

LifeBank Chain

Genetics & Stem Cell
Innovation on Blockchain

White Paper V2.35

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Preface

PART I

Genetics is the branch of science concerned with genes, heredity, and variation in living organisms. It seeks to understand the process of trait inheritance from parents to offspring, including the molecular structure and function of genes, gene behaviour in the context of a cell or organism, gene distribution, and variation and change in populations. The human genetic research is revealing the nature of human bioinformatics and giving scientist a powerful approach to study various health issues of human life.

Scientists conducted scientific research to explore genetic and molecular mechanisms; scientific research institutions conducted validation on the susceptibility models by choosing 2000 gene samples from 2000 different people, conducting a Genome Wide Association Study (GWAS) and publishing articles in such magazines as Nature Genetics with an aim to reveal the universal law of humankind through these 2000 different people's gene samples; the commercial organizations, based on the different GWAS results, built disease prediction models and collected samples like saliva, trying to indicate people whether they need to amputate their breasts, like Angelina Jolie, if they have a high probability of suffering from a hereditary disease in the future.

Genetic research has moved from Mendelian genetics to sequence maps to study the natural human genetic variation at the level of the genome. This progress however brings about a number of ethical concerns. One common concern is that researchers may acquire genetic information that also pertains to relatives who have not consented to any investigation. All accounts of research ethics insist that prior consent must be obtained from individual research subjects, and that data obtained must remain confidential (1). All the genetic data is fragmented and isolated, it is very difficult to organize countries all over the world to work together in an unanimous exploration of the deeper mysteries of the human genome. The competition between countries, the development of science and technology, and the change of the geopolitical landscape make it difficult for humans to perform comprehensive research.



Stem-cell is the area of research that studies the properties of stem cells and their potential use in medicine. Stem cells are undifferentiated, or “blank,” cells. They’re capable of developing into cells that serve numerous functions in different parts of the body. Most cells in the body are differentiated cells. These cells can only serve a specific purpose in a particular organ. Since stem cells have the ability to turn into various other types of cells, scientists believe that they can be useful for treating and understanding diseases. According to the recent research (2), stem cells can be used to:

- grow new cells in a laboratory to replace damaged organs or tissues
- correct parts of organs that don’t work properly
- research causes of genetic defects in cells
- research how diseases occur or why certain cells develop into cancer cells
- find new drugs for safety and effectiveness

In recent years, stem cell therapy has become a very promising and advanced scientific research topic. Although stem cells appear to be an ideal solution for medicine, there are still many obstacles that need to be overcome in the future. One of the first problems is ethical concern. Pioneering scientific and medical advances always have to be carefully policed in order to make sure they are both ethical and safe (3). Because stem cell therapy already has a large impact on many aspects of life, it should not be treated differently. Currently, there are several challenges concerning stem cells. First, the most important one is about fully understanding the mechanism by which stem cells function first in animal models. This step cannot be avoided. The efficiency of stem cell-directed differentiation must be improved to make stem cells more reliable and trustworthy for regular patients. The scale of the procedure is another challenge. Future stem cell therapies may be a significant obstacle. Transplanting new, fully functional organs made by stem cell therapy would require the creation of millions of working and biologically accurate cooperating cells. Bringing such complicated procedures into general, widespread regenerative medicine will require interdisciplinary and international collaboration.

Furthermore, the immune cells have attracted more interest in terms of cancer immunotherapies aiming to support or boost the patient’s immune system to enable the effective clearance of cancer cells. One way to achieve this is to genetically modify immune cells, mainly T cells and recently also natural killer (NK) cells, to express chimeric antigen



receptors (CARs). CAR-expression on T or NK cells allows them to specifically target cancer cells via recognition of tumor associated antigens. Immune cell therapy research has emerged as an exciting new approach to cancer treatment that is yielding unprecedented, durable responses for patients with an increasingly diverse array of cancer types. Much of the excitement has centered around checkpoint inhibitors, immunotherapeutics that release the “brakes” on the surface of immune cells called T cells, some of which are naturally capable of destroying cancer cells. More recently, a second approach to harnessing the power of the immune system, known as immune cell therapy or adoptive cell therapy, has come to the fore. Instead of releasing the brakes on T cells, adoptive cell therapy boosts the power of the patient’s immune system by increasing the number of cancer-killing T cells.

An ideal implementation of genomic data storage and access would prevent both loss and manipulation. Blockchain technology could be an ideal solution due to three key properties: decentralization, immutability, and security (6). Decentralization prevents a single entity from controlling the data; immutability guarantees that data cannot be altered; and security is ensured by protecting accounts with enhanced cryptographic methods.

LifeBank Chain (LBC) is the result of collaboration among genetic and stem cell scientists, doctors, allied health professionals, blockchain specialists, academics and business advisors. LifeBank Chain enables healthcare professionals to manage the medical data and do research in an auditable, transparent and secure way on LBC’s distributed network. Moreover, LBC is a platform for various shareholders to build genetic and stem cell applications to further development and research with the medical data and research infrastructure in LifeBank Chain network. LBC, along with its affiliates, continues to closely monitor the evolution of genetics and stem cell therapy in different medical subspecialties around the world. LBC has created an online community that shares important information from genetics and stem cell professionals’ research and contributions across multiple platforms. LBC’s network fosters a community where sharing and teaching is encouraged to grow the genetics and stem cell industry. LBC’s online community offers access to videos, blogs, and articles about genetics and stem cell research that educate, inform, engage, and aim to increase awareness amongst professionals, patients and investors in the proliferation of the genetics and stem cell fields. Having recognized the potential industry-changing link between genetics and stem cell research with the secure nature of blockchain technology, LBC moves to bridge the gap between accessing and understanding of genetics and stem cell research and development around the world while creating a collaborative and effective network of key players in the industry.



In 2017, a new milestone was set for oncology patients when the FDA approved the first two CD19-targeted (Chimeric Antigen Receptor) CAR T cell therapies produced by Novartis and Gilead Sciences known as Kite Pharma in the United States. Such two approvals have helped to improve the global demand for CAR T cell therapy because more companies are searching for this excellent opportunity to reach the marketplace. More than 200 CAR T clinical trials are ongoing or completed in various parts of the world. In 2018, Novartis announced its 33 approved centres in the U.S. and Gilead announced its 28 approved centres for the care of patients. Companies are also coming up with new developments in the field. According to analysis, CAR-T Cell Therapy Market is expected to be USD 7.4 Billion by the end of the year 2028.

Blockchain technology uses a timestamped immutable system of blocks containing data, making them accessible to anyone with a connected system, anywhere in the world, as long as they receive proper authorization. This technology gives users control over the distribution of their data, thereby protecting its privacy as well.

Growth of personal genomic data has been limited by bottlenecks in computational requirements and server capacity (4). Cloud-based storage and data analysis tools present security concerns, as they are based on a centralized architecture and are therefore vulnerable to single-point-of-failure losses (5). These are critical problems; as genomic data becomes increasingly integral to our understanding of human health and disease, its integrity and security must be a priority when providing solutions to storage and analysis. Corruption, change, or loss of personal genomes could create problems in patient care and research integrity.



Research Methods

PART II

Genetics research approach

The Human Genome Project (HGP) was jointly conducted by scientists from the United States, Britain, France, Germany, Japan and China. The purpose of the Human Genome Project was to determine the sequence of 3 billion base pairs of the human genome, find all human genes and locate their locations on the chromosomes so as to decipher all the human genetic information. The HGP leads to new medical and biological revolutions. In the medical field, there appear a lot of newly-emerging biological technologies such as genetic engineering, cell engineering, and biological chips (7). The wide applications of these new biological technologies in the medical field greatly reshaped the traditional pharmaceutical industry, whose focus was not only put on the treatment of disease as before but also on gene diagnosis and prevention, which opened the door to the world of personalized and precise medicine.

Blockchain is an emerging technology that has attracted increasing attention from both researchers and practitioners, as blockchain provides a new method of solving the problems encountered in the construction of genomics big data platforms . Specifically , it can empower a genomics big data platform in at least 3 ways.



Traceability empowers data ownership:

Traceability is the ability to verify an item's history, location, or application by means of documented identification (8). Blockchain uses timestamp technology to make data traceable and verifiable, so it completely records the entire process from data generation to final storage. Thus, each piece of data on the blockchain can be determined to be owned by the individual data producer at the time of generation, and this data ownership is verifiable



based on the records.

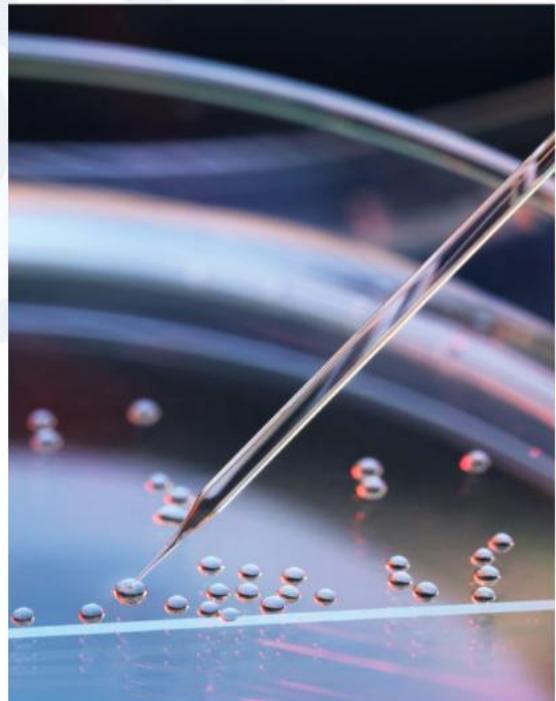
Antitampering and smart contracts empower data sharing: A smart contract contains a set of rules that help the parties to the smart contract interact automatically. No record on the blockchain can be tampered with by any individual node. The smart contract code facilitates, verifies, and enforces the negotiation or performance of an agreement or transaction, and the antitampering feature helps implement access and protect the data's originality, thus ensuring the operation of smart contracts (9). Therefore, the application of these 2 characteristics of blockchain can improve the data sharing mechanism, which then stimulates the platform's participants to share data for extrinsic benefits.

Decentralization and encryption algorithms empower data security and privacy protection: Decentralized storage helps to reduce security risks, increase trust, and manage data. An encryption algorithm is a component for electronic data transport security. The blockchain encryption algorithm encrypts the data and strongly guarantees data security and privacy (10).

Stem-cell research approach

Stem cell research is promising in international research, development, and implementation of stem cell therapy . LBC works together with professionals, labs, clinics,hospitals, and nonprofit organizations around the world to further this research and development. LBC's ultimate goal is to connect people who need treatment with a dedicated team of professionals who can provide personalized solutions based on patient factors and demographics collected in our dual blockchain-supported platform.

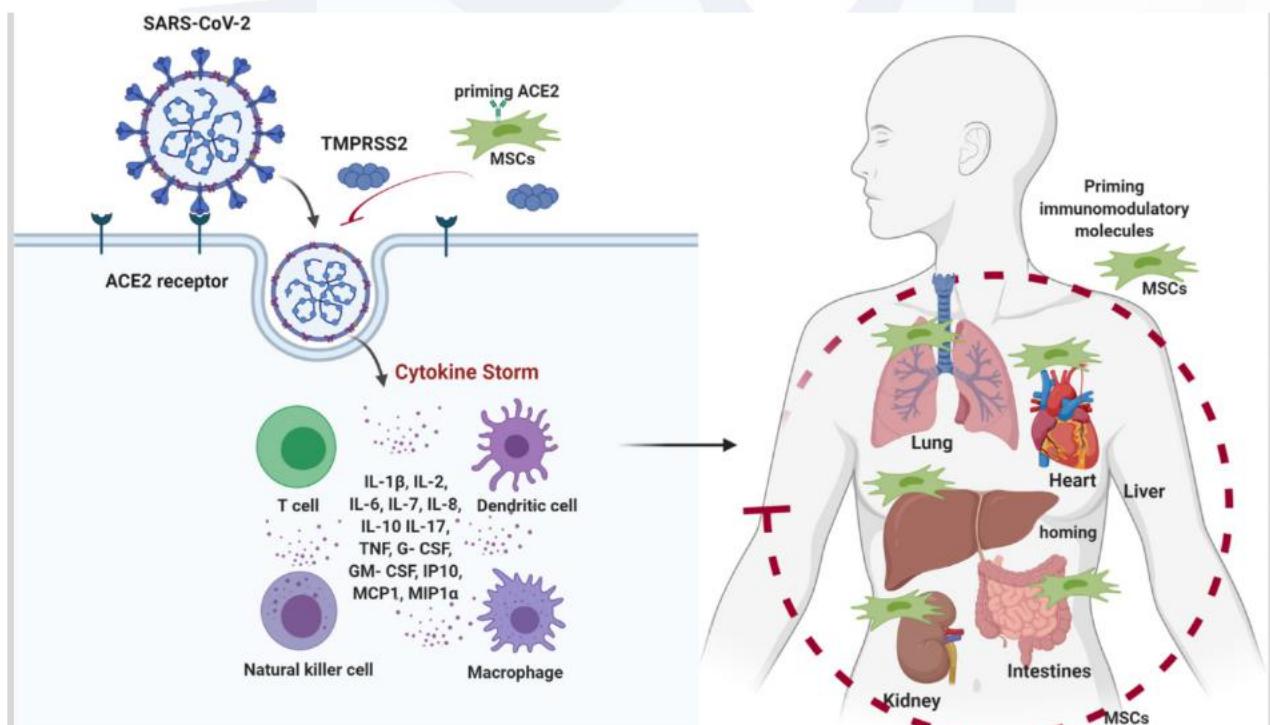
A lack of communication and access continues to plague the medical community in many areas of the world. At LBC, we believe such communication, access, and connections should be convenient and available when needed, just as so many other services are in modern society. With this sufficient information at our fingertips, it was only a matter of time before stem cell research and treatment became mainstream and LBC is ready to take research and



treatment into various applications.

Stem cell therapy for COVID-19

The coronavirus disease 2019 (COVID-19) pandemic has grown to be a global public health crisis with no safe and effective treatments available yet. Recent findings suggest that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the coronavirus pathogen that causes COVID-19, could elicit a cytokine storm that drives edema, dysfunction of the airway exchange, and acute respiratory distress syndrome in the lung, followed by acute cardiac injury and thromboembolic events leading to multiorgan failure and death. Mesenchymal stem cells (MSCs), owing to their powerful immunomodulatory abilities, have the potential to attenuate the cytokine storm and have therefore been proposed as a potential therapeutic approach for which several clinical trials are underway. Given that intravenous infusion of MSCs results in a significant trapping in the lung, MSC therapy could directly mitigate inflammation, protect alveolar epithelial cells (11), and reverse lung dysfunction by normalizing the pulmonary microenvironment and preventing pulmonary fibrosis.



The study shows cutting edge knowledge on the emerging role of mesenchymal stem cells in our fight against COVID-19, and will have implications on developing innovative therapies for COVID-19 infected patients.



Potential mechanism of MSC action in COVID-19 infected patients. SARS-CoV-2 enters cells through receptor-mediated endocytosis via interactions with cell surface protein angiotensin-converting enzyme II (ACE2) receptor. These cells release high amounts of cytokines and chemokines responsible for the cytokine storm, leading to symptoms and major organ dysfunction. Engineering MSCs with immunomodulatory molecules enhance the efficacy of homing to damaged tissues or cells and attenuate the cytokine storm, ultimately improving patients' outcome (12).

Immune cell therapy in cancer

Immune cell therapy is a complex medical procedure that is customized for each patient. It begins with the extraction of T cells. In the laboratory, these T cells are either genetically modified to target tumor-specific antigens and then expanded or are expanded based on their natural tumor reactivity. Once enough T cells have been generated, they are infused back into the patient to help mediate tumor regression.

There are several different types of adoptive cell therapy. One approach utilizes tumor-infiltrating lymphocytes (TILs) that are isolated from a patient's tumor, expanded in number in the laboratory, and infused back into the patient. A second approach is to engineer the T cells harvested from a patient to express a tumor antigen-specific T-cell receptor (TCR) so that the T cells can recognize and attack tumor cells that express such antigens.

Currently, the immune cell therapies approved by the U.S. Food and Drug Administration (FDA) are chimeric antigen receptor (CAR) T-cell therapies, tisagenlecleucel (Kymriah) and axicabtagene ciloleucel (Yescarta). CAR T-cell therapies are generated by genetically modifying a patient's harvested T cells to express a novel chimeric receptor that recognizes a specific antigen on the cell surface. Both tisagenlecleucel and axicabtagene ciloleucel target cells that express CD19, which is expressed in many B-cell malignancies. Some patients have had remarkable responses following treatment with CD19 CAR T-cell therapy, but others have developed resistance to these approaches.

In the case of cancer, immune cells known as killer T cells are particularly powerful against cancer, due to their ability to bind to markers known as antigens on the surface of cancer cells. Cellular immunotherapies take advantage of this natural ability and can be deployed in different ways:



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- Tumor-Infiltrating Lymphocyte (TIL) Therapy
 - Engineered T Cell Receptor (TCR) Therapy
 - Chimeric Antigen Receptor (CAR) T Cell Therapy
 - Natural Killer (NK) Cell Therapy

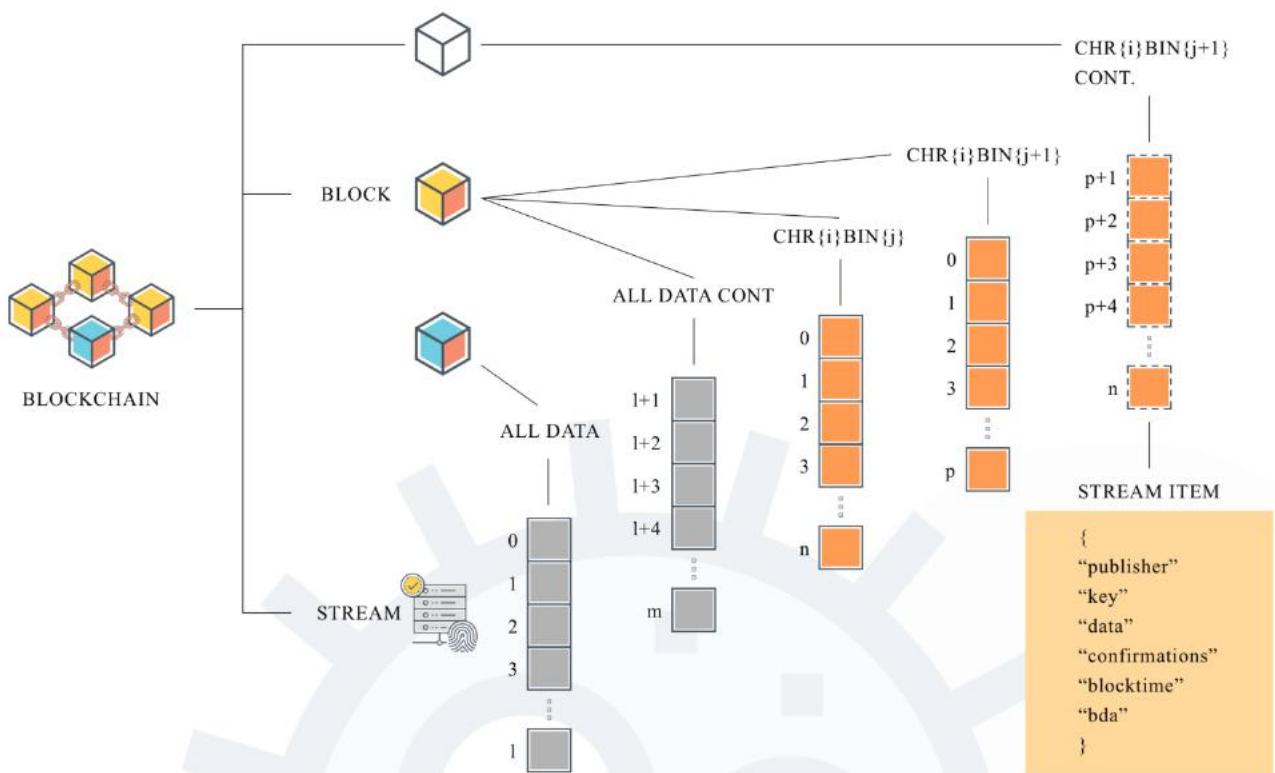
Today, cell therapies are constantly evolving and improving and providing new options to cancer patients. Cell therapies are currently being evaluated, both alone and in combination with other treatments, in a variety of cancer types in clinical trials.

Blockchain on genetics and stem-cell research

Blockchain is an emerging technology that has attracted increasing attention from both researchers and practitioners. Briefly, a blockchain is a publicly distributed ledger that seals blocks with timestamps and encrypted hash links in a secure and immutable manner. It enables transaction processes without the need for a trusted third party because of its traceability, smart contracts, resistance to tampering, decentralization, and encryption algorithm (13). First, a blockchain uses timestamp technology to achieve data traceability and verifiability, which means that it offers a secure and transparent method to track the ownership of assets before, during, and after any transaction. Second, the open-source sharing protocol built into blockchain enables simultaneous data logging and storage by all participants, which ensures that the details of the recorded transactions cannot be retroactively changed without the full agreement of the network. Finally, a blockchain's architecture and governance are decentralized, which makes it highly fault-tolerant and resistant to attacks and collusion. Moreover, a blockchain can protect users' privacy with the use of cryptographic hash functions and asymmetric encryption to enable users to encrypt data with their own private key.

The functionalities of blockchain technology and smart contracts provide an opportunity in the health care system to reinvent decades-old systems of data sharing, storing, and management supporting genetic and stem cell data integrity and security while giving patients control over their own data. The goal of LBC is to establish a global-level service platform for sharing human genetic and stem cell data through secured blockchain with advanced LBCTools.





LBCtools explanations and flowcharts

We developed LBCtools to extract information from raw genetic and stem cell data for downstream analysis with a code base that has the ability to query on a blockchain. The key:value property of the data streams together with the ability to query on multiple keys provides an opportunity to extract data from the blockchain without the need for costly calculations. Our query module can retrieve data from a chain based on the position in the reference of genome and stem cell data. Given our query algorithm, it would be simple to build upon LBCtools and add querying by other keys stored in the binned streams, which we call indexable keys. Moreover, any user could do this with writing a python script (no changes would be needed to the underlying blockchain data structure).

The LBC blockchain is designed to provide genetic and stem cell research industry partners with enterprise-level blockchain infrastructure, industry solutions, and secure, reliable, and flexible blockchain services. Through efficient and secure blockchain services, under the premise of secure and reliable transaction interconnection through visualized data management tools, the comprehensive cost of the gene and stem cell technology industry can be effectively reduced, operational efficiency can be improved, and the application of traditional gene and stem cell technologies can be implemented. Through the integrated solution of the “blockchain + genome and stem cell data analysis & collaboration system”, we



will be able to mine variant genomic and stem cell data to provide richer, more reliable, and easily accessible raw data for gene research, precision medical care, preventive health care, new medicine research & development etc.

Blockchain-based NFT

NFT is a special type of token generated through cryptographic hash methods and leverages blockchain technology for linking with a unique digital asset that could not be replicated. Smart contracts inside the NFTs help in storing the unique and exclusive data that differentiate NFTs from other tokens.



The current popularity of non-fungible token (NFT) markets is one of the most notable public successes of blockchain technology. NFTs are blockchain-traded rights to any digital asset; including images, videos, music, even the parts of virtual worlds. Tokens on the blockchain have many different advantages, such as interoperability, programmability, traceability, liquidity, and ease of trading. When you put non-homogeneous tokens into the blockchain field, a new world full of possibilities opens up. Since ownership can be easily proven, NFT can be applied to all digital art fields (14). You can buy and sell music, movies and some assets with copyright royalties through credit points. Many experts in the NFT field believe that digital art and games will be the first step for NFT to move toward mainstream applications, followed by entertainment, real estate, insurance and other industries.



The Goal and Scheme of LifeBank Chain

LifeBank Chain focuses on research and development in the field of genetics and stem cell science, with the purposes of furthering human longevity and expanding access to genetics and stem cell treatments through cutting-edge technology. During design of infrastructure of LBC, including the architectures of data layer, protocol layer, service layer and application layer, full consideration has been taken to the security, stability, privacy and legal adaptability of genome and stem cell data in pursuit of a fair distribution pattern with incentive business model. Thanks to blockchain technology, the genetic and stem cell data on LBC cannot be illegally tampered with and will be securely stored. Thus users can upload their bio data, medical reports, medicine and wearable device data to the LBC system for automatic analysis. With this information, we will be able to provide users with more accurate and efficient personalized health care services. On the LBCApplication, all information will be fully documented and effectively utilized.

LBC planned to build a genetic and stem cell data collaboration platform incorporating an extensible cross-chain service system based on individual and institutional nodes. The platform product service layer abstracts all typical kinds of gene and stem cell blockchain applications, and provides the full functions and implementation framework of typical applications. To achieve this framework, LBCTools is being developed to provide a safe storage solution for users' medical data and give those users control over their individual genome and stem cell records. Data related to the user's genetic and stem cell will be stored on the LBC blockchain. Such data will be accessible via our secure LBCApplication. With LBCApplication, users will have the ability to share and manage the control of the information accessed by doctors and medical organizations.

Information, such as names and dosages of medications, as well as previous surgeries and other medical information is crucial in emergency situations. Such information will be stored in the LBCApplication so that emergency care providers can quickly access, understand, and provide necessary medical attention based on a user's profile and accessible information. In addition to providing secure access to a user's medical information, the LBCApplication will allow users to seamlessly register for life insurance policies, bone marrow donor registries, and organ donation registries. Furthermore, the LBCApplication will also enable users to access their individualized genetic and stem cell profile, which will facilitate access to genetic and stem cell therapies and services in a convenient and straightforward manner. Our goal is to bring genetic and stem cell into the mainstream medical community while providing harmonious access to medical records for patients and their doctors. It is our vision to empower patients and reduce inefficiency in their access to medical care around the world.



Technical Architecture

PART III

The functionalities of blockchain technology and smart contracts provide an opportunity in the health care system to reinvent decades-old systems in terms of data sharing, storing, and management to support genetic and stem cell data integrity and security while giving patients control over their own data.

LBC's unique identifier

To ensure security and privacy, LBC will require users signing into the LBCApplication to provide information and generate a unique identifier within the LBC ecosystem. A unique identifier is an alphanumeric string of information that is assigned to a specific piece of data in an electronic database. Users will be given a unique identifier that will be generated using a proprietary algorithm, which will be used and stored using blockchain technology. The LBC unique identifier will act as users' keys within the LBC network. Through cryptographic methods, the data used to generate the key will be kept secret and secure, able to be parsed only by the LBC decoder. Unique identifiers enable access to customized genetic and stem cell services and therapies offered throughout the expansive LBC network to our users. LBC will provide personalized genetic and stem cell solutions to patients using our platform, as the LBC network and suite of services grow, users who opt into these services could enjoy advancements and new treatment options as they become available.

LBC' dual blockchain

LBC plans to run on dual blockchain platforms. The first platform will be built on an Ethereum base for token use only, and it will be powered by the ERC20 platform. The second blockchain will be a custom application designed and built by LBC engineers tailored to fit the healthcare environment. LBC has decided to build its own blockchain for storing and processing patient genetic and stem cell records using the Hyperledger Fabric



network, which will be designed to use smart contracts to protect data and ensure only authorized individuals accessing user data. Authorizations on LBC's network are controlled by Hyperledger modeling which allows LBCApplication to process user's genetic and stem cell records on the blockchain securely. Currently, LBC engineers are developing more ways to initiate faster, more secure connectivity between LBCTools and LBCApplication, which will be released in subsequent versions.

LBC's smart contracts

Smart contracts are a major benefit to utilizing blockchain technology to collect, store, and manage data in today's health care system. In short, smart contracts are digital protocols that allow authentication of information online without the use of third-party providers. Such contracts are executed automatically within the LBCApplication when a user registers for the service. The LBCApplication will use smart contracts to provide secure business logic for users and enable dynamic settings upon user demand. All users can set up their unique preferences in the LBCApplication. Smart contracts will allow users to define their preferred genetic and stem cell providers on the LBCApplication, assigning genetic and stem cell records to their preferred list of doctors, labs, or entities. Smart contracts will be processed by LBCTools. Managing data and user preferences is easy with smart contracts. When a user decides to grant or restrict permission, the smart contract will be automatically updated, and LBCApplication will comply with user preferences to grant or deny records to health care providers in the LBC network. Smart contracts are the gatekeepers of the LBCApplication. Users will be free to change their settings at will should their treatments change or preferences change. The straightforward validation associated with a blockchain environment is a secure process that ensures data integrity. Furthermore, a cryptography public key will be added to the LBCTools and LBCApplication to promote a higher standard of security.

SMART CONTRACT



LBC' data structure

Hyperledger Fabric allows LBC to use multiple languages to communicate with current Electronic Medical Records and Health Electronic Records (EMR/HER) systems. LBC uses the highly-encrypted 2048-bit unique identifier to manage those regulations and considerations. The unique identifier string code will have static attributes. The access control language will define the settings for the data to be transmitted, and will grant or restrict transmission on the network. The LBC system uses double-encryption methodology on a private blockchain designed by LBC. The data are private and not accessible to anyone outside the blockchain or the network curated by LBC. Information travels to and from blockchain technology based on permissions provided by users for providers to view records, which are activated by triggers via the unique identifier.



This index will be stored on each node on the blockchain and will carry an address to the next node in the blockchain, building an unbreakable indexed blockchain. In addition, there will be an auditing trail that will monitor changes on the blockchain and will enable the viewing of the history of genetic and stem cell records from creation to a set-point in time. Record trails allow LBC to find errors, debug issues, improve the customized blockchain, and report on network functional views to upgrade LBC's blockchain as needed. LBC will implement the smart contract on the ERC20 platform, which enables secure distribution of currency via public key cryptography. These transactions carry unique, cryptographically-signed agreements to complete the values of the transactions. The smart contract attribute will follow particular instructions and update the entire blockchain to ensure a high level of security and data integrity.



LBC overall architecture The overall architecture is positioned to be a leading genetic and stem cell blockchain infrastructure platform. The infrastructure service layer is the core service layer of the platform. Based on the infrastructure service layer, a highly applicable and extensible blockchain service system will be built, including protocol layer, service layer and application layer. The protocol and service layers provide technical extension and support for the final application platform products, in which the infrastructure service functions of the related fields are integrated to help build upper blockchain application scenarios. The application layer provides the end users with reliable, safe and fast blockchain applications. LBC will work together with industry partners and their technical service providers to explore the blockchain applications in the gene and stem cell industry and jointly promote the implementation of gene and stem cell therapies.

Overall Architecture

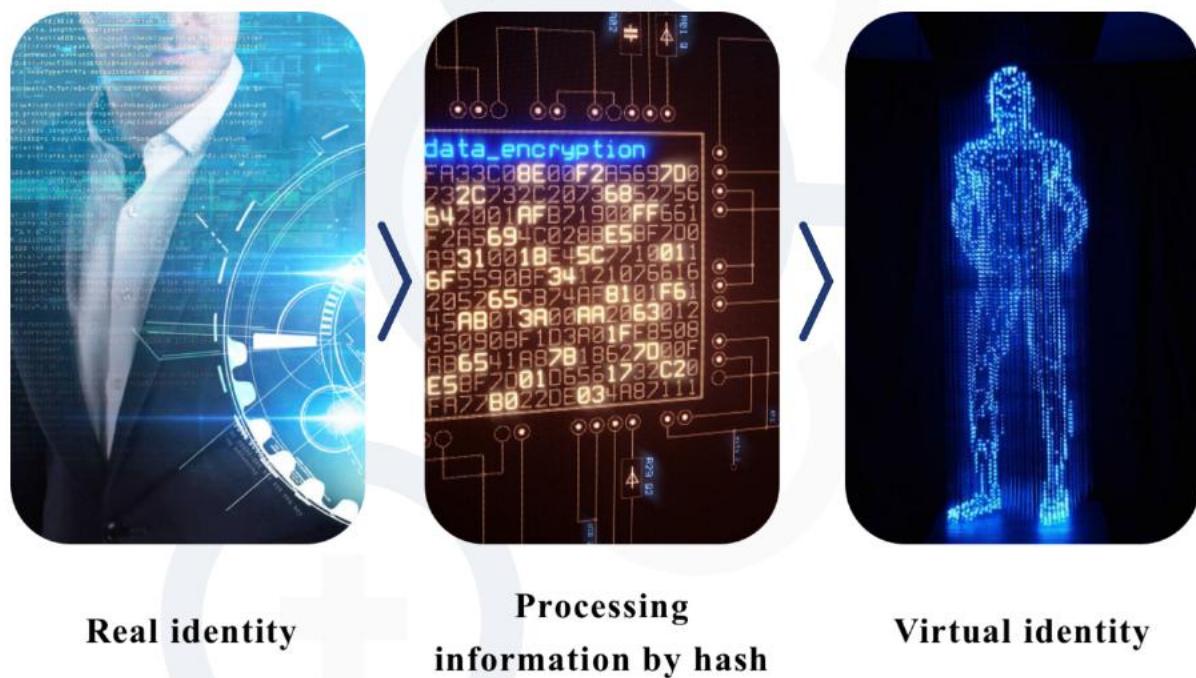


Multiple encryption

The sensitive information on the LBC system, such as privacy data, usage data, storage location, is designed with multiple encryption. And the cryptography public key will be added to the LBCTools and applications to promote a higher standard of security. The symmetric-encrypted key used by LBC is 2048-bit, which is a supremely secure method of data transformation in today's technology-based world.

Privacy Protection

The main difficulties and challenges of data sharing are how to share data while protecting personal privacy. Blockchain - based technology can guarantee the privacy of data and make data sharing possible while protecting its privacy. The data desensitization technology based on blockchain can guarantee the validity of data sharing when the data is desensitized. Blockchain data desensitization mainly uses Hash desensitization and differential privacy to protect the basic privacy of individuals from being leaked.



LBC application functionality

Main Application: Version 1.0 In the first iteration of LBCApplication, several specialized formulas and algorithms will be used to collect data from users, to determine health status and to perform rapid and accurate analysis of cells, molecules and genetics.



Application Scenarios

PART IV

Study of rare diseases and therapies

The genetic and stem cell ecological blockchain platform will invite related research organizations to join the community. With the increase of human genetic and stem cell data across national borders, LBC will be able to discover more answers to key questions about human longevity, genetic diseases, and aging. The main reason for the low cure rate of rare diseases is that the incidence is low and the available data is insufficient, so it is impossible to conduct sufficient research to obtain effective cure methods. The LBC ecological blockchain platform will provide more approaches for the study of rare diseases. On one hand, the increase of genetic and stem cell data can increase the sample size of rare diseases and accelerate the research process. On the other hand, the increase of relevant genetic and stem cell data can provide support for the pathogeny analysis of rare diseases, and provide simulated data for the study of medicine for rare diseases.

Simplifying cell and gene therapy workflow

Revolutionary cell and gene therapies offer significant promise to treat life threatening diseases. LBC will work together with medical practitioners to provide full-solution ancillary reagent services and provide flexible and pioneering tools to simplify therapy workflow at every step of the medical process.

Immune cell therapy

Immune cell therapy is an extremely promising approach for the treatment of many diseases with an immune component including cancer, autoimmune disease, and chronic inflammation. In many immune cell therapies, specific cell populations are isolated, genetically modified,



activated, and expanded to the large numbers required for patient treatment. T cells, NK cells, regulatory T cells (Treg cells), or dendritic cells can be redirected to attack tumors or amplify a local immune response. The immunosuppressive function of Treg cells allows therapies that specifically target an overactive immune system such as in autoimmune disease.

Genome engineering can introduce chimeric antigen receptors (CAR), T cell receptors (TCR), or other proteins to enhance the intended therapeutic activity. It is important to characterize cell phenotype and function throughout the manufacturing process to ensure high quality of the final cell product. LBCTools cell characterization is critical to ensure the cell product is the correct cell type, shows the correct secretory profile, and is free of undesired cells or contaminants.

A growing number of CAR T-cell therapies are being developed and tested in clinical studies. Although there are important differences between these therapies, they all share similar components. The CAR on the cell's surface is composed of fragments, or domains, of synthetic antibodies. The domains that are used can affect how well the receptor recognizes or binds to the antigen on the tumor cell. The receptors rely on stimulation signals from inside the cell to do their job. So each CAR T cell has signaling and "co-stimulatory" domains inside the cell that signal the cell from the surface receptor. The different domains that are used can affect the cells' overall function.

Over time, advances in the intracellular engineering of CAR T cells have improved the engineered T cells' ability to produce more T cells after infusion into the patient and survive longer in the circulation. There are currently a total four immune cell therapies that are approved by the FDA for the treatment of cancer:

- Axicabtagene ciloleucel (Yescarta®): a CD19-targeting CAR T cell immunotherapy; approved for subsets of patients with lymphoma
- Brexucabtagene autoleucel (Tecartus™): a CD19-targeting CAR T cell immunotherapy; approved for subsets of patients with lymphoma
- Lisocabtagene maraleucel (Breyanzi®): a CD19-targeting CAR T Cell immunotherapy; approved for subsets of patients with lymphoma
- Tisagenlecleucel (Kyrmriah®): a CD19-targeting CAR T cell immunotherapy; approved for subsets of patients with leukemia and lymphoma



Regenerative medicine

Expand the frontiers in regenerative medicine with the power and flexibility of stem cells. This emerging therapeutic field promises the ability to correct hereditary defects and to rebuild vital tissue functions lost to degenerative diseases or injury. The LBC system can help stem cell expertise to support regenerative medicine manufacturing.

Gene engineering services

The LBC system can help to develop innovative editing technologies for genome engineering, and leverage them with genetic experts' vast cell culture experience. The LBC system will help gene engineering teams specialize in complex projects and hard-to-transfect cell lines with the following research areas.

- Drug discovery - alteration of genes which encode proteins that serve as drug targets. Genetic screens speed the identification of novel drug candidates and improve drug efficacy and specificity.
- Gene therapy – delivery of genes into relevant cell types to correct genetic defects.
- Diagnostic tools – engineering cells to express proteins for detection of infectious and non-infectious diseases.



Business Model

PART V

LBC token overview

The LBC token will be implemented as an ERC-20 token over the Ethereum public blockchain. The token will primarily be used within the LBC ecosystem as a method for users to access the full range of LBC products and services. Given the self-contained nature of the ecosystem, a token-based model for product usage will support security and exclusivity of access for LBCApplication token holders, which will, in turn, drive the fundamental value of the token.

LBC Life Alliance

LBC will form a professional, open, and shared social organization -- LBC Life Alliance, inviting life technology companies, scientific research institutes, medical institutions, etc. to jointly solve medical, health, disease, and public health problems, and jointly build the application standards of gene and stem cell medical technology on the blockchain, and contribute to the cause of human health. The alliance will vigorously promote the integration of production, learning, research, and application, while strengthening industry self-discipline, promoting the standardization, specialization and scale of the gene and stem cell industry, and enhancing the overall development level and competitiveness of the biomedical industry.

The way to join the alliance is for institutions or organizations only. You must hold a certain amount of LBC tokens before you can become an official member of the alliance. Among the alliances, members have the ability to contribute gene and stem cell data, share scientific research results, and develop various medical applications.

Public welfare and industry code

In order to promote the research of gene and stem cell therapy and the development of regenerative



medicine, and ensure the safety and scientificity of gene and stem cell therapy and its research, LBC urgently needs to adopt comprehensive measures in relevant ethics, economy, law, technical management and public governance to create a better research environment for gene and stem cell therapy.

LBC will donate part of the tokens for the establishment of public welfare service facilities, provide humanitarian assistance for rare diseases and severe diseases, and provide funds for medical research in related fields, so as to promote the development of LBC and its alliances in humanitarian undertakings.

Purchase of products and services

The primary use case for the token will be the purchase of products and services through the LBC ecosystem. The token will be the exclusive means of purchasing within the ecosystem. As additional applications and services are added to the ecosystem, the token will gain utility as a means to access these new products.

Secure access

The LBC ecosystem will allow patients to quickly and securely access their medical records from anywhere in the world and provide users with an avenue to purchase LBC's products within the ecosystem. Additionally, the participation of physicians within the ecosystem will allow patients to access medical care through avenues, such as teleconferencing and video consultations inside the application. Because patients have control over their own medical data within the ecosystem, they can seamlessly consult with relevant physicians who can get up to speed on their case when users provide physicians with direct access to their medical records through the LBCApplication.

Exclusivity

With years of experience in the genetic and stem cell field, LBC is uniquely positioned to act as a curator of quality genetic and stem cell services for patients and their physicians. LBC token holders will have exclusive access to the set of products and services within the LBC ecosystem, allowing them to purchase what they need through the LBCApplication.



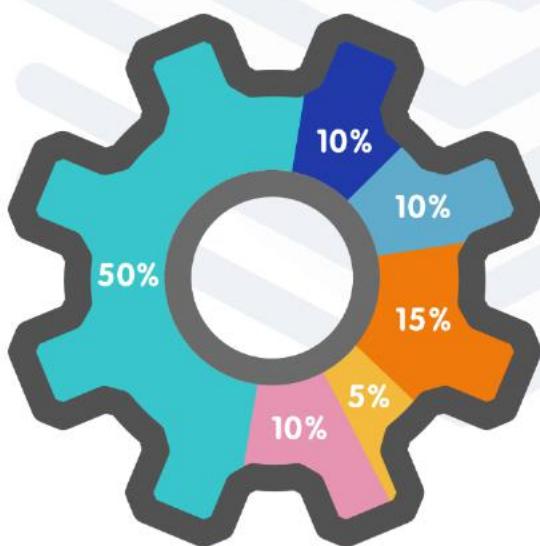
Exclusive access to LBC products and services ensures that token holders benefit directly from acquiring LBC tokens, which ensures the continued growth and development of the ecosystem itself. All purchases and tools can be completed using the token within the ecosystem, allowing for a seamless experience for patients, doctors, and other service providers. Using one token to access everything in the LBC ecosystem breaks down barriers for patients and service providers to gain access to these services, which increases the frequency of use for patients and service providers alike. The use of the token allows for quick and secure payments, particularly in an international setting when a patient has emergency medical needs while traveling or sees a physician in another country. It makes sense to create and use one exclusive token within the LBC ecosystem and application. The LBCApplication will be secure and self-contained using blockchain technology, the use of LBC tokens within the application will support the security of patient information.

LBC token issuance and distribution

The issuance of LBC token will immediately begin to change the cryptosphere and the development of genetics and stem cell research and medical applications.

Token name: LBC

Total token distribution: 3 Billion (3,000,000,000)



- ⚙️ **LBC Alliance reservation**
- ⚙️ **Private placement and medical merchants**
- ⚙️ **Team and advisors**
- ⚙️ **IT development, marketing and legal**
- ⚙️ **LBC Foundation reserved for emergency**
- ⚙️ **Vulnerability reward**



LBC Alliance reservation

LBC will initiate the genetics and stem cell R&D alliance to increase its reach over time with a structured international expansion program and by forging partnerships with other professionals, doctors, and merchants worldwide. The reserved token for LBC Alliance will be used to operate and sponsor genetic and stem cell labs and networks on a global scale in the long run.

Private placement and medical merchants

The private placement will come with our initial investors from various organizations. We will use the LBC token to sponsor the various genetics and stem cell products approved by local authorities.

Team and advisors

The team supports the project and expects its advisors to do the same. The LBC team has the drive and commitment to improve healthcare for those who need it most: the patients. 10% will be retained by the company, team, advisors, founders and future employees.

IT development, marketing and legal

Appropriate time and resources will be committed to the hardware, software, and R&D deliverables, which will enhance the product and concepts within the platform. LBC engineers and software solutions teams will work to ensure rapid delivery of, and security in, all aspects of the project.

Marketing of the LBCApplication will focus on expanding awareness and speeding the adoption and onboarding processes. As part of a targeted marketing campaign, LBC will allocate a number of tokens to individuals who are familiar with our company and want to promote our product to social media audiences around the world.

The landscape for initial coin offerings, tokens, and all forms of cryptocurrency are in their



infancy, with legislation continuing to evolve regularly. This coupled with the complex legal aspects of the medical profession move the LBC team to allocate substantial resources and funding to legal compliance across all aspects of the venture.

LBC Foundation reserved for emergency

Unpredictable events can be life-altering as well as expensive, resulting in financial emergencies. An emergency fund gives LBC the buffer we need to pay out-of-pocket expenses.

The purpose of an emergency fund is to improve LBC financial security by creating a safety net to meet emergency expenses.

Vulnerability reward

LBC is determined to ensure a secure environment for its users. Although our IT specialists are doing their best to find every possible vulnerability on our platform, there is always a slight possibility that a few of them could have been overlooked. Thus, we decided to introduce a bug bounty program. Every LBC user can take part in the program and earn rewards by reporting the bugs they find in our system.

LBC Distribution Schedule

After being listed on the exchange, unlock every 30 days, with a release rate of 25%

LBCSWAP

Traders can exchange tokens on LBCSWAP without having to trust anyone. Anyone can lend their cryptocurrency to the liquidity pool and then charge a fee. This is accomplished by a condition that naturally determines and balances the value that depends on actual interests. This is the main fully decentralized convention for automatic liquidity arrangements in Defi. The cost of tokens on LBCSWAP varies based on market interest rates rather than buyer or seller interest rates. You can basically make a token, and it is often recorded in LBCSWAP without approval. When you have your tokens, anyone can exchange or contribute to it, and the total amount of tokens obtained can be used to trade on LBCSWAP. The LBCSWAP stage is controlled by its own local token LBC, which is a blockchain token. Marking tokens in LBCSWAP will allow holders to obtain a portion of all the above fees paid in LBC. With the largest complete inventory of LBC tokens being



flagged and the use of deflationary tokens, we expect this utility token to provide key advantages when used in the early stages of LBCSWAP.

The goal of LBCSwap is to provide a safe place to trade your valuable crypto while remaining decentralized. LBC will constantly scale this Ecosystem so it may bring ever-increasing interested parties to the LBCSwap platform.

Organization And Team

Lifebank Technologies LTD

Lifebank Technologies LTD aims to maintain the sustainability of LifeBank Chain, the effectiveness of project development and the security of funds raised from the community.

The company will disclose the scope of activities related to the development, promotion and maintenance of LBC. In the event of an incident affecting the reputation of the company, the company shall conduct a public relations response after an internal evaluation and audit. The purpose of the company is to provide a professional international entity with certified medical products for digital asset fans and investors all over the world without violating the local laws and regulations.

Scientist and research team



CEO

Ryan Chris

Ryan Chris Decker is a notary and partner within the law offices of Cohen, Decker, Pex & Brosh. He has been a member of the Israeli Bar Association since 2008.

Attorney Michael Decker serve as chief legal counsel to several leading commercial companies within Israel in the high-tech field and also in the field of tourism. Additionally, he is on the boards of several influential nonprofit associations in Israel. He is also the co-founder of the Israeli Association for Democracy and Justice (ADJ). An organization which was established in order to fight anti-Semitism on an international level and to protect minority groups within Israel.





Dr
Randy Schekman

The Nobel Prize in Physiology or Medicine 2013. Cell biologist at the University of California, Berkeley



Dr
Eric Maskin

The Nobel Memorial Prize in Economics in 2012. Focus on game theory, contract theory, social choice theory, political economy



Dr
Sabeeha Merchant

Professor of Plant Biology at the University of California, Berkeley Member of the National Academy of Sciences (NAS) in 2012



Dr
Pere Gascón

Professor of Oncology, Faculty of Medicine, University of Barcelona, Spain. Director of the Laboratory of Molecular and Translational Oncology in the Clínic Hospital of Barcelona. Certified in Internal Medicine, Hematology and Medical Oncology by the American Board of Internal Medicine. Award as “Best Doctors” in USA



Dr
Konstantinos Kontzoglou

Professor at University of Athens. Focusing on the field of surgical oncology An active member of 11 international and 11 Greek scientific societies



LBC milestones

PART VI

Launch the exchange in November 2023;

Q1 to Q2 2024

Online exchange;

Develop and integrate Q1 smart contract technology, recruit potential gene research laboratories and stem cell science research teams;

Q2 LBC provides testing and trial operation of blockchain technology; Start testing and demonstrating the LBC program V1.0;

From Q3 to Q4 of 2024, cross-border construction will adapt to local laboratories in South Korea, Japan, Vietnam, the Philippines, and India;

Q3 LBC Application version 1.1 released; Doctors and demanders from South Korea, Japan, Singapore, and China are joining the LBC platform;

Q4 LBC Application 2.0 version released; Joining LBC in professionals, patients, genetics, and laboratories in Europe and North America; Online sales of genes and stem cell products; Announcement of the first LBC laboratory site selection and franchise expansion plan;

Q1 to Q2 2025

Hire the Big Four to conduct annual audits that comply with US accounting standards and provide audit reports; Release of LBC Application 3.0 version; Provide a fully functional platform for professionals and patients; Announce clinical development and research strategies in the fields of genetics and thousand cells;



Q3~Q4, 2025

Deploy offline nodes to build laboratories and offline product experience warehouses in countries such as Asia and Southeast Asia; LBCA Application V3 Release of version 5, including components for professionals to help more practitioners participate in research and learning, and contribute to the treatment of complex medical life diseases;

Disclosures and Disclaimers

The purpose of this whitepaper is to communicate who we are and what we are working toward in the software industry, explain our work with genetic and stem cell research, and clarify how we integrate medical features into our systems.

The information outlined in this whitepaper is not exhaustive and does not imply any elements of a contractual relationship. Its sole purpose is to provide relevant and reasonable information to potential token holders to help them determine whether to undertake a thorough analysis of the company with the intent of acquiring LBC tokens. Nothing in this whitepaper shall be deemed to constitute a prospectus of any sort or solicitation for investment, nor does it in any way pertain to an offering or a solicitation of an offer to buy any securities in any jurisdiction.

The product token has not been registered under the Securities Act, the securities laws of any state of the United States, or the securities laws of any other country, including the securities laws of any jurisdiction in which a potential token holder is a resident. The LBC token cannot be used for any purpose other than as provided in this whitepaper, including but not limited to any investment or speculative or other financial purposes. Nothing in this whitepaper shall constitute advertising or marketing publication and does not in any way relate to offering or bidding to purchase securities in any jurisdiction.



Risk disclosures

All information laid out in this disclosure and disclaimer that appears forward-looking is speculative and may change in response to numerous factors including technological innovations, regulatory factors, and/or currency fluctuations, including but not limited to the market value of cryptocurrencies related to LBC.

Furthermore, statements relating to matters outlined in this whitepaper that contain forward-looking statements, associated with LBC's present plan are related to objectives only and are not a forecast or projection of future results of operations. LBC does not take on any obligation to update any forward-looking statement to reflect events or circumstances after the date of this disclaimer.

Pre-sale and/or initial coin offering (ICO) participation can be considered high-risk trading; purchasing financial instruments via a pre-sale and/or ICO or utilizing services offered on the LBC website may result in significant losses or even in a total loss of all funds invested. No information provided on the LBC platform or website should be interpreted as investment advice. It does not constitute an offer or invitation by LBC to any user to buy or sell tokens or make any investment.

The LBCApplication will comprise a complex software platform and its launch may be significantly delayed due to unforeseen development barriers. LBC Token may be significantly influenced by digital currency market trends and their value may be seriously depreciated due to events in the digital currency markets not related to the Company's actions.



Legal Disclaimer

PART VII

PLEASE READ THIS DISCLAIMER SECTION CAREFULLY. IF YOU ARE IN ANY DOUBT AS TO THE ACTION YOU SHOULD TAKE, YOU SHOULD CONSULT YOUR LEGAL, FINANCIAL, TAX, OR OTHER PROFESSIONAL ADVISORS.

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This whitepaper does not constitute a prospectus or offer document of any sort and is not intended to constitute an offer of securities or a solicitation for investment in securities in any jurisdiction. LifeBank Chain does not provide any opinion on any advice to purchase, sell, or transactions with LBC tokens and the fact of presentation of this whitepaper shall not form the basis of any contract or investment decision. No person is bound to enter into any contract or binding legal commitment in relation to the sale and purchase of LBC tokens, and no cryptocurrency or other form of payment is to be accepted on the basis of this whitepaper.



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PART VIII

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