AEVION QVenture — Investment Memo

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Vault Bio

Biotech / Therapeutics · series-a · US · raising $22,000,000

Score 62.1/100 — WATCH (conviction: medium)

Investment memo

Recommendation: participate, but stage it. Vault Bio is not the FDA-gated therapeutics bet the quant model penalizes—it's an industrial-enzyme catalysis platform whose real economics hinge on scale-up, not trial risk, and that reframing materially improves the risk profile behind the 62.1 composite. The single strongest reason for: genuine commercial pull, with three paying chemical majors, a pilot-scale enzyme, and $3.4M in committed milestones validating that generative design plus a wet-lab loop produces something customers will fund. The single strongest reason against: value-capture leakage—those same majors have overwhelming bargaining power and can insource, reverse-engineer, or grant-back the resulting strains, relegating Vault to a low-multiple fee-for-service CRO rather than a royalty-bearing platform. Entry plan: lead with roughly $9.1M for ~12% ownership at the ~$53.6M pre-money anchor, hard-cap total exposure at $11M, and reserve ~$13.6M for pro-rata. Size at ~1.6% of the portfolio. Gate the follow-on on one kill metric: contract-to-royalty conversion proving Vault owns production economics.

Narrative engine: live model (anthropic)

Entry strategy

Ticket: $9,075,600 target (range $4,537,800–$11,000,000)
Target ownership: 12%
Valuation band (pre-money): $25,907,500 / $53,630,000 / $107,260,000
Return: 5.45x expected (9.7x base) · ~32.7% IRR over 6yr · loss prob 44%

Deployment schedule:

- 60% — Entry: On close, after commercial + legal + financial diligence.
- 40% — Pro-rata: Reserve to maintain ownership through the next round.

Portfolio: Size at ~1.6% of a diversified venture portfolio (fractional-Kelly, conviction-scaled). Reserve 13,613,400 USD for pro-rata follow-on.

Score breakdown

Market size & growth — 74/100 (weight 20%)
~$1770B TAM, 14% CAGR (Biotech / Therapeutics).

Timing / tailwinds — 55/100 (weight 10%)
Sector growth 14% vs. 12% neutral baseline.

Moat / defensibility — 80/100 (weight 15%)
Dominant defensibility here: ip patents.

Unit economics potential — 61/100 (weight 15%)
~85% mature gross margin, capital intensity 95%.

Team / execution signal — 58/100 (weight 12%)
commercial validation cited

Scientific / tech feasibility — 46/100 (weight 10%)
AI protein design, base/prime editing, patient-derived organoid screens

Regulatory / legal headroom — 36/100 (weight 9%)
Regulatory intensity 98% (higher = more legal drag).

Competitive headroom — 65/100 (weight 9%)
Competitive intensity 50%. binary trial risk and 8–12yr capital-intensive timelines.

Analyst council

Research Scientist — Industrial enzyme design via generative-protein platform — credible science, mis-scored against therapeutics; real risk is scale-up not trials

+ Sector frontier is real: generative models (RFdiffusion, ProteinMPNN, ESM-2) plus wet-lab-in-the-loop have demonstrably designed novel functional and thermostable enzymes; de novo backbone design with directed-evolution refinement is a validated 2022–2024 workflow, so the core approach is grounded, not hand-wavy.

+ Business model is industrial biocatalysis, NOT therapeutics — so the quant model's 46/100 feasibility, 36/100 regulatory drag and 8–12yr binary-trial framing are largely miscalibrated; specialty-chemical enzymes face no FDA clinical trials, timelines are 12–36mo to pilot, de-risking the single biggest scored penalty.

+ Traction is the strongest signal for Series A: 3 paid discovery contracts with chemical majors, one enzyme already at pilot-scale, and $3.4M committed milestones — evidence of real technical delivery and customer pull rather than a pure platform story.

+ Genuine value creation requires enzymes that hit industrial process specs (>60–80°C thermostability, organic-solvent tolerance, kg-scale titer, cost < incumbent petrochemical catalyst); design-and-validate is proven at bench, but manufacturability at ton-scale via fermentation is the unproven leap.

! Scale-up/manufacturing risk: designing a thermostable enzyme in silico is far easier than achieving cost-competitive fermentation titers and process integration at industrial volume — most enzyme startups die in the pilot-to-commercial gap, not at design; 95% capital intensity score reflects this.

! Value-capture asymmetry: chemical majors fund discovery contracts to internalize IP and know-how; risk that Vault is a fee-for-service CRO with milestone crumbs rather than owning royalties/recurring revenue — patent moat means little if customers own the resulting strain.

! Competition from incumbents (Novozymes/Novonesis, Codexis, Ginkgo, Arzeda) with decades of biocatalysis IP and installed fermentation capacity; a generative-design edge may compress as foundation-model tooling (open-source ESM/RFdiffusion) commoditizes the design step.

Data Analyst — Vault Bio: industrial-enzyme platform mislabeled as therapeutics; real thesis is chemicals catalysis, not FDA-gated drug risk

+ Category mismatch inflates the model: the $1.77T TAM and 8-12yr trial/regulatory drag reflect therapeutics, but Vault sells industrial enzymes to chemical majors — no clinical trials, no FDA approval path, revenue in quarters not decades. True SAM is the ~$6-7B industrial enzyme market (specialty-chem catalysis subset likely $1-2B SOM), so market-size score (74) is directionally right but for the

+ Traction is early but real for Series A: 3 paid discovery contracts + 1 pilot-scale enzyme + $3.4M committed milestones validate demand. However $3.4M is committed, not recognized recurring revenue — need to see conversion from discovery-fee to production royalty/volume economics, which is where enzyme platforms actually monetize.

+ Unit economics claim (~85% mature gross margin) is plausible for licensed/royalty enzyme IP but the 95% capital intensity flag is the tension: wet-lab-in-the-loop + pilot/scale-up fermentation is capex-heavy. $22M Series A is thin if they must fund scale-up manufacturing vs. licensing to partners' plants — clarify capital-light licensing vs. capital-heavy production model.

+ Moat rests on IP patents (80) but generative-protein design is a crowded frontier (Cradle, Basecamp, Arzeda, Codexis, Ginkgo). Defensibility likely comes from proprietary wet-lab data flywheel + design-test cycle speed, not patents alone — need cycle-time and hit-rate metrics to confirm.

! Data gaps: no CAC/LTV, no contract-to-royalty conversion rate, no gross margin realized (only 'mature' projection), no cash runway or burn disclosed — cannot verify unit economics or timeline to self-sustaining revenue on $22M.

! Enterprise-sales concentration: 3 chemical majors = high customer concentration; discovery contracts are often exploratory and may not convert to volume production, and incumbents (Novozymes/Novonesis, DuPont) can in-license or build competing enzymes.

! Kill metric — technical hit rate: if designed enzymes fail thermostability/activity at pilot-to-commercial scale-up (the classic in-silico-to-fermentation gap), the platform's core value prop collapses regardless of market size.

Economist — Industrial-enzyme play mislabeled as therapeutics; B2B chemicals TAM is real but rents accrue slowly to a picks-and-shovels catalyst designer.

+ Sector-classification mismatch inflates the model: this is industrial biocatalysis, not drug development. It avoids the $1.77T therapeutics TAM but also the binary trial risk — realistic served market is closer to the ~$6-8B industrial enzymes segment (Novozymes/DSM-Firmenich duopoly, ~10% CAGR), not $1.77T.

+ Demand is derived and price-elastic: chemical majors adopt bio-catalysts only where they beat petrochemical routes on delivered cost. Enzyme swaps must clear a customer hurdle of both capex retrofit and per-kg economics vs. incumbent thermal catalysts — adoption is gated by feedstock/energy spreads, not just performance.

+ Moat is dual: sequence IP patents plus a proprietary wet-lab-in-the-loop dataset that compounds with each contract. This is the durable rent source — the design-test data flywheel is harder to replicate than the generative model itself, which is increasingly commoditized (AlphaFold, ESM open-weights).

+ Traction quality is high for Series A: 3 paid discovery contracts + 1 pilot-scale enzyme + $3.4M committed milestones shows genuine willingness-to-pay from majors. But contract R&D revenue is not equity-value-creating unless it converts to royalty/production economics with recurring per-kg margins.

! Value-capture leakage: chemical majors have far more bargaining power than a Series-A vendor. Discovery contracts can become work-for-hire where the customer captures the production economics, leaving Vault as a low-

multiple services shop rather than a royalty-bearing platform.
! Capital intensity 95% + wet-lab loop means each design cycle is expensive and slow; $22M funds a limited number of enzyme campaigns before needing scale-up capex or partner-funded manufacturing. Runway-to-recurring-revenue gap is the central execution risk.
! Macro sensitivity: the entire substitution thesis depends on petrochemical/energy price spreads. A sustained drop in oil/gas prices erodes the cost advantage of bio-catalysts, deferring customer adoption regardless of technical success.

Corporate & Regulatory Lawyer — Industrial-enzyme platform sidesteps FDA clinical risk; IP durability and TSCA/EPA biotech pathway are the real legal levers

+ Regulatory posture is materially better than the 36/100 therapeutics-coded score implies: industrial specialty-chemical enzymes are governed by EPA TSCA (biotech MCAN filings under 40 CFR 725, ~90-day review) and OSHA/worker-exposure rules, NOT FDA IND/BLA trials — the 8–12yr binary trial framing does not apply to this use case and should be re-scored upward.
+ Moat is genuine but composition-of-matter claims on engineered enzyme sequences are narrower than they appear: enzyme designs are easily engineered-around by competitors optimizing different residues, so protect via trade-secret (fermentation/process know-how) plus patents; confirm freedom-to-operate against Codexis, Novozymes/Novonesis, Ginkgo, and academic directed-evolution IP.
+ Data/privacy exposure is low (no PHI/patient data despite the organoid-screen sector tag) — key contractual issue is IP ownership in the 3 discovery contracts: verify Vault retains platform IP and background models while customers get only field-limited licenses to delivered enzymes; grant-backs and improvements clauses are the deal-critical terms.
+ Investor protections for a $22M Series A: standard 1x non-participating liquidation pref, milestone-based tranching tied to the $3.4M committed payments and pilot-to-commercial conversion, IP assignment/inventor-assignment audit, and reps on FTO and open-source model-weight/licensing hygiene given generative-AI training-data provenance risk.
! Customer-concentration + IP leakage: 3 chemical majors control the revenue and could insource or reverse-engineer enzymes after discovery contracts; weak field-of-use carve-outs or broad improvement grant-backs would strip platform value.
! Generative-model provenance: training data or third-party model dependencies (open weights, restrictive licenses) could impair ownership of designed sequences or create infringement/derivative-work claims — diligence the AI stack's licensing chain.
! Capital intensity (95%) means scale-up to commercial fermentation is capex-heavy and outside the platform's asset-light thesis; a down-round or dilutive process-plant financing is plausible before enzymes reach margin-positive commercial volume.

Market data sources

- Precedence Research (2025) — Biotechnology ~$1.77T in 2025, ~13.6% CAGR to 2035
  https://www.precedenceresearch.com/biotechnology-market
- Grand View Research (2025) — To reach $3.88T by 2030 at 13.96% CAGR
  https://www.grandviewresearch.com/industry-analysis/biotechnology-market

Assumptions & limitations

- Market size / growth for Biotech / Therapeutics is anchored to Precedence Research (2025): Biotechnology ~$1.77T in 2025, ~13.6% CAGR to 2035. Full citations are listed under "Market data sources".
- Stage norms reflect US-market series-a deals; adjust for geography "US".
- Score is a screening signal, not a substitute for legal, financial, and technical due diligence.