REJUVE
Longevity Network

Dedicated to Rejuvenation Science Advancement

Whitepaper

September 2019

Our Focus

Rejuve leverages blockchain technologies and tokenomics to incentivise individuals passionate about longevity to collaborate with clinics, labs and researchers working to develop rejuvenation therapies. As a membership network, Rejuve provides for rapid deployment of modern AI to improve and extend life.

Since 2018 Rejuve is incubated within **SingularityNET**, the Netherlands-based non-profit Foundation behind the world's leading decentralized platform for AI developers and users. Now that it has reached a certain level of maturity, Rejuve is spinning off from **SingularityNET** as a separate for-profit entity which operates independently while relying on **SingularityNET** based tools for its world class AI functionality and expertise.

Rejuve Founding Members believe it is time to combine leading longevity experts with cutting-edge AI to mine in-depth data from individuals to extend healthspan, support practical anti-aging regeneration therapies and work with universities and laboratories to test new hypotheses suggested by bio-AI tools. Rejuve Network Members concur that the time is now to advance science and play an influential role in the ongoing longevity revolution.

SingularityNET AI assists Rejuve to achieve its longevity mission via analyzing the biomedical, lifestyle and other data contributed by members. The novel economic logic of the RJV Token incentivizes contributions of data to create personalized longevity programs, monetizes member data to forward longevity initiatives and supports solutions and treatments by funding various anti-aging research and development initiatives.

By leveraging the data and energy of its Founders and Members, Rejuve aims to accelerate progress on the most important applications of modern science and technology: *to halt and reverse human aging*.
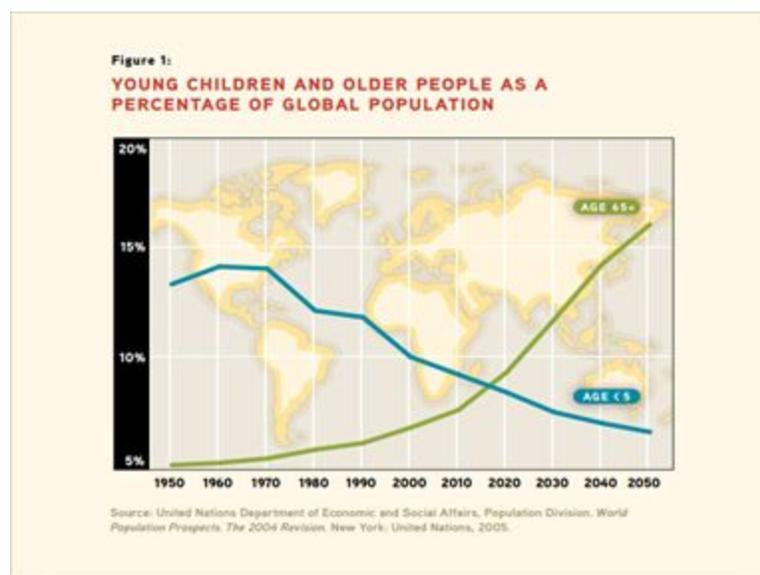
The Problem

The global healthcare and medical research establishment simply does not make personalized healthspan extension a top priority. Regulators are slow to cut red tape for promising longevity treatments. Limited economic incentives exist to align the interests of researchers, doctors and patients to share data and find solutions that can cure the aging disease.

The explosion in the quantity and complexity of experimental data generated by biomedical research is widely recognized. The amount of data produced daily in genomics doubles every seven months; within the next decade genomics could generate up to 40 exabytes of data. This creates a bottleneck in the conversion of discoveries to clinical applications. Given the exponentially growing number of scientific publications (global scientific output doubles every nine years), manual knowledge collection and curation is extremely challenging.

With the imminent arrival of the *silver tsunami* a solution is needed now. More people are dying than ever before – over 150,000 every day, of which two-thirds of deaths are related to aging – as the average age of the world's population rises rapidly. This dynamic creates all sorts of serious issues for individuals and society across the social and financial spectrum.

Biotech and AI technologies provide the tools needed to solve these problems, but these solutions need to be deployed in appropriate ways, something the current medical establishment does not adequately facilitate. Rejuve aims to solve these broader health extension issues, while providing unique benefits to its visionary early-adopter Members.

Figure 1:
YOUNG CHILDREN AND OLDER PEOPLE AS A PERCENTAGE OF GLOBAL POPULATION

AGE 65+

AGE < 5

1950 1960 1970 1980 1990 2000 2010 2020 2030 2040 2050

Source: United Nations Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2004 Revision. New York: United Nations, 2005.

Solution

Biomedical research bridged with AI technology is the solution to the aging disease problem. Contemporary clinical and laboratory techniques, aided by AI analytical, simulation and reasoning tools, can make profound progress toward abolition of human aging in the near-term. Rejuve is ready to lead the way in originating and refining new solutions, using AI to expedite the discovery of new diagnostic tools and anti-aging treatments.

Rejuve is a membership network designed to provide solutions to aging-related disease through AI-based comprehension and assessment of the vast amounts of clinical and biomedical data produced worldwide, together with data contributed by Network Members. The information derived from analyzing this data benefits Members with the tools and techniques to extend their healthy lifespans.

The Rejuve Network includes individuals interested to assist with and benefit from longevity and biomedical AI-driven research. Rejuve Members contribute personal medical, biological and lifestyle data to the **Rejuve Data Commons**, secured via cryptographic methods that give each member visibility into and control over their data. Member Clinics contribute anonymized data with patient consent. Via the **Rejuve Personal Data Lab** software platform, **SingularityNET** AI tools are applied to the Data Commons in cooperation with biological and medical scientists to gain information on aging, create new hypotheses and suggest treatments for age-associated disease.

Members receive numerous benefits, including a Rejuve Personalized Longevity Analysis to support and enhance decisions of medical professionals, nutritionists, fitness coaches and other experts. Personalized Longevity Plans are created by AI to leverage expert human knowledge to support Members.

Rejuve pursues carefully annointed AI-driven research initiatives via a democratic, decentralized approach to project selection and funded via the **Rejuve Reserve**. Through this process, hypotheses are generated in such critical areas as drug repurposing, driving new discoveries delivered to Members through Rejuve Clinics and otherwise and via a B2C e-commerce platform. While the long-term value of nutraceuticals and other treatments may pale in comparison to the effectiveness of future therapies discovered via AIs leveraging Member data, a core value is to assist Members to enhance health and longevity.

Business Model

The operation of Rejuve Network is facilitated by the RJV Token, a cryptographic token with a logic crafted for longevity-oriented value exchange. The RJV token is the tool with which Members are compensated for data contributions and with which individuals obtain Network services, such as personalized AI analytics. As Rejuve Network Members the RJV Holders benefit from a synergistic interaction between individuals, researchers, longevity experts and **SingularityNET**.

The business model for Rejuve is to sell RJV tokens to Members passionate about anti-aging therapies and interested in Longevity Plans, monetize data collected from Members through an incentive reward scheme based on the licensing of this data for research, and obtain a revenue stream through support, investment and licensing of new longevity research-based solutions.

Revenues obtained from licensing longevity therapies discovered using Member data will partially be used to provide discounted therapeutics to Members, in many cases supplied through Member Clinics. A percent of these revenues will be used to drive the creation of AI tools customized for bioinformatics, and application of existing AI tools to longevity data, including public data and data contributed by Rejuve Members. Findings with the potential to advance longevity science will be published via Rejuve through relevant journals in conjunction with partners to advance knowledge and build the Network's reputation.

This Rejuve business model is particularly designed to drive and exploit Network effects that connect biomedical and lifestyle data, AI and biomedical research as well as the clinical delivery of novel therapies to create for Members a virtuous cycle of economic and health value.

Secure Personal Health Data Management

AI and healthcare diagnostics are rapidly merging. It will not be long before data trading becomes an essential and lucrative part of a person's health plan. Medical data is a crucial aspect of communications between machines and humans in this ongoing transformation.

Enabling Members to upload personal medical data into Rejuve Data Commons, the Rejuve Network facilitates medical data trading in a decentralized, secure and patient-centric manner oriented to healthspan extension.

The Rejuve Data Commons provides a flexible method for collection and access to the data of Members and partners. The tokenization of data on blockchain allows Members to control and monetize data in a secure manner that is not readily available in the current medical ecosystem.

Rejuve Data Commons Member data is used to procure recommendations from AI tools and from healthcare practitioners, nutritionists and fitness coaches. This data can improve longevity clinical trials and optimize recruitment for these trials on an exclusive basis. Most importantly, the data fuels AI analyses and patient-centered research studies concerning age-associated diseases.

With strict protocols for the Rejuve Data Commons established on the blockchain, constructed and secured by SingularityNET tools, Rejuve manages the data pool for the good of the contributor and shares a percentage of revenues obtained from that data usage to promote the overall longevity mission. In this way, data that would otherwise be wasted or undervalued becomes a valuable commodity and longevity tool.

Rejuve Data Lab for Personalized Longevity

The delivery of Personalized Longevity Plans to Members, which leverages the data in the Rejuve Data Commons, is facilitated by the **Rejuve Personal Data Lab** (PDL) platform to ingest, visualize and analyze Member data, interoperating closely with the **Rejuve Forum** for communication and collaboration critical longevity issues among Members.

Founded upon a vision where client retention is essential in a relationship that may last a lifetime, Rejuve leverages ongoing participation by Members to evolve into an ever more powerful platform with time and experience. The ability to collect, analyze and process data for personalized longevity plans provides better results the more data contributed.

The Rejuve PDL toolset delivers personal healthcare and lifestyle services through a mobile application and web service. PDL tools enable collection of Member data from various modalities, such as locomotion traffic from wearable devices, sleep patterns, demographic data, clinical measurements, nutrition tracking and usage of supplements and medication. This data goes into the secure, blockchain-based Data Commons, whereby Rejuve experts advise and recommend personalized plans to achieve a healthier lifestyle. Results of this analysis are communicated via online reports, interactive AI chatbots, and direct interaction with medical experts in the Rejuve Network.

PDL tools scan medical forms and capture medical records and lab reports through an AI-powered optical recognition systems. Data ingested is stored through an Ocean Protocol based permission-styled access cloud storage that allows complete control over data. **SingularityNet** AI tools are used along with visualization frameworks to enable members to explore their health system and work with medical professionals to choose appropriate therapies.

PDL software provides a seamless capacity to download, store and share personal, healthcare and genomic user data from services such as 23andMe, Ancestry, Fitbit, Hexoskin, Apple Watch, MyFitnessPal, Medtronic CareLink Continuous Glucose Monitoring, Abbott FreeStyle, Clue Menstrual Tracker and PS Suite Electronic Medical Record. Powered by this data, PDL is at the center of the e-commerce platform to provide an open market opportunity for independent researchers to market health applications that run on SingularityNET. Services, supplements, diagnostic devices and other products are marketed to add value to the revenue model and PDL links into the Rejuve Forum, a networking platform where members and experts interact.

Research & Licensing

The final portion of the Rejuve platform is the research and licensing arm managed under the Rejuve Reserve – a research funding, product discovery and licensing business that applies AI to develop anti-aging and longevity solutions.

Through the Reserve, Rejuve resources are applied to research projects and organizations focused on longevity, healthspan extension and eradication of diseases. The Reserve works in a manner that joins the power of AI technology with investment management and business monetization strategies. The Reserve combines AI data mining utilization on medical data with investment management practices to maximize Network resources.

The Reserve participates in ongoing development, registration, application, ownership, use and licensing of proprietary intellectual property, including patents, copyright, secret processes, formulas and algorithms to enable life extension and healthspan improvement.

The Reserve team manages resources in a structured manner, in some cases sharing revenues derived from therapies or research whose development or deployment that is commercialized. This profit model enables Rejuve to expand the Reserve over time to benefit the Network. RJV Holders are invited to directly participate in the decision making for allocation of Reserve resources via a voting function associated with their tokens.

In the design and management of the Rejuve Data Commons and Personal Data Lab, and in the choice of projects that receive Reserve resources, attention is given to the need for a whole systems approach to longevity. On the R&D side, discovery and development of new therapies and repurposing of approved drugs are pursued in a data-driven manner. The output of AI analysis and computer simulation technology creates significant value for Rejuve and its Members.

RJV Distribution, Benefits & Governance

To support the operation of the Rejuve Network, one billion RJV Tokens will be pre-mined at a Rejuve Initial Exchange Offering (IEO). Following the IEO, an internal RJV Token Relations Department oversees the issuance of tokens to Network Members as well as communicates Rejuve initiatives to the longevity community as a whole.

RJV Token Holders benefit from the following:

1. Development of personalized Rejuve Longevity Plans
2. Access to exclusive information
3. Data Commons for storage and management of personal medical data
4. A personalized portal to collect and analyze data via Rejuve PDL software
5. Ability to buy goods and services related to longevity
6. A personal data usage monetization plan
7. Access to unique therapies and clinical trials
8. Information exchange on a customized forum
9. Benefits related to research investment
10. Interface with cutting edge AI tools
11. Interact with leading human and AI healthcare experts
12. A longer and healthier life

RJV Token Holders are invited to participate in the decision-making process for allocation of Rejuve Reserve and other resources via a voting function associated with RJV Tokens. RJV Holders have the opportunity to appoint a representative to the Rejuve Board of Directors to ensure a community-driven approach to strategic decision-making.

Candidate Research Projects

The R&D aspect of Rejuve supports a variety of longevity projects to varying degrees over time. The following projects are currently under consideration by the Rejuve Reserve Team in areas that range from regenerative medicine, health extension therapies, AI and research:

AI-Driven Systems Biology Human Aging Model
Dr. Ben Goertzel, Michael Duncan, Denis Odinokov & Lin Zheng

Thymus Regeneration, Repair, and Replacement
Gregory Fahy, MD, Ph.D.

Application of Evolutionary and Probabilistic AI to Learn designs for "molecular LEGO" drug molecules and regenerative nano-devices
Dr. Christian Schafmeister

P53 and Other Cancer Preventives and Therapies: A Researchers Retrospective and Call to Action
Dr. Dominic Man-Kit Lam et al.

Novel Targeted Immuno-Stimulant Modulations for Prevention of Infectious Diseases, Cancer and Other Diseases
Dr. Dominic Man-Kit Lam, et al.

Vision Research and Product Development (http://www.worldeye.org/)
Dr. Dominic Man-Kit Lam, et al.

Immunotherapy and Gene Therapy
Dr. Dominic Man-Kit Lam, et al.

Application of Evolutionary and Probabilistic AI to Learn Stem Cell Differentiation and Somatic Trans-differentiation Protocols
Dr. Ben Goertzel & Michael Duncan

Ion Exchangers to Eliminate Toxins within Animal Models and in Humans
Dr. Krešimir Pavelić and Dr. Sandra Kraljevic Pavelić

Strategic Partners

Rejuve works closely with the following partners to develop first use cases for the Rejuve Network:

Rejuve benefits from a close founding partnership with **SingularityNET**, an open-source protocol and collection of smart contracts that enables a decentralized market of coordinated AI services.

SingularityNET completed a record-breaking US$36M token sale in December 2017 after a 66-second public crowd sale.

MOZI is a ground-breaking AI bioinformatics company that creates software for regenerative medicine and novel therapeutics for age-related disease.

Through MOZI's tools, AI scientists upload datasets to the cloud, enabling them to analyze data in the context of personal databases and the world's published biomedical knowledge.

Rejuve Team

From Hong Kong, China, Europe, US, and the Middle East, Rejuve Team Members are passionate about AI, blockchain, longevity science and the opportunity to improve people's lives. We bring together decades of experience in AI, medicine, bioinformatics, and marketing to provide a world-class team to deliver results in the pursuit of longevity.

Dr. Dominic Man-Kit Lam, Chairman & Chief Biomedical Officer
Globally acclaimed scientist, philanthropist, award-winning artist, educator, medical professor and entrepreneur, Dr. Lam founded LifeTech Group to develop healthcare products and founded the World Eye Organization (WEO). His patent on "edible vaccine" was named by MIT as one of "five patents that will transform business and technology", and by Time Magazine as one of the ten most important inventions in the 21st century.

David Lake, Director & Chief Executive Officer
Based in China for over two decades, Lake is the Investor Relations Director for **SingularityNET** and Founder of Greater China Capital Inc., a financial consulting group that participates in regenerative medicine projects.

Dr. Ben Goertzel, Director & Chief AI Scientist
World leading AI and biotech researcher and founder of **SingularityNET** AI community network and MOZI.AI. Dr. Goertzel is renowned as the Father of Artificial General Intelligence (AGI) and played a leading role since 2001 in the application of machine learning to longevity genomics.

Tony van de Ven, Chief Innovation Officer
Highly accomplished entrepreneur, Van de Ven is an advocate of longevity and healthspan extension and the Chief Longevity Officer of MOZI AI.

Denis Odinokov, MBBS, MSc, PMP, Chief of Genetics & Bioinformatics
A trained physician, biomedical engineer, bioinformatician, seasonal research and project manager, Mr. Odinokov has pursued a career focused on science, technology and longevity treatment research for anti-aging with top rank global relationships across the health sector.

Dr. Deborah Duong, Director of AI Development
Thirty years of work in Complex Adaptive Systems and distributed AI, including applying Neural Networks, Bayesian Networks, Evolutionary Computation and Distributed Agents to problems of population health and personalized medicine.

Drs. Ibby Benali, Director of Product Development
Experienced team leader of content developers and decentralize AI technologists. Holds a degree in Digital Business Studies. Tech Marketing Manager and Data Protection Officer at SingularityNET.

Bruce J. Klein, Director of Outreach
Created the Immortality Institute (Longecity) in 2002, and participated in the creation of Singularity University and the AGI Conference series.

Tommy Kwok Yuen, Chief Financial Officer
Extensive experience in accounting, management consulting, corporate restructuring, business development, financial modeling, corporate finance and IPO issuance in Greater China and the US.

Louis Man-Fat Lam, Chief Administrative Officer
Long background in the health industry as President of LifeTech Group and as President of the World Eye Organization (WEO) with the mission of preventing and treating eye disease.

Network Advisors

Kent Zaitlik, Network Advisor
Founder and CEO of MOZI AI, an AI bioinformatics company that creates software for the development of regenerative medicine and novel therapeutics for age-related disease.

Javin Pierce, Network Advisor
Founder of Pierce Surgical and a medical entrepreneur active in University and private sector R&D involving products and therapies for tissue engineering, stem cell biology and regenerative medicine.

Michael Duncan, Network Advisor
Founder and computational biology chief at MOZI AI Health, brings 15 years of clinical experience as a physician assistant and academic training in applied mathematics (BA, UC Berkeley) and epidemiology (MPH, SUNY Downstate) to research at the intersection of AI and bioinformatics.

Scientific Advisors

Dr. Krešimir Pavelić, Chairman of the Scientific Advisory Board
Medical doctor and molecular biology professors who practice and teaches across Europe and the US at premier institutions. Head of the Biotechnology Department at the University of Rijeka and Dean of the University of Pula Medical School.

Dr. Sandra Kraljevic Pavelić, Scientific Advisory Board
Holds a Biology Ph.D. and is the Associate Professor at the Department of Biotechnology, University of Rijeka, and Head of Centre for High-throughput Technologies.