various health care apps, and data using wearable devices through CDBIO's molecular sensors. It also provides a variety of EHRs through professional medical records of partners (hospitals, research institutes, schools, etc.) participating in the platform as a consortium, and through CDBIO's hospital/research precision medical devices.

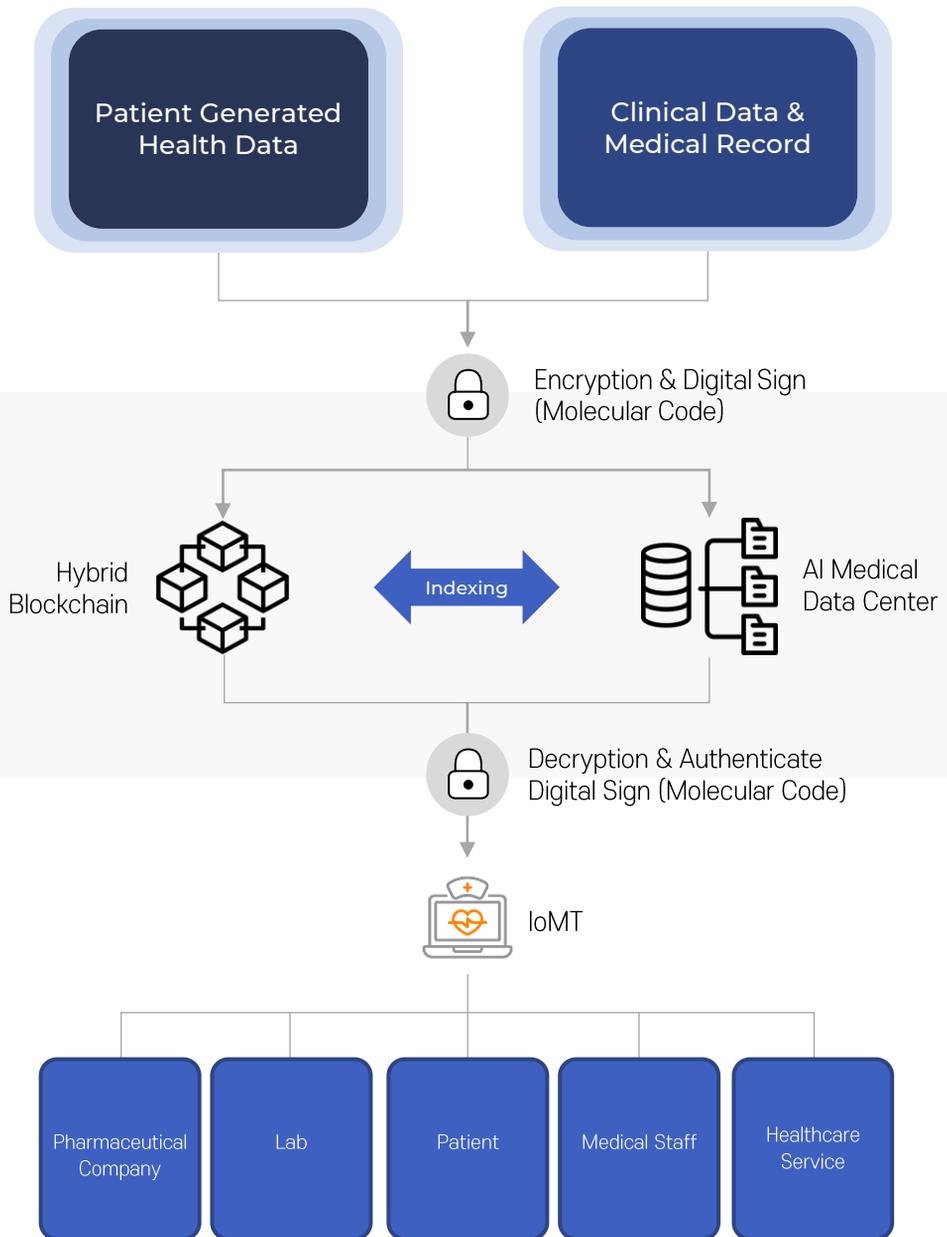
Blockchain domains consist of hybrid chains that complement the public and private (consortium) blockchain. The public blockchain is based on Ethereum, and the private (consortium) blockchain consists of a chain utilizing Hyperledger Fabric. In view of the sensitivity of medical/health data, the data itself is molecular-coded to be used only by approved participants, and general data with low sensitivity is applied to separate specialized activities such as research/development from general health care services by utilizing the public chain.

AI Medical Data Center (AI Data Center) operates to efficiently collect, store, analyze, and manage vast amounts of data.

Service domains are developed using container and orchestration (Docker and Kubernetes) concepts, and various app/web services are provided to each participant in the platform, including patients, through an organic connection with AI domains under the IoMT environment.

Molecular Platform Concept

Platform Concept



Molecular Platform Concept

Platform Concept



The CDBIO Molecular-Medical/Healthcare platform is developed as an Ethereum-based blockchain platform centered on general health data centered on PGHD in the early stages of the service.



Encryption & Digital Sign (Molecular Code)



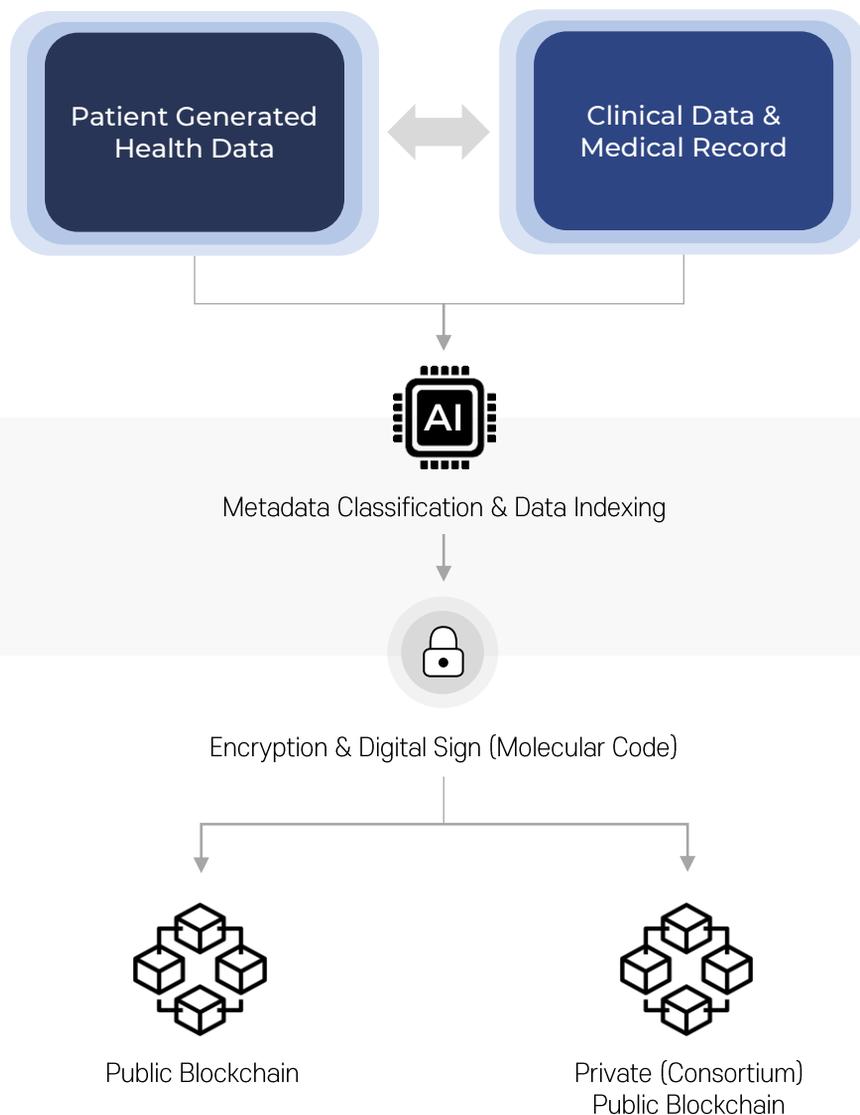
Public Blockchain

Molecular Platform Concept

Platform Concept



The CDBIO Molecular-Medical/Healthcare Platform Mainnet, which will be launched at the time of molecular sensor advancement and personal portable molecular meter development completion, will consist of a Dual Hybrid chain combining Public and Private Blockchain.



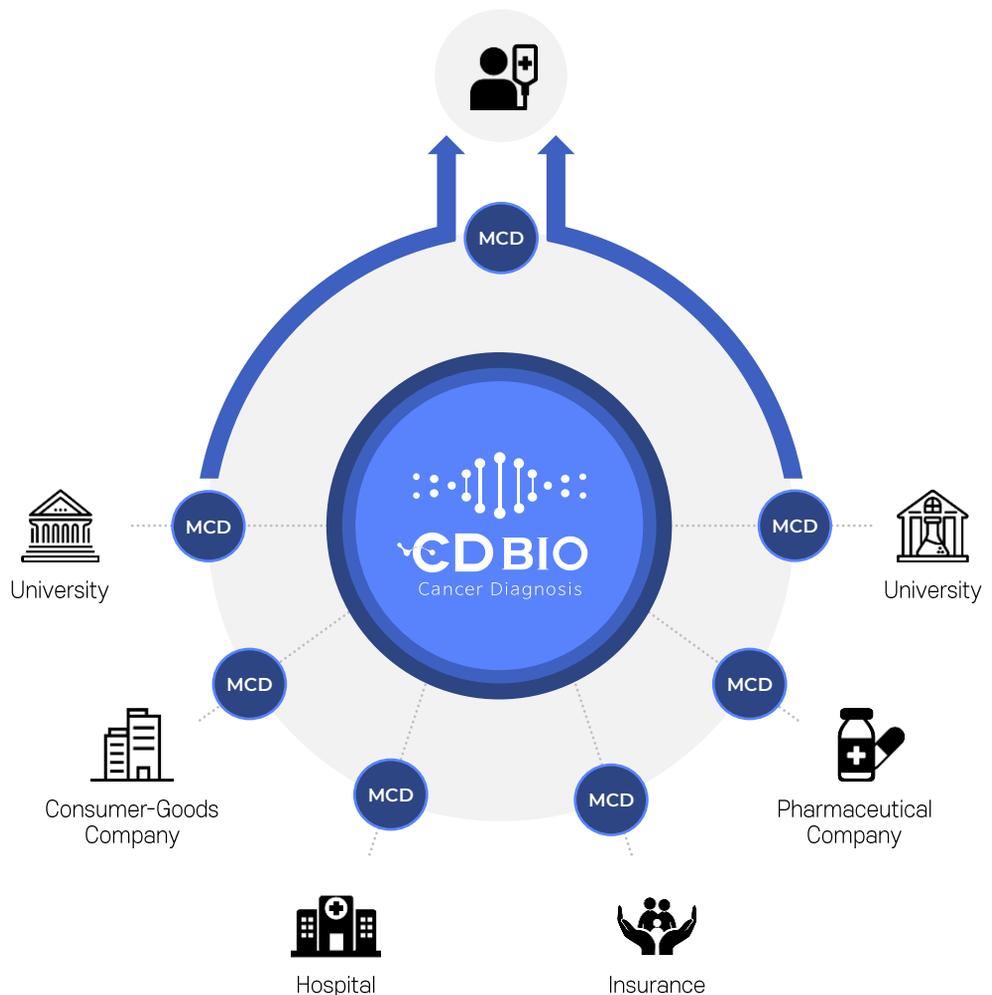
Molecular Platform Concept

Platform Concept



CDBIO Molecular-Medical/Healthcare Platform Mainnet's Consortium Blockchain will involve health partners from universities, research institutes, hospitals, pharmaceutical companies, insurance companies and consumer goods companies to provide research and development and services based on PGHD and EHR.

Data-driven healthcare technologies, products, and services developed by Consortium partners will return to the best customized healthcare-care services for users.



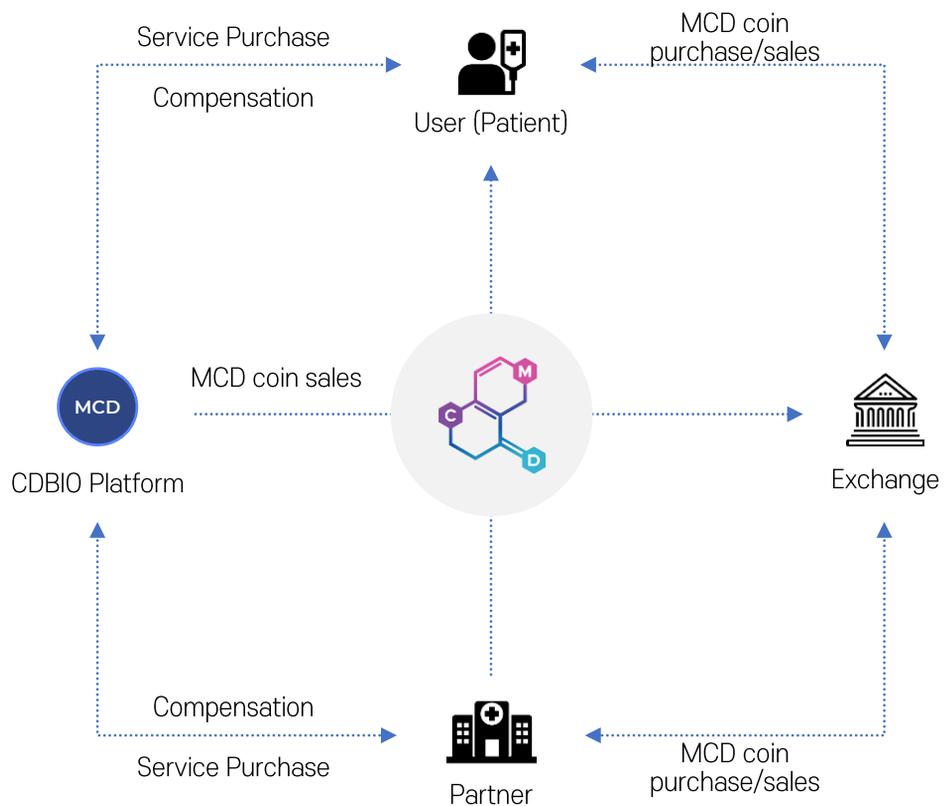
Molecular Platform Concept

Platform Concept



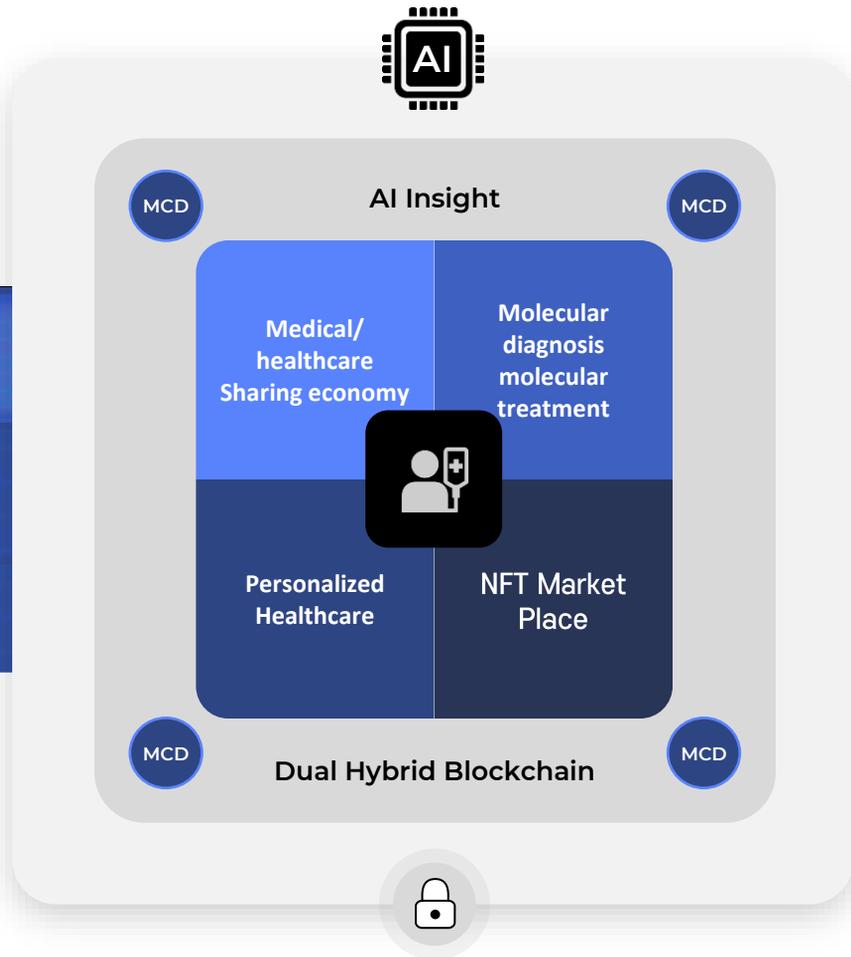
Users can participate in the CDBIO Molecular-Medical/Healthcare platform to securely manage their own medical data on the blockchain and receive the best personalized healthcare services based on data they choose and publish. You can also receive rewards for providing data.

Alliance partners on the CDBIO Molecular-Medical/Healthcare platform can leverage user-provided data to provide research/development and optimized healthcare services and products to users.



Molecular Platform Ecosystem Platform Ecosystem

10



Personal Molecular Diagnostics

Molecule Diagnosis



CDBIO's molecular diagnostic technology is a state-of-the-art diagnostic technology based on molecular physics and electrochemistry, which shows many differences in testing and analysis methods from conventional biopsies.

In general, VOCs are easy to think of as environmental pollutants, but they are gases that can actually occur normally in the human body. VOCs in the human body move around in the blood and are also released through urine or exhalation.

These VOCs can be a new type of biomarker.

Molecular sensors utilizing CDBIO's lithium-containing fullerene are technologies that diagnose the presence or absence of diseases by detecting VOCs from pathogens generated in the body. This technology is not implemented with precision medical devices such as X-Ray and CT, or expensive medical equipment such as the mass meter of the world's leading science firm Thermo Fisher Scientific. It can be implemented in the form of a small portable device is similar to a 3.5g or 15ml portable spray or e-cigarette. There is also no need for complicated examination or analysis.

Just take a long breath into a small personal portable molecular diagnostic device and spit it out, and the molecular sensor immediately tells you whether you are sick with high accuracy at the ppt level.

A in his 30s breathes into a personal portable diagnostic device after eating a car with severe heartburn. And then, five minutes later, esophageal cancer rates come out. Heartburn is a phenomenon that occurs when stomach and esophageal reflux worsens, and if heartburn persists, a protective film is formed to protect esophageal cells, which is called Barrett's Esophagus. The protective membrane consists of abnormal cells that can withstand stomach acid, which are likely to turn into cancer cells in the future, and in fact, 10% of Barrett's esophageal patients are found to be transferred to esophageal cancer.

If CDBIO's personal portable molecular diagnostic device was not developed, A would have to undergo painful endoscopy every year, but now he can diagnose almost all diseases comfortably at home early and take efficient and stable health care.

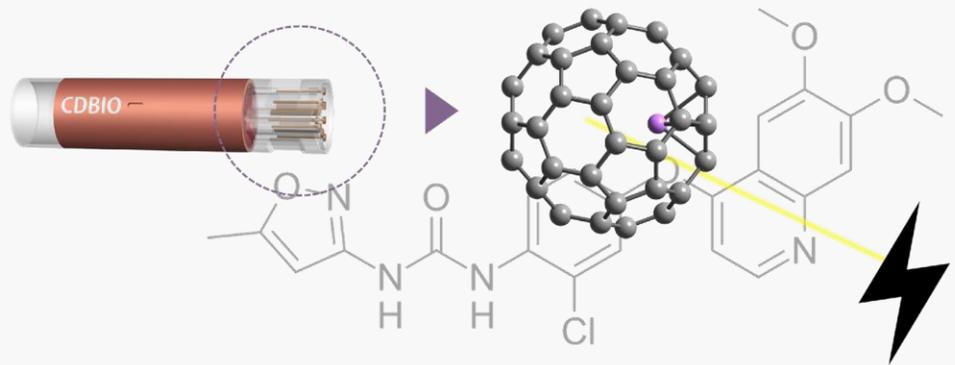
Currently, CDBIO has already developed a diagnostic system with precision above ppt level for lung cancer, which is almost difficult to diagnose early, and is currently working on a prototype Prototype. This product is available on the CDBIO Molecular-Medical/Healthcare platform and can be provided with a variety of personalized health care solutions through smart devices and App./Web services that work with diagnostic devices in the platform's IoMT environment.

Personal Molecular Diagnostics

Molecule Diagnosis

11

- A memorizing substance (a substance caused by cancer) contained in the respiration that enters the diagnostic unit activates the molecular sensor.
- The energy level of the memorized material is measured using the light energy projected from the memorized material, lithium-containing fullerene, and pigment.



- Insert a breathalyzer into the molecular diagnostic system.
- Check the energy level of the measured carcinogen for cancer.
- It is possible to monitor the diagnosis results of various cancers and diseases as well as lung cancer in conjunction with the smartphone app.



Molecular diagnostic system (personal use)

Molecular App

Personal Molecular Diagnostics

Molecule Diagnosis

11



Molecular diagnostic system (for hospitals)

Molecular diagnostic system (for personalized use)



Synthetic Molecular Medicine

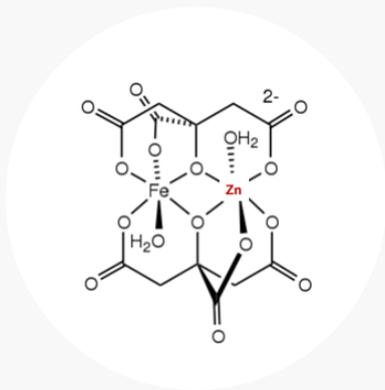
Molecule Diagnosis

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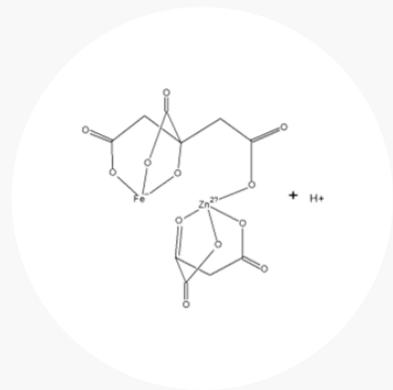
After lithium-resistant fullerene, another new substance being developed by CDBIO is carbon organic compounds through molecular-synthesis. Currently, KIST in Korea is conducting research on molecular structure determination, and Tohoku University in Japan will also conduct research.

The new material is an organic compound made by molecular-synthesizing carbon (carbon, C) in zinc (Zinc, Zn) and iron (iron, Fe), and is a material that can be absorbed into the body through cell penetration and absorption through organization.

If you look at the reason why the combination of hydroxychloroquine, zinc supplement, and azithromycin (antibiotic), which has been at the center of the recent controversy over COVID-19, has been effective in vitro to some extent, but has not been effective in vivo, you can see how important organization is.



Estimation Structure of Carbon Organic Compounds A



Estimation Structure of Carbon Organic Compounds B

Synthetic Molecular Medicine

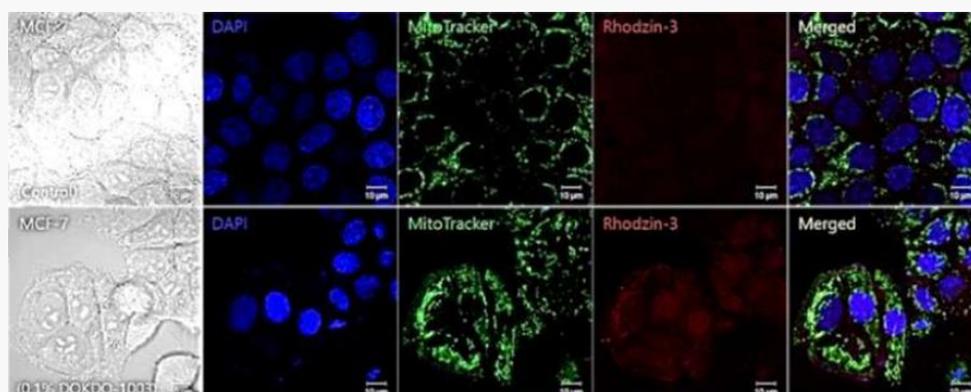
Molecule Diagnosis

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In fact, carbon organic compounds through molecular-synthesis of CDBIO have been tested for intracellular penetration and absorption through experiments conducted at Inje University's Cardiovascular & Metabolic Disease Center (CMDC) for a year from August 2019 to August 2020.

The purpose of the experiment was to confirm the study on the regulation of mitochondrial function of the substances in cardiomyocytes and cancer cells, and the fluorescence effects of fluorescence on carbon organic compounds were analyzed through OIV.

In addition, iron ions bound in cells of carbon organic compounds of CDBIO have been found to be able to regulate the retention or export of iron ions to induce apoptosis in cancer cells known to contain more iron in cells. In other words, organization of minerals has enabled the development of innovative cancer treatments that activate inactive mitochondria of cancer cells to induce cell suicide on their own.



Effect of Intracellular Infiltration in Breast Cancer Cell MCF-7

Synthetic Molecular Medicine

Molecule Diagnosis



Antivirus experimental groups and experimental conditions

Treatment Plot	Test Condition	Reaction Speed	Composition
1	Voice Test	-	-
2	Positivity Test (Pathogen Test)	-	Coronavirus-19 (SARS-COV-2)
3	CDBIO Carbon-organic Compound	3 Hours	Coronavirus-19 (SARS-COV-2)+ Carbon-organic Compounds + Neutralizing Solution (10% FBS)

Anti-virus Study Results

Treatment Plot	Test Condition	Reaction Speed	TCID50/ml	Reduction Rate (%)
1	Voice Test	-	N/A	-
2	Positivity Test (Pathogen Test)	-	2.8XTCID ₅₀ /ml	-
3	CDBIO Carbon-organic Compounds	3시간	6X10TCID₅₀/ml	99.9984%

Report of Research				
Research Title	Evaluation of mitochondrial functional effects of novel compound DKDKD-1003			
PI	Name	Jin Han, MD, PhD	Position	Professor
	Institute	Cardiovascular and Metabolic Disease Center, Jeju University	Expertise	Medicine Physiology
Experiment Manager	Name	Hyung Kyo Kim, PhD	Position	Professor
	Institute	CMDC, Jeju University	Expertise	Physiology
Period	2019. 08 - 2020. 08 (12 months)			
Research Cost Payment	W 0 won (Conditional payment agreement)	Tel	0519008778	
		Mobile	01034343833	
Summary	Dkdkd-1003, a new substance of Hesperidin, is a complex of organic compounds of Zn ²⁺ and Fe ²⁺ , and has anti-cancer, anti-viral, and anti-inflammatory functions. Considering the positively charged properties of the material, mitochondrial influx and function change are expected.			
Purpose	To confirm the study on the regulation of mitochondrial function of the substance in cell physiology and cancer cell lines			
Contents	Study on cell proliferation and death by concentration through drug: carbonyl cyanide (MCC-7) A study on the regulation of mitochondrial function of drugs: oxygen consumption, ROS production, ATP production, membrane voltage, mitochondrial calcium and zinc concentration.			
Results	Confirmation of cancer cell death by drug Confirmation of drug delivery to mitochondria Confirming the effect of drugs to inhibit cancer cell migration			
Expectation	By inducing the death of cancer cells, potential anti-cancer effects are expected at the in vitro cell line level.			
	2020. Aug. 27 Principal Investigator : Jin Han			

SGNDOKDO-1003의
COVID-19 항바이러스 효과조사
결과보고서

2021. 12. 03

전북대학교 인수공통전염병연구소

Synthetic Molecular Medicine

Molecule Diagnosis

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Carbon organic compounds through molecular-synthesis of CDBIO have been proven to have therapeutic effects not only in cancer cells but also in investigations of COVID-19 antiviral candidates.

As a result of testing the SARS-COV-2 (NCCP 43326) virus sold by the National Hospital Resource Bank of the Korea Centers for Disease Control and Prevention at BL2 facilities, the coronavirus decreased 99.9984% within three hours of the experiment. In addition, it has been studied that it is not toxic even if administered more than 2,000 mg. In addition, MRSA and VRE, which are antibiotic-resistant bacteria, have also shown strong anti-bacterial activity.

In addition, CDBIO's carbon organic compounds have been verified for stability through experiments on the size of particles according to the amount of energy injected by the Gwangju Institute of Science and Technology (GIST). After injecting energy into a sample using an ultrasonic extractor, the particle size was confirmed to be 2,008 nm after injecting the dispersed energy of 321J and decreased from 9,659J to 914 nm, and there was no change in size due to the increase in energy.

Carbon organic compounds through molecular-synthesis of CDBIO with intracellular penetration through organization, antiviral effect, and stability will be developed/produced in earnest after molecular structure is confirmed through research at KIST Korea and Tohoku University in Japan in 2022.



Antibody Drug Conjugates

Molecule-synthetic Antibody Drug Conjugates

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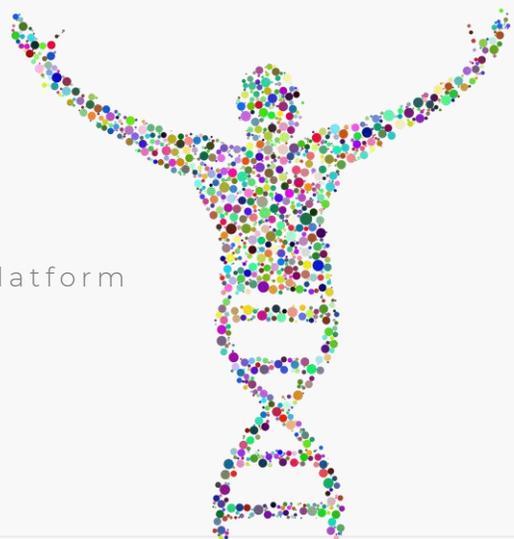
Even if the next generation of anti-cancer and anti-virus treatments are developed with carbon organic compounds through molecular-synthesis, the treatment effect will inevitably decrease if the treatment is not well delivered to the disease area. Accordingly, CDBIO is also developing an advanced drug delivery system ADC (Antibody Drug Conjugates) through molecular-synthesis, following molecular diagnosis and molecular-synthesis treatments.

Like molecular diagnosis, ADC through molecular-synthesis, which is being jointly studied by Dr. Kwon Eun-sang of Tohoku University and CDBIO affiliate ACROSCALE of Japan, is being developed based on glycine engineering, a biotechnology expected as a next-generation biotechnology.

Proteins, an important component of the body, often contain monosaccharides such as glucose and galactose, which are complexly linked in a chain shape, and they also exist on the cell surface. And with the research and development of biochemistry and cell biology, it has been found that our chains play an important role as signaling substances in cell differentiation, cancer, information transfer between cells, and biometric devices.

CDBIO's ADC drug delivery system is an application engineering of how to control the structure and function of this chain. Dr. Kwon Eun-sang and ACROSCALE of Japan currently have the technology to attach sugar chains to surfaces that can control the size and function of N-type chains.

Blockchain Based
Molecular Healthcare Platform



Personalized Healthcare App. Service

Molecule Data-based Personal Healthcare Service



CDBIO's Molecular-Medical/Healthcare platform will offer a variety of personalized healthcare services, including artificial intelligence-based health functional food subscription services and smart healthcare services linked to personal portable molecular diagnostic devices in the future.

The CDBIO health functional food subscription service, which is currently preparing for the service, automatically collects ingredient information and certification in the form of images of 50,000 health functional foods not only in Korea but also around the world, and automatically recognizes them through deep learning technology. Auto-recognized information recommends health functional foods optimized for the user's current health condition by artificial intelligence.

In addition, knowledge information and analysis systems such as efficacy improvement and decline issues that occur when mixed with prescription drugs or other health functional foods that are being taken are accumulated.

At the beginning of the service, the health status is checked through the user's self-diagnosis, but after linking with a personal portable molecular diagnostic device, a more advanced service will be provided through an ultra-precise personal health status check.

When the service is advanced, it is possible to check the actual content of health functional foods through molecular diagnosis.



CDBIO Personalized Healthcare App Service



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Blockchain

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- 16. Service Layer Structure
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면책조항

Blockchain Structure

Blockchain Structure

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Blockchain enables consensus among untrusted parties to meet the needs of healthcare big data sharing processes and ensure secure and granular data access. Data recorded on the blockchain is tamper-proof, persistent, and traceable to achieve stability.

CDBIO's molecular-medical/healthcare blockchain platform protects personal information and implements hybrid blockchain-based Electronic Medical Records Sharing (EMRS). The hybrid blockchain consists of a public blockchain and a private (Consortium) blockchain, and sensitive parts of the EMR are recorded in the private (Consortium) blockchain. Only organizations that have joined consortiums within the platform can access it, and patients can control their EMR. The Public Blockchain uploads non-sensitive parts of the EMR (typical PGHD).

The Private (Consortium) blockchain is used to record sensitive and precise medical data and anti-manipulation transactions, and only limited health information control systems can participate to generate records and collect data. The Private (Consortium) blockchain is implemented as a chain code, a smart contract for Hyperledger Fabric.

The Public Blockchain is implemented on an Ethereum (ERC20) basis and is primarily used for common apps/web services that share common PGHDs and exclude professional medical research activities.

A uniform, interoperable approach is expected to improve the efficiency and safety of EMRs shared across healthcare information control systems, and to advance data management. Therefore, EMR sharing, based on hybrid blockchain architecture, allows all participants involved in the consortium to be bound by a set of rules and predefined smart contracts, allowing only authorized organizations to access sensitive areas of EMR to develop medical diagnosis and treatment plans.

Given the large amount of EMR, EMRS is designed as on-chain and off-chain storage. Data is encrypted and stored in the Inter-Planetary File System (IPFS), a distributed storage system that supports content-based indexes.

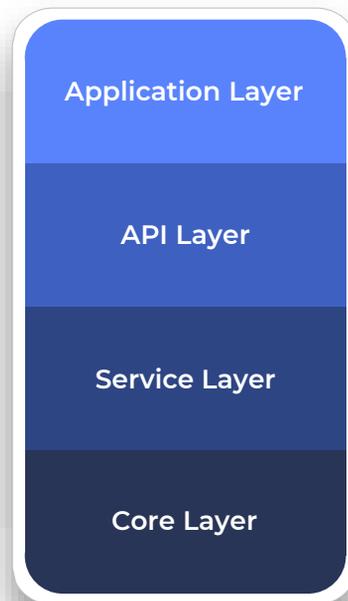
Platform Service Architecture

Service Layer Structure

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Application Layer provides web and mobile applications for user convenience. This provides the best user experience for users to conveniently use a variety of health-related data, including their medical records, lifestyle and eating habits, and health functional foods and medication history.

It also provides a variety of services that users can use by leveraging MCD coins in the CDBIO molecular-medical/healthcare platform ecosystem.



Platform Service Architecture

Service Layer Structure

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The API layer consists of APIs for storing, retrieving, and service development of user data. Data created by users is classified through API layers to make it more valuable, and users can select the data they need by searching for conditions. In the long run, we plan to create a complete AI medical big data that integrates not only PGHD written by users, but also precision data and molecular coded molecular bio data through personal portable molecular diagnostic devices, and HER generated by consortium partners. In addition, the CDBIO Molecular-Medical/Healthcare Platform API is available for use by the 3rd Party to enable the development of new services that can be linked to or linked to the CDBIO Molecular-Medical/Healthcare Platform.

Service & Core Layer is the area where core logic of the CDBIO molecular-medical/healthcare platform runs and core data is stored, consisting of smart contracts, Data Storage (Blockchain, Interplanetary File System - IPFS, Hybrid), and other service jobs. User data from API Layer is recorded in the blockchain after fulfilling the smart contract of Core Layer. The data handled by the CDBIO Molecular-Medical/Healthcare platform can be largely classified into personal information, personal health data (PGHD), etc. Personal information or personal health data is sensitive to its nature, or valuable as a user's asset required by the organization, so it is encrypted and stored in distributed storage to avoid public exposure. In order to specify ownership of stored data, hash values are stored in the blockchain and mapped so that they cannot be forged/modulated in external areas, including CDBIO molecular-medical/healthcare platforms. Data can include data with large capacity characteristics, such as images and videos, which are stored on external storage, such as AWS S3, for effective management of resources. And if the individual's forgotten rights and user sovereignty on the blockchain are sufficiently secured in the future, we aim to use IPFS to achieve decentralization in more areas.

Once the terms of the smart contract are defined by the user's contribution to the CDBIO Molecular-Medical/Healthcare platform, such as the number of data uploads, data value, service usage, and content shared to the community on the platform, the user will be rewarded accordingly.

Coin Distribution

Coin Distribution

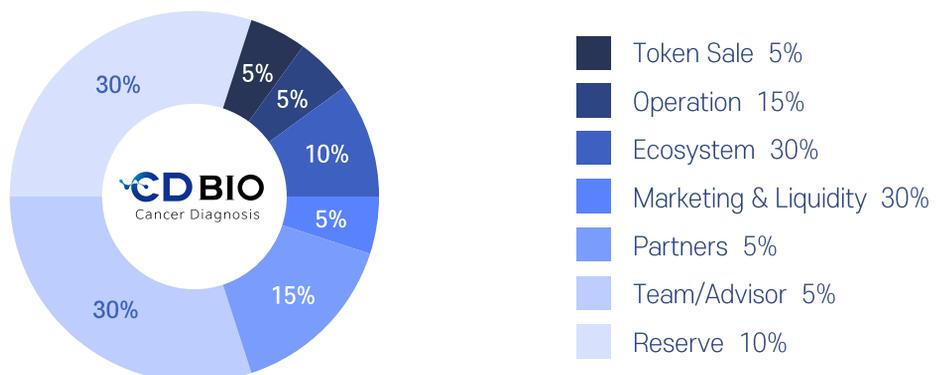
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MCD is a basic transaction coin for CDBIO Molecular-Medical/Healthcare Platform Blockchain. It is based on Ethereum ERC-20, which can be purchased and sold on the exchange and can be remitted between users.

All MCDs held except those used in ICOs are used for CDBIO operation and platform development. In the future, CDBIO Molecular-Medical/Healthcare platform mainnet development can be used as a blockchain platform to provide smooth service to users if Hyperledger Fabric or protocol performance is excellent, or if there is a blockchain protocol that is fast and technically active.

Coin Name	CDBIO	Symbol	MCD
Platform	ERC-20	Decimal	18
Total Supply	1,000,000,000 MCD		

<https://etherscan.io/address/0xc66cdac744916afb6811c71c277d88de90ce8d5b>



Team Members Profile

Team Status

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Management

Founder : Baek Kyoungjin

Present) CDBIO Limited. Founder
CDBIO Inc. CEO
Past) SJK Inc. Deputy CEO
Smart Innovation Inc. CEO
Mediascape Inc. Deputy CEO

CEO : Lee Jiman

Present) CDBIO Limited. CEO
Past) SJK Inc. Manager
Bexco Inc. Manager

General Director: Kim Kihoon

Present)
CDBIO Inc. General Director
Domestic Foul Produce Inc. (Management
Consultant)
Mars LP Inc. General Director

Executive Director: Jeon Minho

Present)
CDBIO Limited. Executive Director
Starbucket Executive Director & Audit
Past)
Quartz Inc. Executive Director
Theme IM Inc. CEO

Planning Director: Hahm Younghwi

Present) CDBIO Planning Director
Past) Smart Innovation Inc. Strategy
Director
Mediascape Inc. Planning Director
AK217 CEO
Digitul Chosun Ilbo Media Team Lead
Income Planning Inc. AE

Team Lead: Cheon Eunji

Present) CDBIO Inc. Management Team
Lead
Past) SK Networks Inc. Walkerhill DF
Business Unit Sales Management Team

Team Members Profile

Team Status

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Molecular Technology R&D

Gwon Eunsang

Present) CDBIO Foundation Lead CTO
CD BIO Inc. CTO
Japan Tohoku University Science
Research Department, Science
Department
Research and Analytical Center for
Giant Molecules) Professor
Japan Idea International Research
Advisor
Japan Cytok Engineering Inc. CEO

Commercialization of the world's first
Li⁺@C60
Japan Tohoku University Graduate School
of Science Research Master's Degree
Japan Tohoku University Graduate School
of Science Research Ph.D
Nanotech materials and fundamental
physics research
Thesis presented 133 times

Yokoda Junji

Present) Japan ACROSCALE Inc. CEO

Development of cloud analysis platform
Development of remote analysis platform

Kasama Yasuhiko

Present) Japan Idea International CEO
Japan Tohoku University Adjunct
Professor

Commercialization of the world's first
lithium fullerene Li⁺@C60 with Professor
Eun Sang Kwon Li⁺

Build nanocarbon synthesis and applied
physical properties in Tohoku University in
Japan

Japan Society for the Advancement
Association Special Researcher
Development of Molecular Sensors and
Lung Cancer Diagnostic Sensors

Sakamoto Izme

Present) Japan ACROSCALE Inc. Lead
Researcher

Development of molecular sensor pigment
development
Development of cloud analysis platform
Doctor of Pharmacy

Team Members Profile

Team Status

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H/W, S/W, R&D

Medical Technology Advisory: Yun Byeonghak

Present) Thelma Therapeutics President
Axceso Biopharma Inc. CEO
Hongik University Basic Science Professor
Ministry of Health and Welfare of South
Korea New Drug Development Project
Judge
Korea SMEs and Startups Agency Head of
Venture
Seoul National University Doctor of
Medicine, Harvard Medical School

Technology Advisory : Kim Gwangtae

Present) G-HUB Pangyo Advisor
Daedong Investment / TDI Inc.
Past) National Information & Credit
Evaluation Outside Director, Daegu
Gyeongbuk University Start-up Invited
Director
Gyeongbuk University Technopark Head,
Agency for Defense Development, Head of
Aeronautical Electronics Development
Team
Japan Sophia University Exchange
Researcher

Head of Research Institute: Lee Myeongwan

Present) CD BIO Inc. Head of Technical
Research Institute
Past) Electronet Inc. CEO
Dataline Inc. CEO
Patent Law Firm Chief

Design Executive: Kim Eungju

Present) CD BIO Inc. Technical Research
Institute Design Executive

Past) Metal Design CEO
KODAS Design Director
Hyundai Motors Exterior Design
Researcher
Venture Designer Awards (2001)

R&D: Gwon Wisang

Present) CD BIO Inc. Technical Research
Institute
R&D Executive
Past) Japan Shempix CEO

Team Members Profile

Team Status

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Advisory Board

Investment Advisory: Jang Sanghyeon

Present) KOTRA-affiliated Invest Korea
CEO

Medical Verification Advisory: Kim Yeongyu

Present) Korean Academy of Clinical
Health Chairman
Past) International Organization UIA Korea
Representative (Union of International
Association)
USA ILRS FDA Research Institute Head
(International Licensing Research
Solutions LLC

Legal Advisory : Jo Sanggi

Present) Dadam LLC. Vice President
Lawfirm Joong Bu Law Director
Korea Industrial Development Institute
(Researcher at the Industry Office)

Financial Advisory : Kim Juil

Present) Kim Juil Tax Accounting Firm
President
Gangseo-gu Office Local Taxation
Examiner
Gunpo-si Local Taxation Examiner
UJU Electronics Co. Ltd Tax
Consultation

Legal Disclaimer

Legal Disclaimer

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White Paper v1.0

Blockchain based
Molecular Healthcare Platform
