

Gate Research: Real-World Challenges and Paradigm Shift in the "Innovative Drug" Narrative Under the DeSci Framework



Meta Description

- DeSci (Decentralized Science) is becoming a hot topic in the blockchain industry, sparking widespread discussion, especially in the field of innovative drug funding.
- However, there is a significant mismatch between DeSci and the biopharmaceutical industry in terms of funding, timelines, and operational models, making integration highly challenging.
- This article provides an in-depth analysis of the current state, challenges, and potential development paths of DeSci in the innovative drug sector, including new models such as IP-NFTs, RWAs, and clinical data prediction.

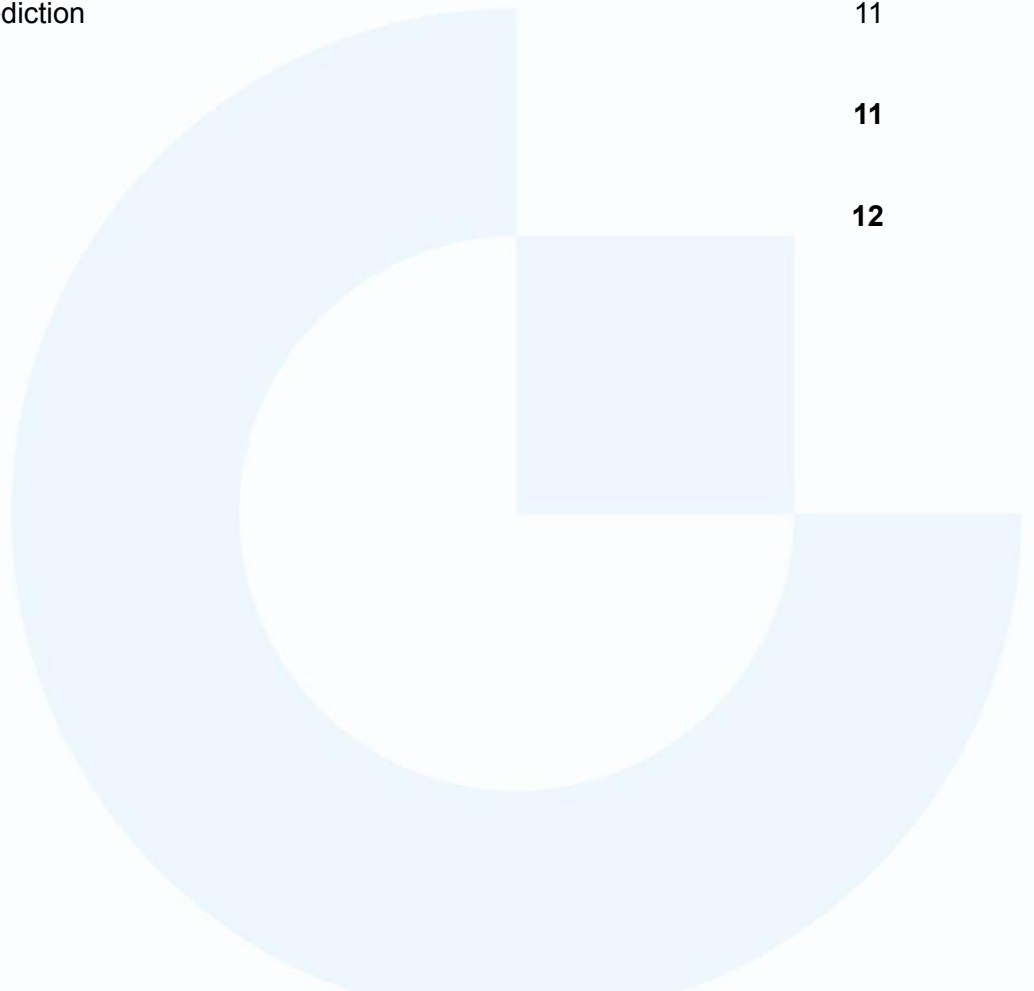
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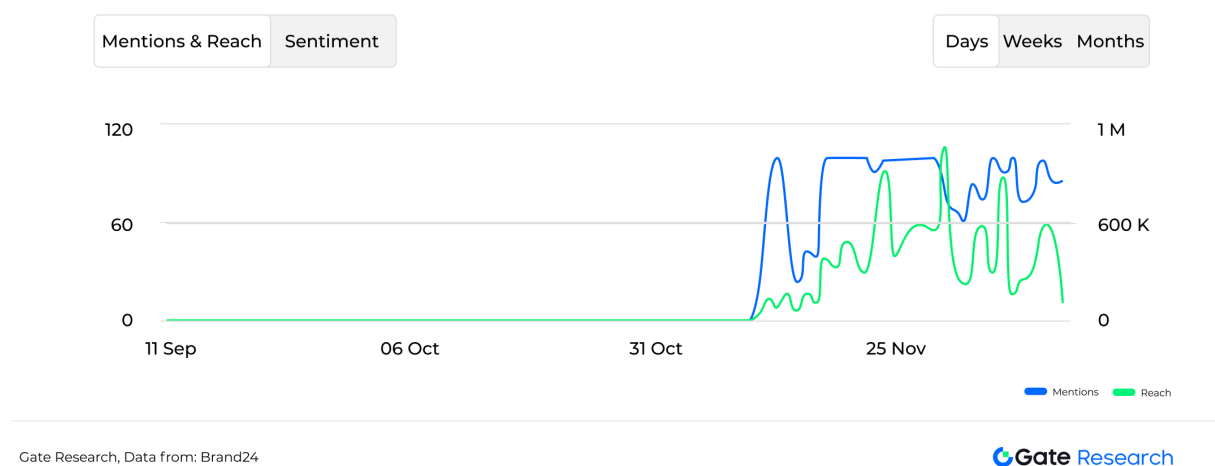
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1 Introduction

When reviewing the hottest topics of Q4 2024, DeSci (Decentralized Science) has emerged as a highly discussed focal point. Many industry key opinion leaders (KOLs), including Vitalik, have publicly endorsed this emerging field. According to data from the BRAND24 platform, since November, the daily exposure of DeSci on X has surged to 500,000 impressions. DeSci originated in 2022, leveraging blockchain technology to address various challenges in traditional scientific research, such as the opacity of academic funding distribution, the monopoly of centralized institutions like top journals Nature and Science, and issues related to the sharing of research data [1].

Figure 1: Frequency of the Term "DeSci" on X from September to December 2024



DeSci aims to create a more open, transparent, and inclusive scientific research ecosystem, breaking through the limitations of traditional research models. By democratizing funding allocation, dismantling centralized monopolies, and promoting public participation in research, DeSci empowers scientific innovation. The rise of DeSci not only signals the broad application prospects of blockchain technology in scientific research but also holds the potential to drive open access to academic achievements and introduce new paradigms for research collaboration, encouraging scholars to produce high-quality academic papers.

However, from an industry-specific perspective, DeSci exhibits a tendency toward centralization. No influential decentralized autonomous organizations (DAOs) have emerged in frontier fields such as materials science, information science, or nuclear physics. Instead, the primary projects in the DeSci sector are concentrated in biopharmaceuticals. According to Coingecko data,

among the seven DeSci tokens with a market capitalization exceeding \$30 million, Bio Protocol, AxonDAO, Hippocrat, VitaDAO, and HairDAO are all directly related to biopharmaceuticals. As a result, biopharmaceuticals have already captured most of the market share within DeSci. [2]

Figure 2: Market Capitalization Ranking of DeSci Projects

	Coin	Price	1h	24h	7h	24h Volume	Market Cap
☆ 270	 OriginTrail TRAC	\$0.4675	▼ 1.0%	▼ 7.9%	▼ 24.7%	\$2,621,286	\$233,332,267
☆ 287	 Bio Protocol BIO	\$0.13	▼ 1.2%	▼ 11.7%	▼ 44.8%	\$43,584,310	\$209,122,068
☆ 645	 ResearchCoin RSC	\$0.5055	▼ 1.9%	▼ 0.9%	▼ 16.0%	\$325,058	\$57,960,932
☆ 656	 AxonDAO Governance Token AXGT	\$0.1765	▲ 0.1%	▼ 9.5%	▼ 22.4%	\$272,610	\$57,075,260
☆ 671	 Hippocrat HPO	\$0.05359	▼ 0.6%	▼ 5.1%	▼ 15.0%	\$887,647	\$55,207,382
☆ 729	 VitaDAO VITA	\$1.84	▼ 1.3%	▼ 4.4%	▼ 22.2%	\$3,024,406	\$47,479,623
☆ 938	 HairDAO HAIR	\$45.35	▼ 0.9%	▼ 2.5%	▼ 15.2%	\$1,410.83	\$30,174,535

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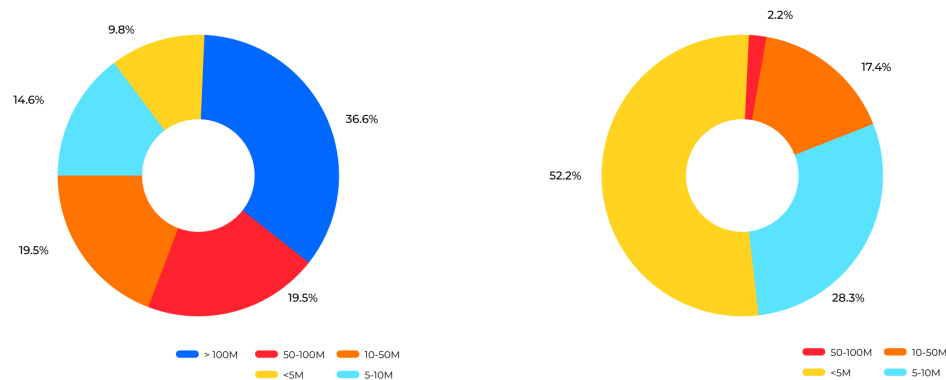
Issues such as the opacity of research funding allocation and the monopoly of mainstream journals are not exclusive to innovative drug research but are common across various disciplines. The author believes that the dominance of life sciences within the DeSci industry is primarily because, after accumulating substantial wealth, crypto industry opinion leaders have satisfied all five levels of Maslow's hierarchy of needs and have shifted their focus toward topics related to life extension.

Amid the current optimistic sentiment in the crypto industry, significant limitations remain in the understanding of the pharmaceutical sector among crypto practitioners. From a fundamental perspective, there is a structural mismatch between DeSci in the crypto space and real-world innovative drug research. These differences will pose significant challenges to the deeper integration of the two in the future. The following sections will elaborate on this perspective in detail.

2 Mismatch of Resources Between Innovative Drugs and the Crypto Industry

First, at the funding level, developing an innovative drug pipeline requires over a hundred million dollars. Drug development consists of multiple stages, including preclinical research, IND (Investigational New Drug) application, Phase I clinical trials, Phase II clinical trials, Phase III clinical trials, and NDA (New Drug Application) approval. According to Green Field data, animal testing costs in preclinical research have already exceeded \$15 million [3]. Aggregated data from multiple sources indicate that the RD expenditure for a newly approved drug in the U.S. exceeds \$300 million [4]. This industry characteristic forces innovative drug companies to seek large-scale funding. According to IT Juzi data [5], in Q4 2024, projects with over \$100 million in funding accounted for the highest proportion (36.6%) in the biotech sector, while blockchain projects with funding below \$5 million accounted for the highest proportion (52.2%). As a result, innovative drug projects struggle to secure sufficient capital from DAOs to support clinical drug development.

Figure 3: Q4 2024 Biotech Project Funding Amounts Figure 3: Q4 2024 Blockchain Project Funding Amounts



Gate Research, Data from: IT JUZI

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Second, there is a significant difference in time cycles. It takes at least ten years for a new drug to progress from molecular discovery to market approval [6]. Equity funds in the innovative drug sector generally follow a "5+2" model (five-year investment period and two-year exit period). Consequently, most innovative drug companies aim to go public as early as Phase II or even Phase I clinical trials to facilitate early investor exits through capital markets.

Figure 4: New Drug Development Process and Timeline



Gate Research, Data from: Seikagaku Corporation

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Even so, the time from founding to IPO for innovative drug companies remains long. For instance, among the innovative drug companies that went public in the U.S. in 2024, the average listing cycle reached 6.42 years [7]. While there is no comprehensive data for the crypto industry, projects such as Ondo, CARV, Ethena, and Jupiter, which completed their TGE in 2024, typically had 2–3 years or even shorter development cycles. The fundamental reason for this difference lies in the underlying logic of each industry. In crypto, the approach is to establish a narrative first and then build toward realization, whereas, in the innovative drug sector, clinical data must first provide validation before further development can proceed.

Figure 5: Innovative Drug Companies That Went Public in the U.S. in 2024

Biotech Public Companies	Primary Pipeline Indications	Founding Year	IPO Year	Time Cycle
Jupiter Neurosciences	Neuroinflammation	2016	2024	8
Septerna	Endocrine & Metabolic	2019	2024	5
Upstream Bio	Respiratory Diseases	2021	2024	3
BioAge Labs	Metabolic Diseases	2015	2024	9
MBX Biosciences	Metabolic Diseases	2018	2024	6
Zenas BioPharma	Autoimmune Diseases	2019	2024	5
Actuate	Oncology	2015	2024	9
OS Therapies	Oncology	2018	2024	6
Rapport Therapeutics	Central Nervous System Diseases	2022	2024	2
Contineum	Pulmonary Fibrosis	2009	2024	15
Boundless Bio	Oncology	2018	2024	6
Telomir	Stem Cells	2021	2024	3
Average Time				6.42

Gate Research, Data from: stockanalysis

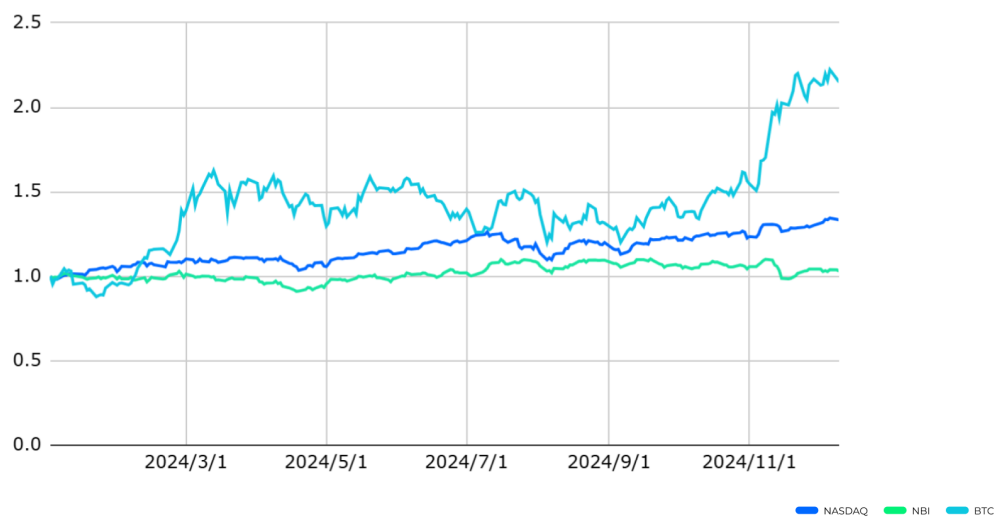
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Finally, there is the operational model. On the surface, both industries adopt a business-to-consumer (ToC) approach, but a deeper analysis reveals that early-stage innovative drug companies primarily operate with a business-to-business (ToB) model. Early-stage biotech firms often opt to license their intellectual property through business development (BD) transactions to major pharmaceutical companies such as Roche, Novartis, and Pfizer when a new drug successfully completes Phase I clinical trials with promising data. These large pharmaceutical firms then take over the subsequent development and commercialization processes. Suppose an innovative drug company insists on a fully independent research and development strategy. In that case, it must establish its own distribution channels, coordinate with hospitals and insurance companies, and still cannot directly reach patients. One key difference between ToB and ToC business models is that ToC companies must allocate significant resources to public relations and social media engagement, whereas ToB companies do not require frequent publicity. If De-Sci investors are accustomed to frequent project updates while biotech startup teams remain focused on research and lack external communication, this expectation mismatch could lead to difficulties in managing investor relations and ultimately impact the success of investment collaborations.

3 Poor Returns, Declining Market Capitalization of Biotech Companies, and Overall Financing Difficulties

Besides the mismatch between the biotech and crypto industries regarding resources, timelines, and operations, biotech companies have experienced a continuous decline in market capitalization in the secondary market. The Nasdaq Biotechnology Index (NBI) has underperformed the Nasdaq Index by more than 30%. In contrast, the crypto market has seen continuous bullish momentum in 2024. As of December 2024, Bitcoin has risen by over 100% compared to the beginning of the year. Given limited capital, BTC and other cryptocurrencies may offer better returns than biotech companies.

Figure 6: Standardized Net Value Trends of NASDAQ, NBI, and BTC in 2024

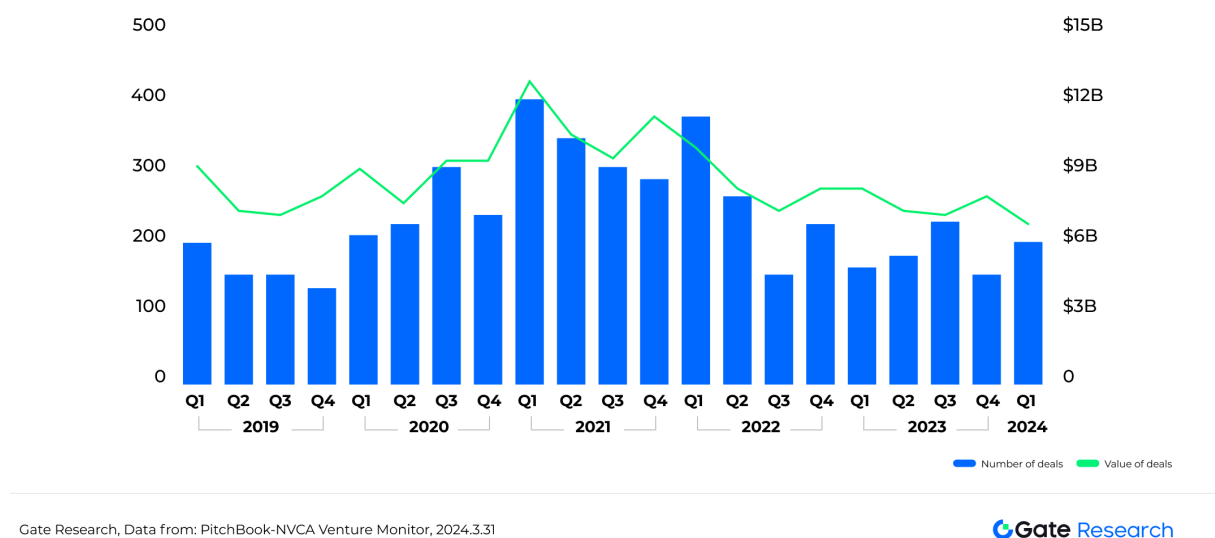


Gate Research, Data from: yfinance

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The underperformance of the biotech sector in the secondary market has gradually impacted the primary market, making it increasingly difficult for early-stage biotech companies to secure funding over the past two years. Since the emergence of COVID-19 in 2020, the biotech industry has experienced a full market cycle. The pandemic initially drove governments worldwide to prioritize healthcare and medical advancements, leading to a surge in biotech funding. However, as societies have gradually adapted to living with COVID-19, speculative capital has exited the sector. According to PitchBook data, in Q1 2021, biotech funding exceeded \$10 billion, with over 350 funding events. Since then, both biotech funding volume and the number of deals have declined. By Q1 2024, total funding had dropped to less than \$6 billion, with only 200 funding events. [8]

Figure 7: Biotech Funding Volume and Deal Count (2019-2024)



The overall performance of the biotech sector in capital markets has continued to decline, making it difficult for DAO investors to exit their investments in biotech projects through IPOs, secondary fund transfers, or mergers and acquisitions. As a result, DAOs need to explore new exit strategies to safeguard investor interests within their organizations.

4 Lack of Role Models, Limited Willingness of Renowned Scientists to Participate

The DeSci narrative requires collaboration between the crypto industry and the biotech sector. Currently, KOLs from the crypto space, such as Vitalik and CZ, have voiced support for this narrative, but the biotech sector lacks influential scientists or executives from major international pharmaceutical companies advocating for it. The biotech industry remains cautious toward DeSci. While some Molecule and VitaDAO core members have medical backgrounds, their influence within the biotech sector is relatively limited. Top-tier scientists still prefer traditional funding paths, and few entrepreneurs opt for DAO-based fundraising.

The biotech industry's conservative stance toward DeSci stems from multiple factors. First, compared to the crypto industry, biotech professionals require longer learning and working periods to establish themselves, resulting in an older average age for biotech entrepreneurs. Meanwhile, younger individuals predominantly initiate crypto startups, creating a learning barrier for

more senior bioscientists. Second, the pharmaceutical industry is well-established with entrenched hierarchies. Fully embracing DeSci would mean disrupting the existing order, which does not align with the interests of industry incumbents. Consequently, many biotech entrepreneurs prefer traditional funding methods, as they require the support of experienced decision-makers within the sector.

However, the low participation of the biotech industry may shift in the future. Traditional finance, for instance, has long been led by older figures. BlackRock CEO Larry Fink, now 71, Fidelity CEO Abigail Johnson, now 61, and Franklin Templeton CEO Jenny Johnson, now 60, have historically been cautious toward crypto. Yet in 2024, traditional finance ultimately embraced the crypto industry, with these major asset management firms launching Bitcoin ETFs. In 2017, Fink famously referred to Bitcoin as an “index of money laundering,” but by 2024, as crypto gained broader acceptance, he compared Bitcoin to digital gold, signaling a clear shift in stance. Similarly, for established Nobel Prize-winning scientists and pharmaceutical executives, accepting the DeSci narrative may simply require more time. Even if the biotech industry embraces crypto, the mismatch in resources, timelines, and operational models between clinical drug development and the crypto sector will remain unchanged.

Nature is the most influential scientific journal and has increased its coverage of DeSci topics in recent years. In October 2023, Nature published an editorial on DAOs, highlighting their advantages in securing funding more easily and maintaining transparency in fundraising. In December 2024, Nature published an article introducing the DeSci protocol ResearchHub, quoting São Paulo-based molecular biology consultant Pedro Paulo Gattai Gomes, who stated that his earnings from reviewing papers on ResearchHub exceeded his income as a professor in academia. Nature’s continued coverage of the positive impacts of the DeSci ecosystem, to some extent, reflects traditional academia’s growing recognition of the crypto sector. [9]

5 The Optimal Paradigm for Combining Innovative Drugs and the Crypto Industry

The previous sections outlined various incompatibilities between clinical drug development and the crypto sector. However, we believe the two industries can be integrated through paradigms such as NFTs, RWA, and data prediction.

5.1 IP-NFT

VitaDAO is currently one of the most well-known projects in the DeSci space. It is a community-owned initiative dedicated to funding early-stage longevity research. Scholars who lack financial support can raise funds for their projects by joining the DAO. VitaDAO currently employs two fundraising methods: equity-based fundraising and IP-NFT fundraising. As Nature noted, DAO projects undergo review by experienced professionals from the innovative drug industry before they are approved for listing on the platform. As of December 2024, VitaDAO has helped 24 projects raise over \$4.2 million. [10]

Figure 8: IP-NFT Projects on VitaDAO's Official Website

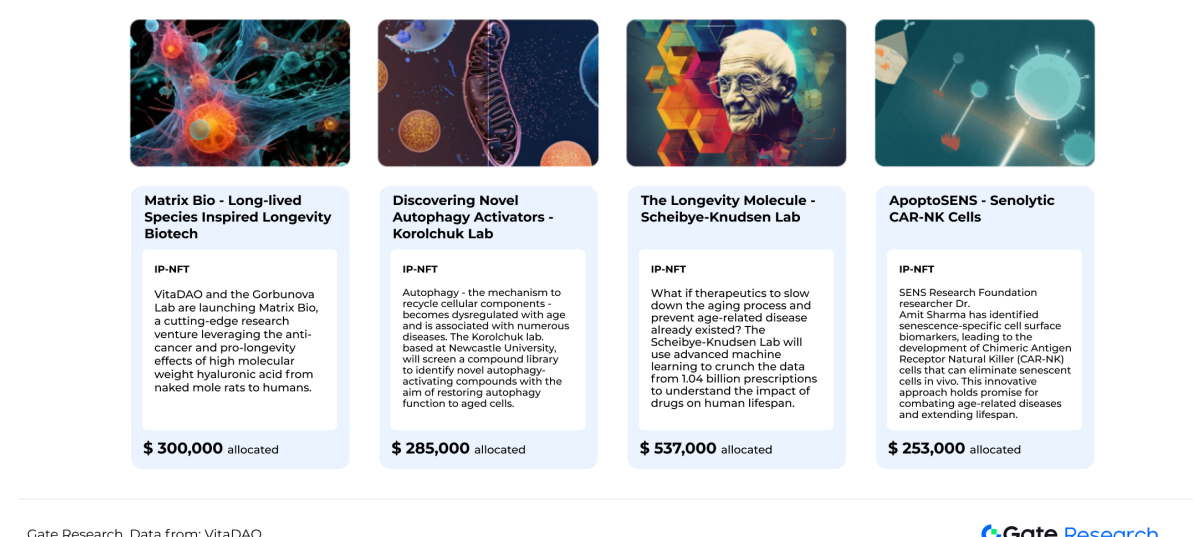
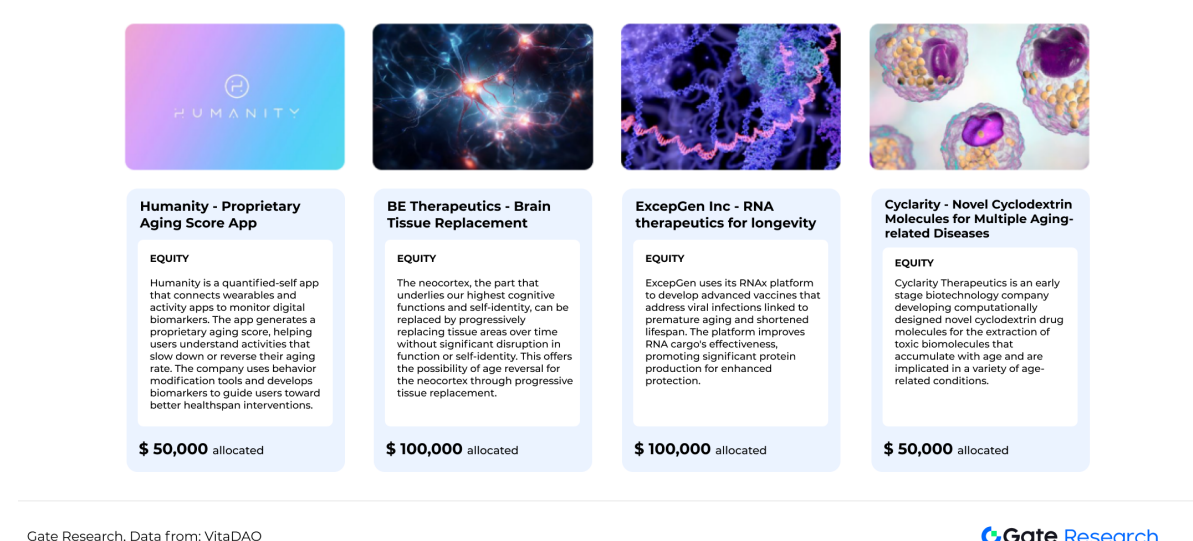


Figure 9: Equity Projects on VitaDAO's Official Website



Compared to equity financing, IP-NFT offers several advantages and is more aligned with the crypto industry's characteristics. IP-NFT is essentially a form of RWA, with scholars' patents as its underlying assets. It is a smart contract framework developed by Molecule that enables DAOs to own, license, and transact intellectual property generated by the projects they support. VitaDAO is responsible for facilitating the commercialization of these patents, whether through collaborative development or transfers. The key advantage of this model is its shorter project cycle and lower capital requirements. According to VitaDAO's official website, all seven listed projects are less than two years in duration. Several successfully funded projects have raised less than \$1 million in total, significantly reducing the cost of patent development compared to equity financing for innovative drugs, which often requires tens of millions of dollars. This model aligns well with the crypto industry's preference for "short, fast, and efficient" fundraising strategies. [11]

Building on the IP-NFT framework, VitaDAO introduced an innovative "Pay for Success" model, specifically targeting the niche market of expanding indications for off-patent drugs. For instance, if a physician discovers that an off-patent drug could be highly effective for treating a certain condition but lacks clinical data to support its use, it would fall outside the drug's approved treatment scope. Securing investment for such an indication expansion is difficult, as PE/VC firms prefer to fund new drug developments that promise higher theoretical returns. Given the financing challenges in traditional funding pathways, researchers working on new indications for off-patent drugs require DAO funding support. For DAO investors, expanding indications for off-patent drugs presents a shorter timeline than developing new drugs from scratch, allowing them to see clinical results more quickly. Moreover, once an indication expansion succeeds, insurance companies will pay premium reimbursement prices for the new use case, with these funds distributed to IP-NFT holders. The Pay for Success model benefits patients by making treatments more affordable (as off-patent drugs are cheaper) while also providing investors with a clear demand-side payer in the form of insurance companies. [12]

5.2 Large Pharmaceutical Companies' Stock Tokenization

One reason the crypto industry actively promotes the DeSci narrative is that capital seeking excess returns in crypto is looking for new investment opportunities, making the innovative drug industry a key target. From an industry perspective, large pharmaceutical companies are in a phase of steady performance growth and are more stable than startups. Companies like Eli Lilly, Gilead, and Novo Nordisk have significantly outperformed the NBI index during downturn cycles. Moreover, in terms of market cycles, large pharmaceutical companies differ from crypto assets, allowing investors to achieve risk diversification. Currently, the tokenization platform Dinari has tokenized shares of Pfizer (NYSE: PFE), but its minting volume and daily trading

volume are significantly lower than tokenized stocks of companies like Nvidia and Tesla. It is expected that as the biopharmaceutical industry enters an upward cycle, demand for tokenization will increase significantly. [13]

Figure 10: \$PFE.d Data Minted on the Dinari Platform



Gate Research, Data from: RWA.xyz

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5.3 Clinical Data Prediction

The core driver of innovative drug investment trends is clinical data performance. Metrics such as ORR (Objective Response Rate) and DCR (Disease Control Rate) determine a company's future stock price trajectory. Currently, investors have no financial instruments to hedge risks after betting on an innovative pharmaceutical company. The crypto industry's prediction market platform Polymarket has introduced a science prediction category, but it has yet to include clinical trial data predictions. If breakthroughs occur in this area, investors can hedge some risks in biopharmaceutical investments. However, strict monitoring will be necessary to ensure that companies themselves do not participate in data predictions.

6 Conclusion

Although the DeSci narrative is gaining momentum, integrating biopharma and crypto is bound to be challenging, as the two industries have fundamentally different underlying logics in many aspects. Additionally, the biopharmaceutical sector has been in a downturn since 2021, leading to a decline in capital attraction. On the other hand, the crypto industry can complement traditional finance, addressing some of biopharma's weaknesses. It introduces new financing channels and amplifies the voices of emerging scientists in the biopharma space, ensuring they are heard and valued.

Author: Mark

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