

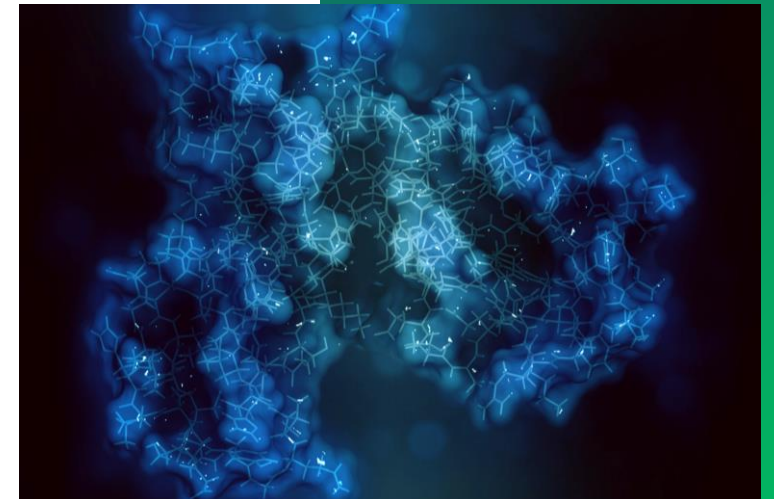
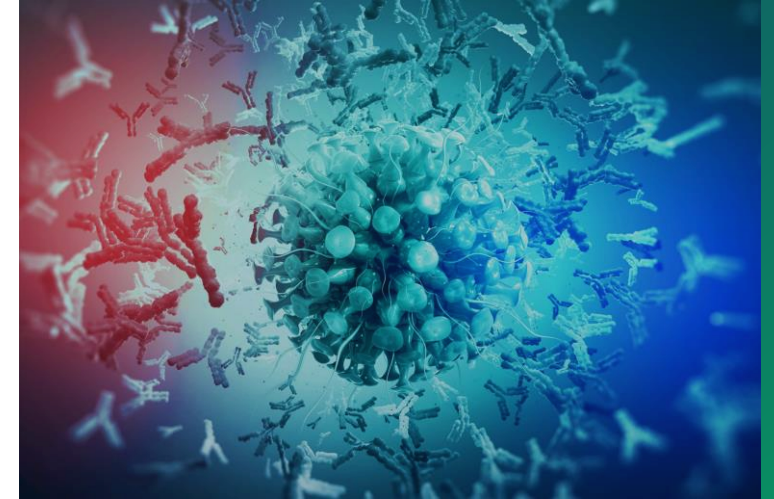


Complex Human Therapeutics Manufacturing

Executive Summary



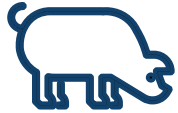
- Several large therapeutic markets are still dependent on human donations, a high-overhead, limited, and unstable supply source.
- Lyric Bio is leveraging proprietary tissue engineering technology to develop high-density, tissue-mimicking bioreactors for production of therapeutics currently derived from human donation, starting with immunoglobulin (Ig) therapies (Ivlg, ScIg).
- Ig is an ~\$15 B market completely dependent on human plasma and blood donations.
- Lyric's process will alleviate dependence on donors, increasing supply, reducing costs, and improving quality of Ig therapeutics.
- Lyric's bioreactors mimic lymph node tissue to solve a critical hurdle to Ig manufacturing, high density B cell culture.
- Lyric is raising \$7 M to validate manufacturing processes.



The Biotech Revolution Was Driven by Manufacturing Advances, But Several Large Markets Were Missed

Well defined protein-based therapeutics are produced at industrial scale

Insulin



Monoclonal Antibodies



Bacteria and mammalian cell culture production meets global demand

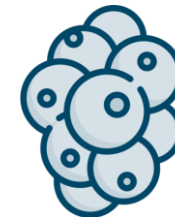
But existing manufacturing technologies *can not* replicate human donor derived therapeutics



Donor derived therapeutics



Ivlg & ScIg
\$15 B



Stem Cells
\$13 B



Blood Transfusion
\$6 B

Lyric is Reversing the Donor to Recipient Paradigm for Ig

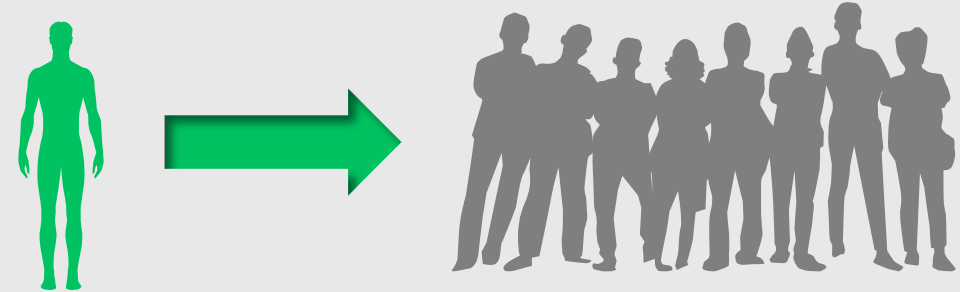
Lyric Bio has an exclusive license to Prellis Biologics' bioprinting technology to produce high-density bioreactors for the industrialization of therapeutic immunoglobulin (Ig) manufacturing

Current Process



Est. 7-10 donors per Ivlg dose

LYRIC Process



Est. 1000 Ivlg doses per donor

Our process will produce the same Ivlg product with a 10,000+ fold reduction in donations required.

What are Immunoglobulin (Ig) Therapies?



Ig is a mixture of polyclonal antibodies purified and concentrated from donor serum.

- Ig can be administered in two formulations intravenous (Ivlg) and subcutaneous (ScIg)
- Ivlg has been used therapeutically since the 1950s
- Human B cells produce it, but it is highly cost prohibitive to manufacture with existing technology
- Two known mechanisms of action are immune system replacement and reduction of inflammation.



Ig therapies are FDA-approved for use in 7 diseases:

- Immune thrombocytopenic purpura (ITP)
- Primary immunodeficiency, secondary immunodeficiency
- Pediatric HIV infection
- Kawasaki disease
- Graft versus host disease (GVHD) prevention
- Infection in bone marrow transplant recipients
- Chronic inflammatory demyelinating polyneuropathy (CIPD)



Most Ig use is off-label (>100 diseases):

Including: Lupus, Myasthenia Gravis, Multiple Sclerosis, Multifocal motor neuropathy (MMN), CLL, Alzheimer's Disease (in Clinical Trials), Chronic fatigue syndrome, and Long-COVID (in Clinical Trials).

Ig: Current \$15B Market with Significant Limitations

High-Overhead



- 1000s of donation centers
- Donors paid ~ \$2.6-4.8 B / yr. (in US)
- Millions of liters of plasma shipped and processed annually

Unstable & Limited Supply



- 7-10 donations per standard dose
- Paid donation only legal in 5 countries
- Unstable supply revealed by COVID-19

High Cost

~\$56,327- \$277,119
per year per patient

Infection Risk

Donor derived materials
can spread bloodborne
pathogens

Market Shortages

Physicians would use Ig
more often without supply
constraints

Demand Increase

Currently in clinical trials
for diseases impacting
>25M Americans

Ig: Growing Market with Room for Disruption

Ivlg Major Players



65% Market Share

GRIFOLS

octapharma

CSL Behring

Baxter



KEDRION
B I O P H A R M A



Opportunity to expand current 7% annual market growth by increasing supply, allowing physicians to prescribe more freely



Trend toward at home, subcutaneous administration requires 30-50% higher doses of immunoglobulin exacerbating cost and supply concerns

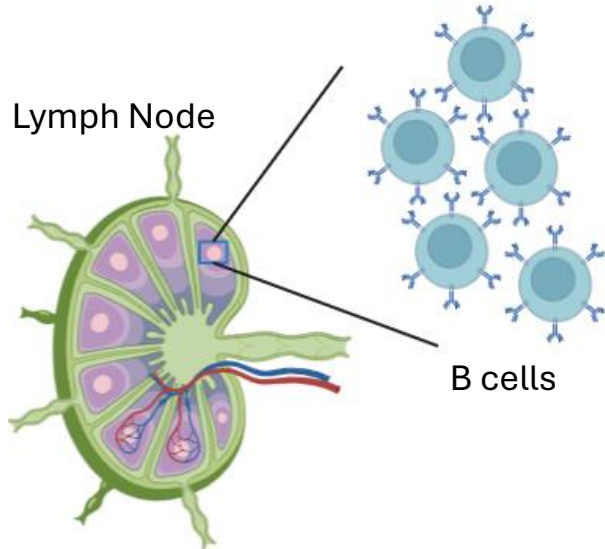


Industry operating model has significant overhead that can be eliminated by industrialized manufacturing with raw materials and CapEx accounting for 85% of costs

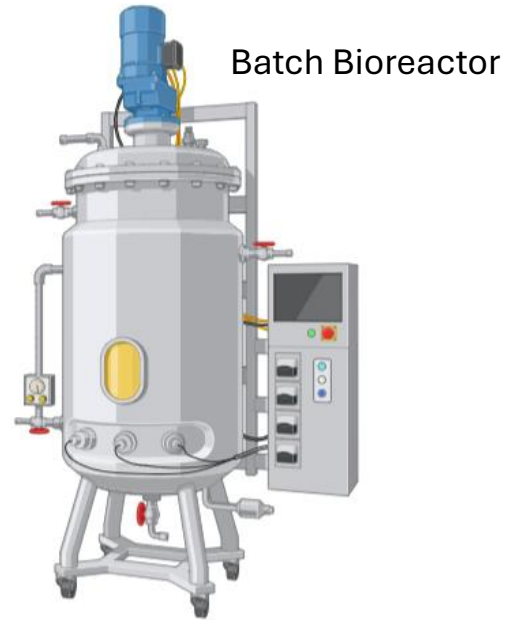
Alternative Technologies in Development Have Limitations

| | Applicable in All Indications | Scalable Manufacturing | Matches Current Product |
|--|-------------------------------|------------------------|-------------------------|
| FCRN Therapies Antibody fragments targeting one proposed mechanism of Ig therapy | ✗ | ✓ | NA |
| Animal Derived Ig Animals (cows) engineered to produce humanized Ig | ✓ | ✗ | ✗ |
| Recombinant Ig Manufacturing cell lines engineered to produce a mix of antibodies that mimics human Ig | ✓ | ✓ | ✗ |
| Lyric Culturing human B-cells in proprietary bioreactors to produce Ig at scale | ✓ | ✓ | ✓ |

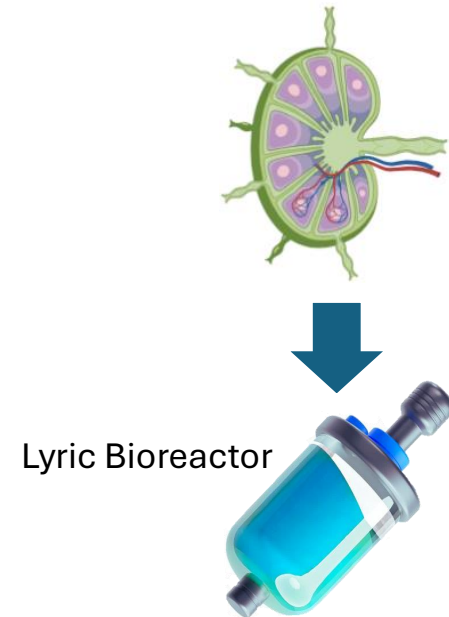
Our Process: Leverages Natural Ig Producing Cells



B cells naturally produce Ig and are primarily found in your lymph nodes



B cells are not efficient with suspension bioreactors and manufacturing technologies

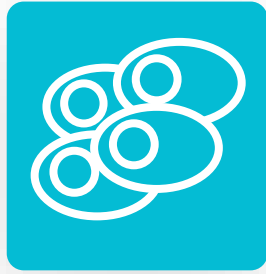


Lyric uses 3D bioprinting to make lymph node mimicking bioreactors for B cell culture

Our Process: One Donor, One Bioreactor, Thousands of Doses



B cells
(one donor)



Grow B cell
populations



Seed and expand
in a high-density
bioreactor



Stimulate B cells
to produce
immunoglobulin



Collect Ig
(est. >1,000 doses)

Est. 10X - 100X lower cost

Estimated industry costs for plasma collection
vs Ig production excluding purification costs

Est. >90% gross margin

At current reimbursement rates and protein
purification on par with efficient mAb processes

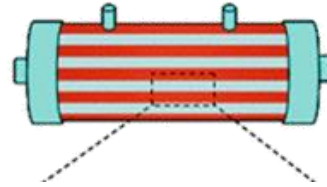
Ig Manufacturing Limited by Surface Area to Volume Ratios

At ~\$1,000/liter, media costs require high-density 3D culture systems for cost efficient Ivlg production



2D Cell Culture

~30,000 Flasks and ~\$1.5M of media for 1,000 doses



Hollow Fiber Bioreactor

~10+ Bioreactors and ~\$650K of media for 1,000 doses



Lyric High Density Bioreactor

1 Bioreactor and ~\$10,000 of media for 1,000 doses

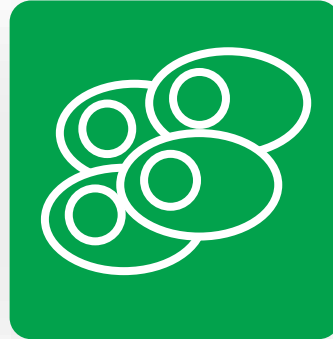
Increasing Surface Area to Volume Ratio

- **2D cell culture is not sufficient:** Standard B cell culture (2D) does not allow high enough densities to enable cost effective production, 3D culture improves IgG production by B cells.
- **Existing 3D cell culture technologies are not sufficient:** Lyric has an exclusive license to use world's fastest and highest resolution bio printer providing a 10x advantage in surface area-to-volume relative to other 3D cell culture technologies
- **Lyric Biosciences can produce bioreactors capable of cost efficient Ivlg production**

Key science derisked at Prellis Biologics to tackle a decades old therapeutic market



IgG comparable polyclonal antibodies can be produced *in vitro* (2D culture)



Prellis LNO organoids are routinely within range of high-density bioreactor numbers



Ig is a long-standing therapeutic, first used in the early 1950's

Unique Opportunity to Improve Patients' Lives

Market Size

\$15B market growing at 7% annually and potential to accelerate that growth

Unmet Need

Inefficient supply source leads to high cost and shortages

Product Fit

We address existing issues will supplant existing products and expand market

Derisked Science

Most scientific aspects already demonstrated in literature or at Prellis

Major Impact

Ivlg is a life saving therapeutics used by millions



pedsRN68

My son received multiple IVIG infusions when he was diagnosed with Kawaski's disease at age 3. His cardiologist believed it saved his life by preventing an aortic aneurysm.

6-28 Reply



user641055865288

Used it for MECFS. It helped a lot. Like ALOT. But had to pay cash and I ran out of money.... So I suffer

7-1 Reply

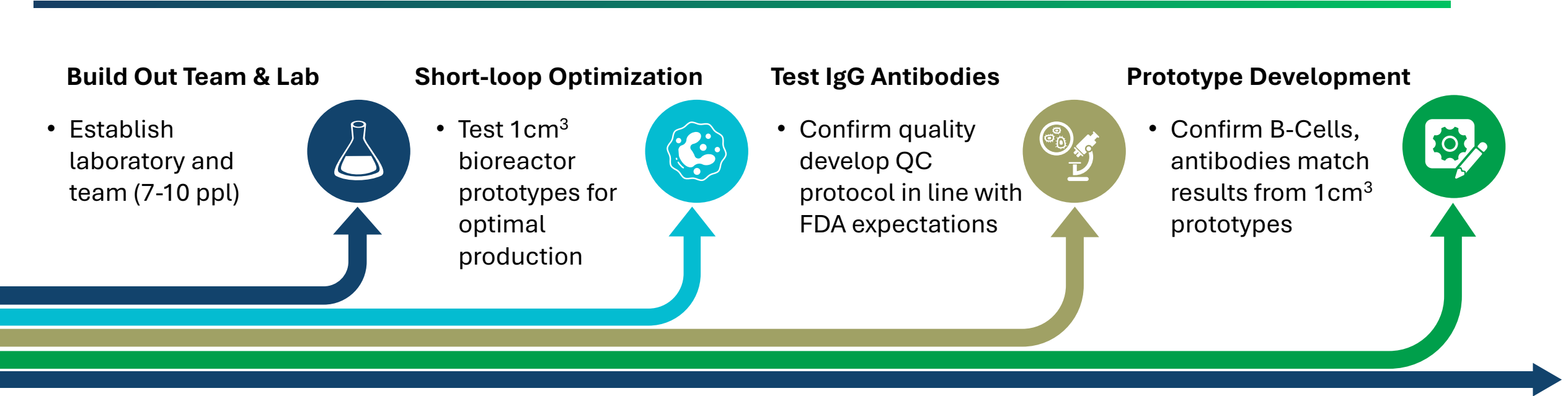


Tammy

My life depends on IVIG. I get infused for 3 days every 4 weeks. I have Myasthenia Gravis. It is extremely affective for me, until it wears off. Ins.hates paying but it's cheaper than icu

6-29 Reply

\$7 M Fundraise: 18 Month Runway



- \$7M provides 18 months of runway for 7-10 FTE, including 5-7 lab staff
- Base Case: Demonstrate POC for lvg production in a 1cm³ bioreactor
- Bull Case: Initial test of production size (150 mL) MVP bioreactors
- Series A will focus on industrialization of manufacturing capability and FDA regulatory approval

Founding Team



Kayj Shannon
Co-Founder & CEO
10 years at large Pharma
and start-up companies



Melanie Matheu, PhD
Co-Founder & CSO
Prellis Biologics, Inc.
Founder and CTO



University of California
San Francisco



Erin Stephens, PhD
Scientific Director
Prellis Biologics, Inc.
VP of Tissue Engineering



Cornell University



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