VitaLabs

VitaLabs is VitaDAO's in-house network of interdisciplinary scientists dedicated to pioneering cutting-edge longevity science. Our mission is to radically extend human healthspan and lifespan by developing cutting-edge research while empowering democratic ownership of intellectual property through Intellectual Property Tokens.

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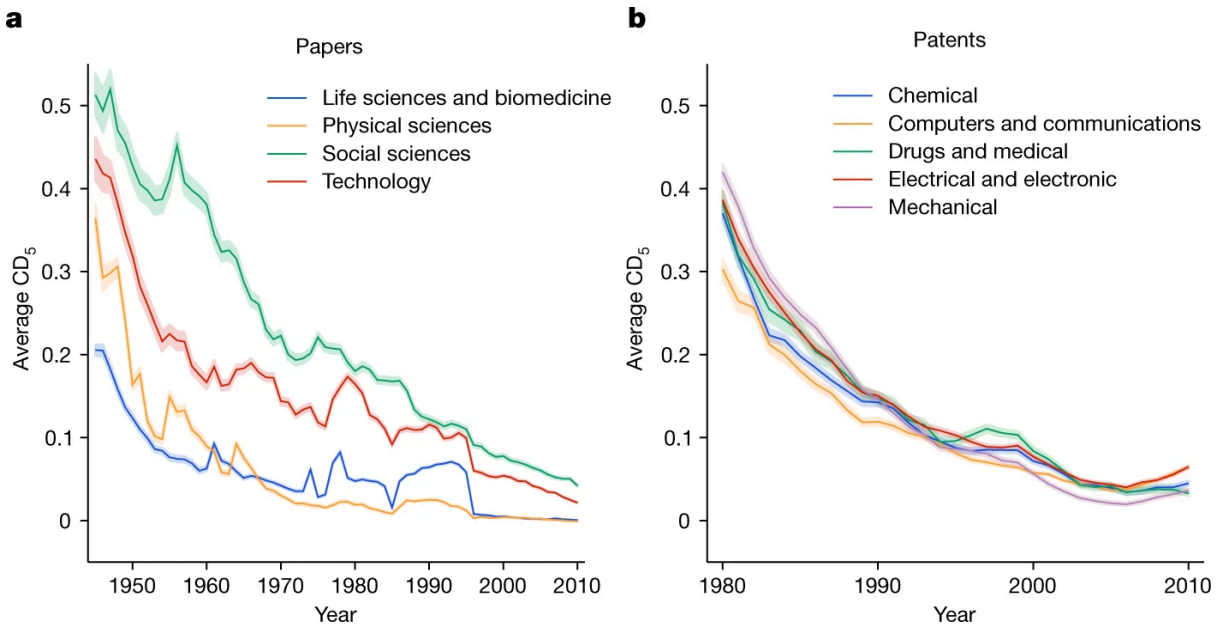
Motivation

TL;DR

Traditional academia discourages disruptive innovation by favoring safe, incremental projects. This stifles groundbreaking discoveries despite increased funding. Decentralized Science (DeSci) offers a solution by promoting transparency, collaboration, and risk-taking. VitaLabs, through VitaDAO, supports high-risk, transformative projects in longevity that others may avoid.

Traditional academia and funding mechanisms often stifle disruptive innovation by favouring incremental advancements and established paradigms. Grant schemes typically reward "safe" projects with predictable results, while the peer review process can suppress novel ideas, as reviewers may favour research aligning with their own views. This creates a conservative environment where scientists may avoid pursuing unconventional research to protect their careers, leading to a decline in groundbreaking discoveries despite increased funding and publications. Researchers who challenge prevailing paradigms risk their careers, as negative reviews from influential figures in the field can impact future funding, publications, and job prospects. This creates a culture of conformity where scientists may avoid pursuing innovative or controversial research to safeguard their careers. Quantitative evidence supports the decline in disruptive science (Park, Leahey and Funk, 2023, Nature).



Decline in disruptive science over time

*the CD index characterizes how papers and patents change networks of citations in science and technology; CD index five years after the year of each paper's publication is indicated by CD5

The study indicated that despite an increase in the number of scientific papers published and the amount of funding available, the proportion of papers that challenge existing paradigms and open new research directions has decreased. Certain research areas can be dominated by key opinion leaders (KOLs) who shape the direction of the field. These influential figures can create and perpetuate "false paradigms" by promoting their own theories and marginalizing alternative viewpoints. The field of Alzheimer's research, for example, has

faced criticism for its focus on amyloid-beta plaques, often at the expense of exploring other potential causes and treatments. The "mouse model" controversy, commonly referred to as "Mouseheimers," revolves around the reliance on mouse models to study human diseases, particularly Alzheimer's disease. Critics argue that while mice can be genetically engineered to exhibit symptoms similar to human conditions, these models often fail to accurately replicate the complex biology of human diseases. As a result, treatments that appear effective in mice frequently do not translate to successful human therapies. This controversy underscores the limitations and potential misdirections of using animal models, raising concerns about the efficacy of such research in developing human treatments.

Decentralized Science (DeSci) offers a solution by fostering a more open, transparent, and collaborative research ecosystem. Web3 tools can provide improved incentive structures and anonymity options for researchers who would like to take part in both the traditional and decentralised science worlds without impacting their career.
Scientific research, particularly in academia, has traditionally relied on funding from governments and charities. The emergence of the DeSci movement has introduced a fresh and dynamic revenue stream from the crypto community, expanding the overall funding available to the field without disrupting traditional sources.
Embracing DeSci can rejuvenate the scientific landscape by encouraging high-risk, high-reward research that challenges existing paradigms and drives significant advancements.

VitaLabs strives to establish VitaDAO as the go-to platform for groundbreaking and transformative ideas—projects that have yet to be explored and may never materialize without our support. By uncovering new directions, fostering innovation, and funding proof-of-concept studies, the DAO aims to provide value to the longevity field by taking on high-potential risks that others may hesitate to take, but may yield significant advancements.

VitaLabs Fellowship Program

In order to attract top talent into VitaLabs, VitaDAO will run a Fellowship program targeting creative and independent thinkers passionate about longevity to collaborate, ideate, and develop groundbreaking ideas.

Outreach strategy

- Podcasts, newsletters and spaces to raise awareness about the opportunities in VitaLabs.
- Leverage events & conferences

Key benefits for Fellows:

- **Creative & Scientific Freedom**: You will have full autonomy to come up with your own ideas and explore novel hypotheses.
- **IP Ownership**: Enabled by blockchain tech, you'll have a unique opportunity to retain an ownership stake of any intellectual property generated by you and your

colleagues - we truly believe in giving scientists the recognition they deserve from innovations they create!
- **World-Class Network**: You'll have access to VitaDAO's extensive network of scientists, serial biotech entrepreneurs, and senior pharma executives who will support your research and entrepreneurial endeavours.
- **Funding**: The VitaDAO community will provide generous monthly stipends for the fellows, as well as the funding to commission experiments & potentially launch new biotech companies.

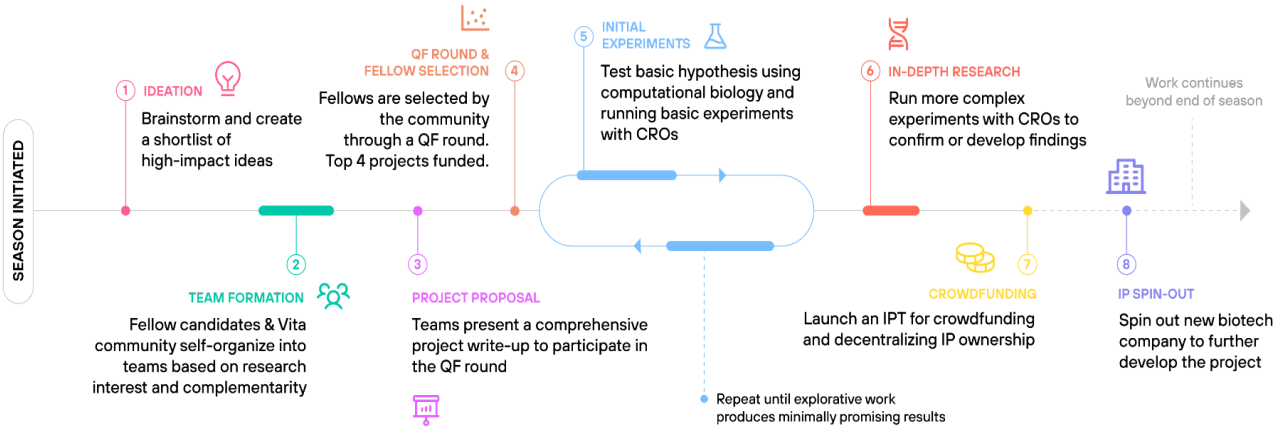
Comparison vs other Fellowship Programs:

- 50Y: 8 weeks, education only, more of a course nights and weekend lectures.
- YC: 8 weeks full time, very intense, working alone on their own ideas.
- Nucleate: 4 months, heavy emphasis on mentoring and matching with a cofounder to work on their own idea.
- Flagship pioneering: "Apprenticeship for scientific imagination".
- Deep Science Ventures: Internal process of ideation (area of interest and opportunity), external hire of EIR.
- Apollo (venture creation): Independent research within a defined area of interest, connect with leading scientists, co-develop.
- **VitaLabs:** Internal ideation, support from EIR, creativity and independence, supercharge collaboration, IP.

VitaLabs: Workflows

Seasons

A Season is a period of 4 months where the VitaDAO community selects and develops up to 4 projects.



Season 1 - Time Frame & Deadlines

Timeline

- Applications open: Oct. 20, 2024
- Applicants Onboarding (1st batch): Nov. 8, 2024
- Quick start Ideation: Nov. 8, 2024
- Ideation, team formation and project submission: Nov. 8 - Dec. 30
- Quadratic Funding Start date: Jan. 6, 2025
- Quadratic Funding Results: Jan. 15, 2025
- Projects start date: Jan. 15, 2025
- Projects runtime: Jan. 15 - Apr. 30, 2025

Deadlines

- Applications: Dec. 25, 2024
- Project Submission: Dec. 30, 2024
- Quadratic Funding Round: Jan. 15, 2025
- Midterm report: Mar. 15, 2025
- Final report: Apr. 30, 2025

Projects Roadmap

1. Ideation

The Ideation stage serves as an integral part of the selection process for becoming a VitaLabs Fellow. This phase provides a platform for fellowship applicants to introduce themselves and present their innovative ideas to the broader VitaDAO community for the first time. It is designed to foster collaboration, open discussions, and the formation of teams

that can drive groundbreaking projects in longevity science. By actively engaging in the Ideation stage, applicants demonstrate their initiative, collaborative spirit, and commitment to advancing longevity research. This process not only enhances the quality and diversity of project proposals but also strengthens the VitaDAO community by fostering connections among individuals passionate about extending healthy human lifespan

- Every fellowship applicant is invited to join this stage and introduce themselves and their ideas to the VitaDAO community for the first time. Applicants are encouraged to share hypotheses and research proposals.

- By sharing their ideas with the community, applicants can receive valuable feedback, refine their proposals, and identify potential collaborators. This interaction helps in strengthening their projects and building teams with complementary skills.

- Unlike traditional selection processes, this stage emphasizes community engagement over centralized decision-making. **Success is determined by the applicant's ability to communicate their ideas compellingly and attract support from peers and community members.**

- The goal is to stimulate open discussions that lead to the identification of gaps and unrealized opportunities within the longevity space.

- Applicants are encouraged to refer to the *Appendix: 1. Suggested Season Verticals* for inspiration. These topics reflect areas of interest previously expressed by the VitaDAO community, offering guidance but not limitations on the scope of proposals.

2. **Team Formation**

Teams are crucial for turning innovative ideas into impactful projects. We encourage the formation of teams that combine diverse skills and backgrounds to maximize creativity and innovation. By emphasizing collaborative synergy, inclusive participation, and strong support systems, VitaLabs aims to cultivate teams that are well-equipped to push the boundaries of longevity science. We believe that when diverse minds come together with a common purpose, extraordinary innovations are possible. The main guidelines for team formation are as follows:

- Teams are encouraged to form around shared interests and to optimize for complementary skill sets.

- Members of the broader VitaDAO community are also welcome to form teams independently of the Fellowship Program.

- Teams in formation have the freedom to discuss and develop their project specifications in separate communication channels.Teams will be required to open up new project-specific threads in the VitaLabs Discord channel for openness and collaboration.

- While the VitaLabs Core Team has the option to join any team, their primary commitment is to support projects accepted into the program. They will provide guidance, resources, and mentorship to ensure that each team has the tools needed to succeed. Whether or not they choose to participate directly in a project, the Core Team is dedicated to fostering an environment where all teams can thrive.

- Any member is free to join more than one team.

3. Projects Proposal

At this stage, newly formed teams are ready to move their innovative ideas into formal project proposals for participation in the upcoming Quadratic Funding Round. This is a critical step where teams articulate their vision, plan of action, and resource needs to the VitaDAO community. Teams are expected to prepare comprehensive proposals adhering to specific guidelines provided by the VitaLabs Core Team. While a detailed template will be supplied ahead of time, proposals should thoughtfully address the following key elements:

  - **Detailed Budget**: Clearly outline the total funding amount requested and provide a transparent breakdown of how the funds will be utilized. This should include Fellow stipends (fixed rate), allocations for experimental costs, equipment, personnel, and any other relevant expenses.

  - **Team Composition**: Specify the Fellows leading the proposal, ranging from zero to a maximum of three. If no Fellows are leading, the project is considered fully community-driven. There's no need to list all community participants at this stage, as additional contributors may join later. Highlight the unique strengths and expertise that each Fellow brings to the project.

  - **Initial Roadmap of Planned Experiments**: Present a coherent plan of the proposed experiments or research activities. This roadmap should detail the methodologies, experimental design, key milestones, and expected timelines.

  - **Problem Statement and Proposed Solution**: Articulate the specific problem or gap in the field of longevity science that the project aims to address. Describe the innovative solution or approach the team intends to pursue. Emphasize the scientific rationale, novelty, and potential impact of the proposed work.

  - **Commercialization Potential**: Briefly discuss the potential pathways for translating the project's outcomes into practical applications or commercial ventures. This may include plans for IP protection, market analysis, partnerships with industry stakeholders, or strategies for scaling the innovation.

Teams will submit their proposals through a designated platform by the specified deadline. Adherence to the submission guidelines is crucial for the proposal to be considered in the Quadratic Funding Round.

4. Funding Round and Fellow Selection

The Funding Round is a critical phase where projects compete for financial support through a **Quadratic Funding (QF)** mechanism. This funding model empowers the VitaDAO community to democratically allocate resources to the projects they believe hold the most promise in advancing longevity science. By leveraging QF, VitaLabs ensures that projects with broad community support receive proportionally more funding, promoting inclusivity and amplifying the impact of individual contributions.

- VitaDAO commits a Total Funding Cap of **$200,000** per Season in ETH or USDC to serve as the matching pool for the QF round.

- Community members, irrespective of their direct participation in projects, use their VITA tokens to support the projects they like the best.

- VITA tokens contributed are locked until the end of the season or the project's IPT launch.

- At the end of the funding round, the QF algorithm calculates the matching amounts for each project based on both the number of contributors and the total contributions.

- Up to **4 projects** with the highest community support are selected per season. The QF algorithm will redistribute funds pro-rata to the top 4 projects if more than 4 projects receive community support. VITA tokens locked in support for projects that don’t end up in the top 4 will be returned to members and will not be redistributed to the top 4 projects.

- Projects securing less than their proposed budget may adjust their plans to fit the funding received or opt to withdraw.

Fellows are officially selected as the result of the QF Round, ensuring alignment with the projects that have garnered the most community support.

5. Initial experiments

Following the successful funding round, selected projects move into the Initial Experiments phase. This stage focuses on conducting low-cost, high-impact experiments designed to provide a minimal viable proof of concept. The objective is to generate preliminary data that minimally validates the project's hypotheses and guides further research and development.

- At this stage, projects are encouraged to pursue cost-effective strategies such as computational biology and/or engage with CROs for affordable, small-scale

laboratory experiments. Refer to the "*Appendix: Example Range of CRO Costs"* to estimate and manage experimental costs effectively.

- It's expected that all research done in this step is conducted fully outside and independent of Fellows' affiliated institutes.

- Projects will be required to provide comprehensive updates to the broader VitaDAO community. Emphasizing transparency and the principles of open science, teams are encouraged to share all generated data while safeguarding any confidential information related to potential intellectual property.

- This phase should be iterative. Teams are expected to refine their approaches based on results. This cycle continues until enough data is collected to make an informed go/no-go decision about advancing to the next stage.

6. **In depth research: Continued experimental process**

Following successful initial experiments, projects may advance to **In-depth Research**. This phase focuses on conducting further experiments to validate hypotheses and reduce risks associated with the project.

- Engage CROs for more extensive and detailed studies. Refer to the "*Appendix: Example Range of CRO Costs"* to estimate and manage experimental costs effectively.

- It's expected that all research done in this step is conducted fully outside and independent of Fellows' affiliated institutes.

- Build upon initial findings to strengthen the evidence supporting the project's hypotheses.

7. **IPT and Crowdfunding**

As projects generate promising data and validate their hypotheses, they become eligible to advance to the **IPT and Crowdfunding** stage. This phase provides an opportunity for teams to secure additional funding and community support to further develop their projects.

- The proposal to launch an IPT should be submitted as an open community proposal on **Snapshot**, allowing all VitaDAO members to participate in the decision-making process. The Snapshot proposal should outline the project's achievements, future plans.

- Upon approval, VitaDAO and its operating Pods will facilitate an IPT Sale similar to VITARNA and VITA-FAST to facilitate crowdfunding and project development.

- The IPT launch follows the established tokenomics model outlined in the ***Economics & Framework for IPT Allocations section***. This includes allocations to team

members, community contributors, public sale participants, and VitaDAO, ensuring fair distribution and incentive alignment.

8. **Spin-out creation**

As projects reach maturity and exhibit strong potential for real-world application, they advance to the **Spin-out Creation** phase. This stage focuses on transforming innovative research outcomes into viable ventures that can make a tangible impact on human health and longevity.

- Projects will have the opportunity to collaborate with seasoned entrepreneurs within the VitaDAO community. These entrepreneurs will work closely with project teams, providing mentorship and expertise in business development, strategy, and operations.

- VitaDAO will assist with incorporating new ventures in strategic jurisdictions that are favorable for nascent biotech/crypto startups. This ensures optimal legal and financial frameworks for the company's growth.

- The VitaDAO community will also provide guidance on bridging blockchain-native IP to the real world. Projects will also be able to tap into VitaDAO's extensive network of investors, industry experts, and potential partners to accelerate the venture's development.

Economics & Framework for IPT Allocations

VitaLabs operates on a community-driven economic model designed to incentivize participation, foster innovation, and create value for all stakeholders—including contributors, fellows, funders, and the broader VitaDAO community. The key components of this economic framework are bounties for referrals, a Quadratic Funding mechanism to support projects, and decentralised ownership of research IP through Intellectual Property tokens.

Bounties

To encourage the recruitment of talented contributors and the generation of novel ideas, VitaLabs offers a bounty system:

- **Referral Bounty**: Community members receive a bounty of **500 VITA** tokens for referring candidates who subsequently propose a project idea, either individually or as part of a team. If that project idea ends up being funded by VitaDAO as the result of the Quadratic Funding Round, referrer will receive an additional **0.1%** of that project’s IPT supply if/when it launches. This incentivizes the entire community to actively seek and bring in high-potential contributors to VitaLabs. There’s a hard cap of 500 VITA per person irrespective of the number of referrals but no cap on the IPT allocation. For instance, if a person refers 4 Fellows, 3 of which propose projects for funding and 2 of them end up launching an IPT that person gets 500 VITA for **all**

referrals + 0.1% of the IPT supply **for each one** of the projects that launched an IPT.

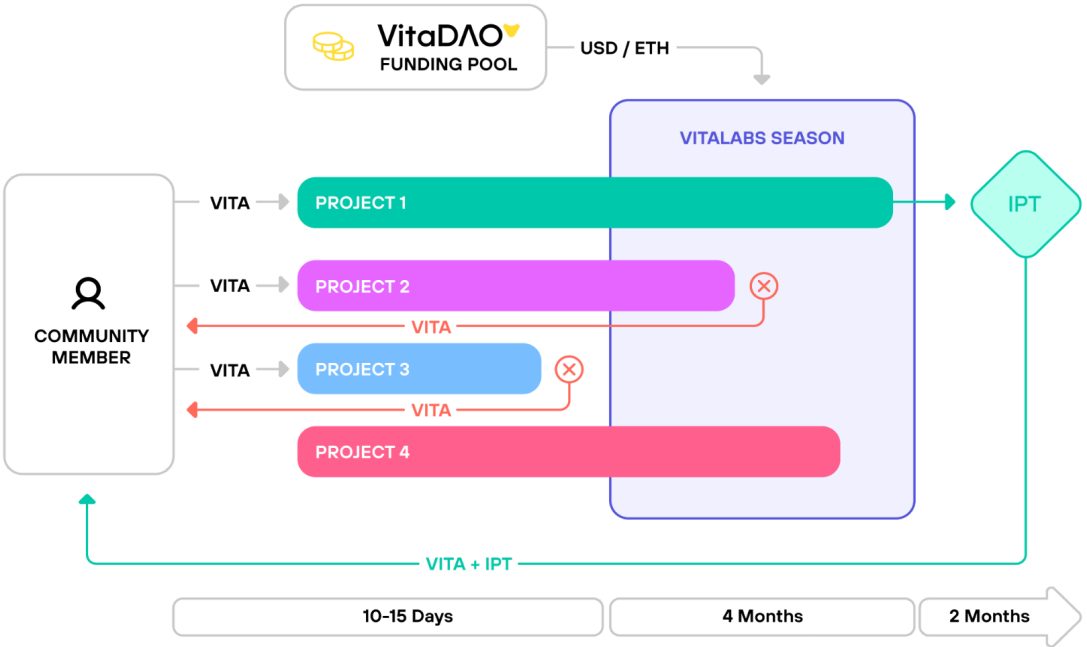
- **Token Utilization**: The awarded VITA tokens can then be used by the referrer to support project ideas during Quadratic Funding (QF) rounds (described below). This not only reinvests VITA tokens back into the ecosystem but also allows referrers to have a stake in the success of the projects they helped bring in (exact mechanisms explained below).

Funding

VitaLabs will employ a Quadratic Funding (QF) mechanism, supported by VitaDAO, to finance multiple projects in parallel and ensure community involvement in funding decisions:

- **Initial Funding Pool**:
  - VitaDAO commits a fixed amount of **$200,000** in ETH or USDC as the Total Funding Cap per Season to create an initial funding pool, which is then distributed across multiple projects based on community contributions. This pool serves as a Matching Fund to amplify community support through the QF mechanism and allows for multiple projects to be pursued in parallel, fostering a diverse range of innovative ideas.

- **Community Participation**:



    - Community members can contribute VITA tokens to projects they wish to support. The QF mechanism ensures that projects with broader community support receive more funding from VitaDAO, even if individual contributions are small. This democratizes the funding process and encourages widespread participation.

    - VITA tokens contributed will be locked until the end of the season or until the IPT for that specific project launches, whichever comes later. If the Season ends and the project is discontinued, then all VITA tokens will be sent back to community participants. If the project progresses successfully and launches an IPT, community members will get an NFT representing an LP (liquidity provider) position in a Uni v3 pool created between the IPT and VITA.

    - The hypothetical LP position will be **50% in VITA and 50% in the newly launched IPT with equivalent ETH/USDC amounts**. The exact amounts will be calculated at the time the liquidity pool is set up.

- **Project Selection**:
    - Each Season and at the end of the QF Round, VitaLabs will select up to four **(4) projects** to receive funding and support. This limit allows for focused attention on each project, ensuring that adequate resources and mentorship are available to maximize their chances of success.

    - Each project can have between **0 and 2 fellows** and will be required to outline an experiment plan constrained by a budget.

    - Projects accepted for development that secure a Matching Amount from VitaDAO that is **greater than** the proposed budget will receive the proposed budget as funding, with the difference being redistributed pro-rata to other selected projects or returned to the treasury if there's no other project(s) to redistribute to.

    - Projects accepted for development that secure a Matching Amount from VitaDAO that is **less than** the proposed budget will have the option to trim the budget and accept the funding amount or waive the project. If it decides to waive the project, the Matching Amount granted by that project will be distributed pro-rata to other project(s) accepted for development. If there's no other project, the Matching Amount should return to VitaDAO's treasury.

Incentive Structure

- **For Supporters**: As explained above, community members that express support for selected projects will receive an LP position on a VITA <> IPT Uni v3 pool to be created for projects that progress successfully and launch IPTs. If the project does not move forward, their VITA tokens are returned. This provides a balanced risk-reward scenario for community funders and direct exposure to the IPT they

supported.

- **For Fellows**: Fellows receive support from VitaDAO, including funding for experiments, a monthly stipend of $2,000/month, a performance bonus in VITA, access to community resources, and ownership stakes in any IP generated.

- **For VitaDAO**: VitaDAO has an incentive to help projects succeed and launch IPTs, as this enhances the value of the ecosystem by increasing the number of IP assets in the Web3 market.

Tokenomics (IPTs)

The tokenomics framework for projects launching from VitaLabs is meticulously designed to align incentives among all stakeholders—fellows, community contributors, investors, and VitaDAO itself. When a project progresses successfully and launches an Intellectual Property Token (IPT), the total token supply is allocated in a manner that rewards contribution, encourages community participation, and ensures the project's sustainability and growth.*****

****All IPT allocations outlined below are subject to change and will be subject to vesting schedules to be specified in a forthcoming Whitepaper at the event of the Genesis Sale.***

IPT Token Allocation

- **Team Allocation (30%)**
    - **Fellows (0-20%)**:
        - A substantial portion of the total IPT supply is allocated to the fellow(s) who have led the project's development. This significant stake ensures that the fellow(s) are highly incentivized to drive the project's success and benefit proportionally from its achievements. Respecting the cap of 2 Fellows per project, this following specifies the exact distribution in each scenario:
            - Project with 0 Fellows: 0%
            - Project with 1 Fellows: 10%
            - Project with 2 Fellows: 10% each
        - Projects can be led by 0 (fully community driven) to max 3 fellows. If a project proceeds without fellows, the allocation designated for fellows increases the portion allocated to Community Contributors.
        - Each fellow can receive a maximum of 10% of the total IPT supply.
    - **Entrepreneur in Residence (EIR) (4%):**
        - A fixed allocation of 4% is reserved for the EIR. Its core responsibilities include providing leadership, strategic direction, and management expertise to drive the project forward, especially during

the commercialization phase.

        - If a Fellow or a Community Contributor ends up also being assigned the EIR role, its IPT allocation will be cumulative.

    - **Community Contributors (6-26%):**
        - An additional % of the IPT supply is reserved for other community members who have supported the project.

        - This includes individuals who referred fellows (fixed allocation of 0.1% per successful referral), contributed ideas, expertise, or resources that were instrumental in advancing the project.

        - To allocate this portion fairly, VitaDAO will develop an automated attribution system that assesses and rewards the contributions of eligible community members. Community Contributors receive the remainder of the Team Allocation after allocations to Fellows and the EIR.

        - Depending on the number of fellows involved, Community Contributors receive between 11% and 41% of the total IPT supply, therefore projects with fewer fellows result in a larger percentage allocated to Community Contributors, recognizing the greater relative input expected from the community in such cases.

- **IPT Public Sale (20%)**
    - Fundraising and Stakeholder Expansion: A fixed amount of 20% of the IPT supply is made available through a public sale. This allows supporters to participate directly in the project, providing necessary capital and broadening the base of stakeholders committed to the project's success.

- **VitaDAO Allocation (20-45%)**
    - This ensures that VitaDAO retains a vested interest in the project's long-term success, aligning the organization's goals with those of the project and its contributors.
    - The VitaDAO community and its Pods will support the project(s) by:
        - Financing experiments and Fellows
        - Leveraging its network to facilitate connections with top-tier CROs, Biomedical companies, etc
        - Creating an attribution system that rewards contributors fairly
        - Managing all technical Web3 requirements
        - Managing the launch of IPTs, including whitepaper creation, marketing materials, investors outreach, etc.

- **Uniswap v3 Liquidity Pool (5-30%)**

- The remaining IPT tokens, after allocations to the team, public sale, and liquidity pool, are allocated to create a liquidity pool on Uniswap v3, paired with VITA tokens. This pool will be seeded with VITA tokens contributed by the community during the Quadratic Funding (QF) round.

Appendix

1. Suggested Season verticals

VitaLabs is committed to pioneering transformative ideas in the field of longevity science. To inspire innovation and guide exploration, we have identified a list of Suggested Verticals* —specific sectors within the longevity space that have garnered significant interest from the VitaDAO community in the past. These verticals represent areas where we believe impactful research and breakthroughs are possible. However, projects are not constrained to these verticals; they are suggestions only. We encourage proposals across all areas of longevity research, especially those that challenge existing paradigms and introduce novel concepts.

1.1 Energy

Energy is the lifeblood of all biological systems, and as we age, the way our bodies produce and utilize energy undergoes profound changes, impacting everything from cellular health to overall vitality. As we accelerate toward a future where aging is optional, reimagining how our bodies generate and harness energy is the next frontier. As we age, the inefficiencies in our cellular powerhouses —mitochondria— become a bottleneck to longevity. But what if we could bypass these limitations? Imagine bio-augmenting our cells with young transplanted or even advanced, synthetic mitochondria that never tire, or even engineering new, hybrid energy systems that blend biological and artificial power sources. By turbocharging our energy systems and exploring and funding research in energy dynamics, we unlock the potential to extend not just lifespan but the quality of life, making it one of the most exciting frontiers in longevity science.

1.2 Temperature

Temperature and thermosensory circuits offer a fascinating and highly promising avenue for longevity research. While traditional approaches focus on slowing aging, the regulation of core body temperature and thermosensitive pathways offers a direct and potentially more impactful way to extend life. Lowering core body temperature has been shown to significantly extend lifespan across species, revealing that temperature control is a powerful determinant of longevity. It’s not just about keeping cool—thermosensitive circuits play crucial roles in activating genetic programs that enhance cellular resilience, reduce oxidative damage, and maintain homeostasis even under stress.On the flip side, mild heat stress has been shown to trigger protective mechanisms, such as the production of heat shock proteins, which preserve cellular function and inhibit cell death. These thermally induced responses don’t just slow down aging—they actively rejuvenate cells, improving their resistance to stress and enhancing overall vitality. By manipulating temperature and engaging these thermosensitive circuits, we’re not just managing the aging process; we’re harnessing the body’s innate ability to adapt, repair, and thrive, pushing the boundaries of what it means to live longer and better.

1.3 Plants

Plants, with their remarkable longevity, offer valuable insights into the aging process that could significantly impact human health. These organisms have developed

sophisticated mechanisms to maintain vitality, such as genetic redundancy, active telomerase, and continuous regeneration of tissues. By studying how plants delay aging and manage stress over long lifespans, we can explore new avenues for extending human healthspan. The potential to apply these biological strategies to human aging is a promising area of research, offering a realistic path toward enhancing our own longevity by learning from nature's most resilient organisms.

1.4 Long lived organisms

Nature has already solved many of the challenges we face, and aging is no exception. Long-lived organisms, from centuries-old trees to animals with negligible senescence, offer a treasure trove of insights into the mechanisms of extended life. For example, the naked mole rat, a small rodent with remarkable longevity, has evolved cancer resistance, partially due to a unique substance called high-molecular-mass hyaluronan. This discovery has already led to potential therapeutic applications in humans.Exploring the biology of other long-lived species, like elephants with their multiple copies of the tumor suppressor gene TP53, or whales with their independent cancer resistance mechanisms, could unlock new strategies for human therapies. By studying these extraordinary organisms, we can identify novel approaches that might one day allow us to enhance human longevity, applying nature's time-tested solutions.

1.5 Development

Developmental biology, often underappreciated in longevity research, is actually central to understanding aging. This field, which studies how cells differentiate and tissues form, reveals that aging and development are deeply connected, possibly even beginning at conception. Recent advances challenge the idea of fixed cell states, opening doors to innovations in cellular reprogramming, tissue engineering, and regenerative medicine. By understanding how organisms develop, repair, and regenerate, we can uncover new strategies to reverse aging and extend human healthspan, making developmental biology a critical driver of future longevity breakthroughs.

**from previous work done in the moonshot group at longevity wg:*
https://docs.google.com/document/d/197TyAJ9OHk59wqv-bJQY0imgVF0PEQ24QLuA6Rkt0-g/edit#heading=h.5mf5nustr9ac

2. Example range of CRO costs

2.1 Early stage experimentations

Service	Cost Range	Description

Basic Assay Development	$5,000 - $10,000	Development of simple biochemical or cell-based assays.
Complex Assay Development	$20,000 - $50,000	Development of sophisticated assays, including high-throughput screening.
Testing in Cell Lines (Basic)	$10,000 - $30,000	Testing compounds or genetic modifications in standard cell lines.
Testing in Cell Lines (Advanced)	$30,000 - $70,000	Includes more complex testing, such as high-content imaging or multi-cell type assays.
Basic Omics Analysis	$10,000 - $30,000	RNA sequencing, proteomics, or metabolomics with basic analysis.
Basic Bioinformatics Services	$5,000 - $15,000	Standard data processing and analysis, such as pathway analysis.
Basic Imaging Services	$5,000 - $20,000	Standard imaging techniques such as microscopy.

2.2 Later stage experimentations

Service	Cost Range	Description
Target Identification	$10,000 - $25,000	Early-stage research to identify potential molecular targets involved in aging.
Small Molecule Screening	$30,000 - $100,000	Screening compound libraries to find those that affect a biological target.
RNAi/CRISPR Screening	$50,000 - $150,000	Screening for genes that influence aging processes using RNAi or CRISPR.
Basic In Vivo Studies	$30,000 - $80,000	Simple animal studies to test the effects of interventions on aging-related parameters.
Complex In Vivo Studies	$100,000 - $250,000	Advanced studies including multiple treatment arms and detailed phenotyping.
Advanced Omics Analysis	$50,000 - $150,000	Integrated analysis of multiple omics layers or detailed computational analysis.
Advanced Bioinformatics Services	$20,000 - $50,000	Custom computational models or integration of large datasets.

Basic Toxicology Studies	$10,000 - $30,000	Safety studies to assess toxicity of compounds.
Pharmacokinetics Studies	$20,000 - $50,000	Studies on the absorption, distribution, metabolism, and excretion of a compound.
Advanced Imaging Services	$30,000 - $100,000	High-resolution or live-cell imaging for detailed analysis.
Small Molecule Synthesis	$5,000 - $20,000	Custom synthesis of small molecules for testing.
Large Scale Synthesis	$50,000 - $150,000	Larger quantities of compounds for in vivo studies or preclinical testing.

The ones listed below might be replaceable by open source, public and resources available to contributors associated with universities:

Category	Description	Tools/Software/Databases	Cost Estimate
Bioinformatics Tools	Open-source and commercial software for computational biology.	- **Open-Source:** Bioconductor, GATK, Biopython, R, Python - **Commercial:** MATLAB, Schrodinger, Rosetta	$0 - $5,000 per user per year
Genomic Databases	Access to public and subscription-based genomic databases.	- **Public Databases:** NCBI, Ensembl, UCSC Genome Browser - **Subscription Databases:** GenBank, UniProt, OMIM	$0 - $50,000 per year
Scientific Journals	Subscriptions or pay-per-view access to research publications.	- **Subscriptions:** Nature, Science, Cell, PLOS, Bioinformatics - **Pay-per-view:** $30 - $50 per article	$10,000 - $50,000 per year (subscription) \n $30 - $50 per article (pay-per-view)