



ChromaTan

Continuous Column-Free Chromatography

Revolutionizing bioprocessing productivity.

Company Presentation

Vision & Mission

Transformational **next-generation** **biomanufacturing** solutions.

Empower biopharmaceutical manufacturers with the **first-ever, columnless, single-use continuous chromatography platform**, offering enhanced flexibility, scalability, and purity, reducing resin consumption and downtime, and maximizing productivity for the cost-effective production of life-saving therapies.

Chromatography: Revolutionizing a **Critical Bioprocessing Bottleneck**

Mikhail Tsvet (1900)

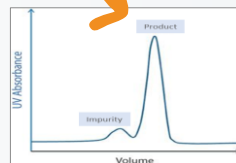
Chlorophyll Separation

Batch Feed



Little product.

One Batch of Purified Product at a Time



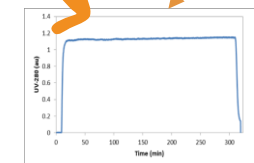
ChromaTan Inc (2023)

Continuous/Batch Feed

THE FIRST DISPOSABLE COLUMNLESS PURIFICATION PLATFORM

Lots of product.

Continuously Purified Product



Overcoming Bioprocessing Inefficiencies with CCTC

CCTC vs. COLUMN CHROMATOGRAPHY

Fast cycle times minutes vs. hours, days

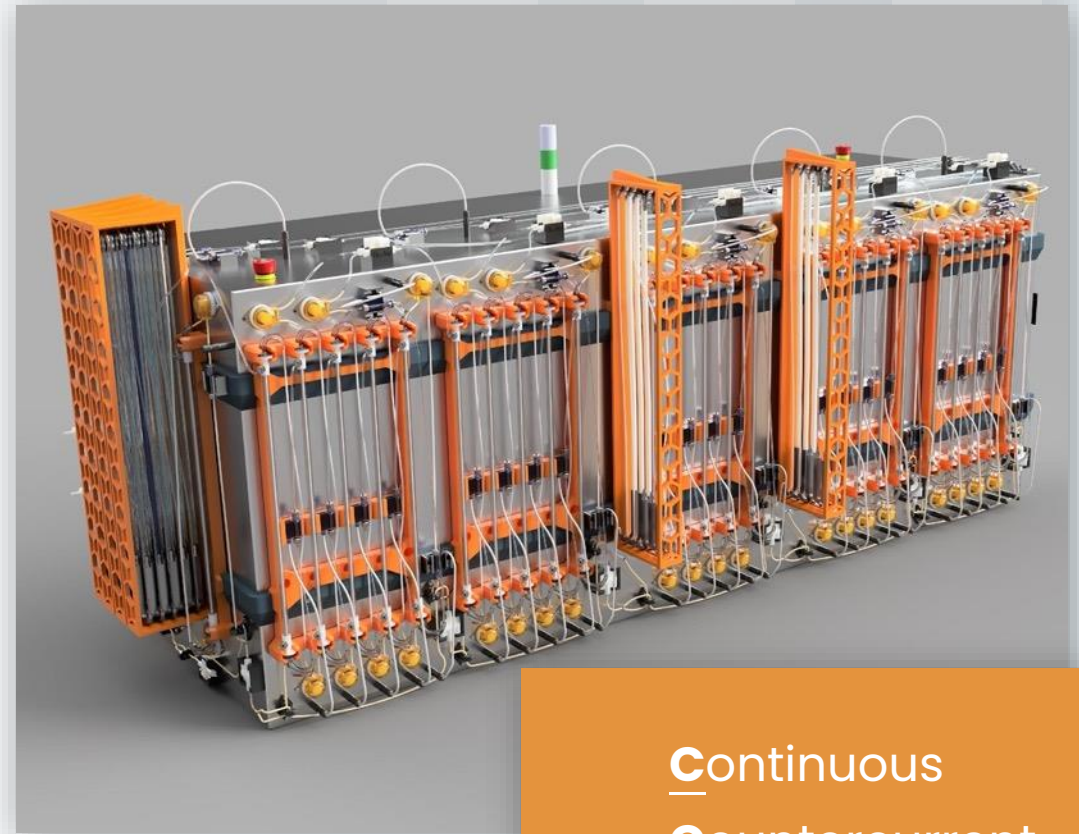
High product recoveries >95% vs. <80%

High purity AND high yield vs. EITHER/OR

Modular scalability vs. non-linear

Low operating pressures <3-15 psi vs. 30-50 psi

Single-use flow path no cleaning-in-place
rapid turnaround



Continuous
Countercurrent
Tangential
Chromatography

How Are We Able to Accomplish All That?

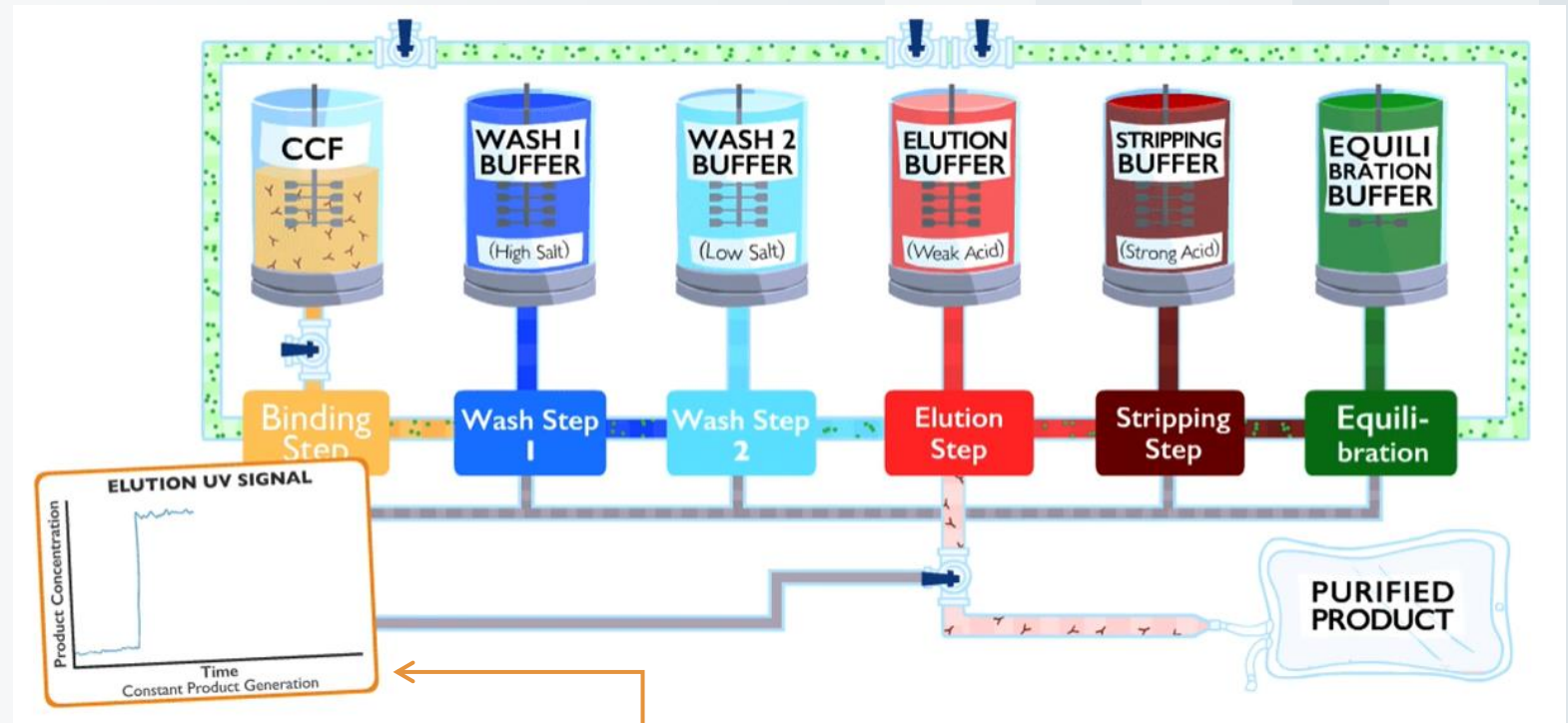
The CCTC Operating Principle

Real Moving Bed Principle

- Different operations are performed on the resin slurry as it is gently pumped in a **continuous loop like a conveyer belt**.

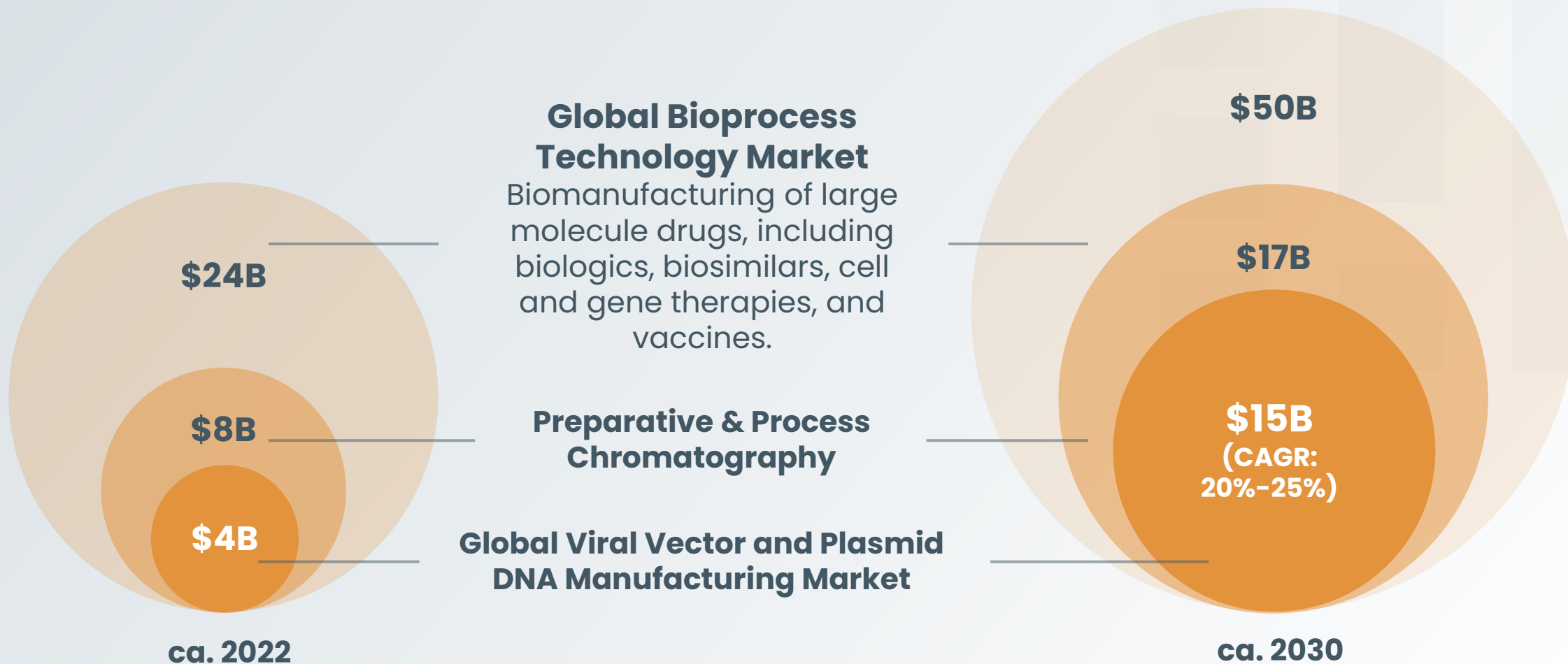
Single-Use

- Entire flow path is designed for **single-use** economics.



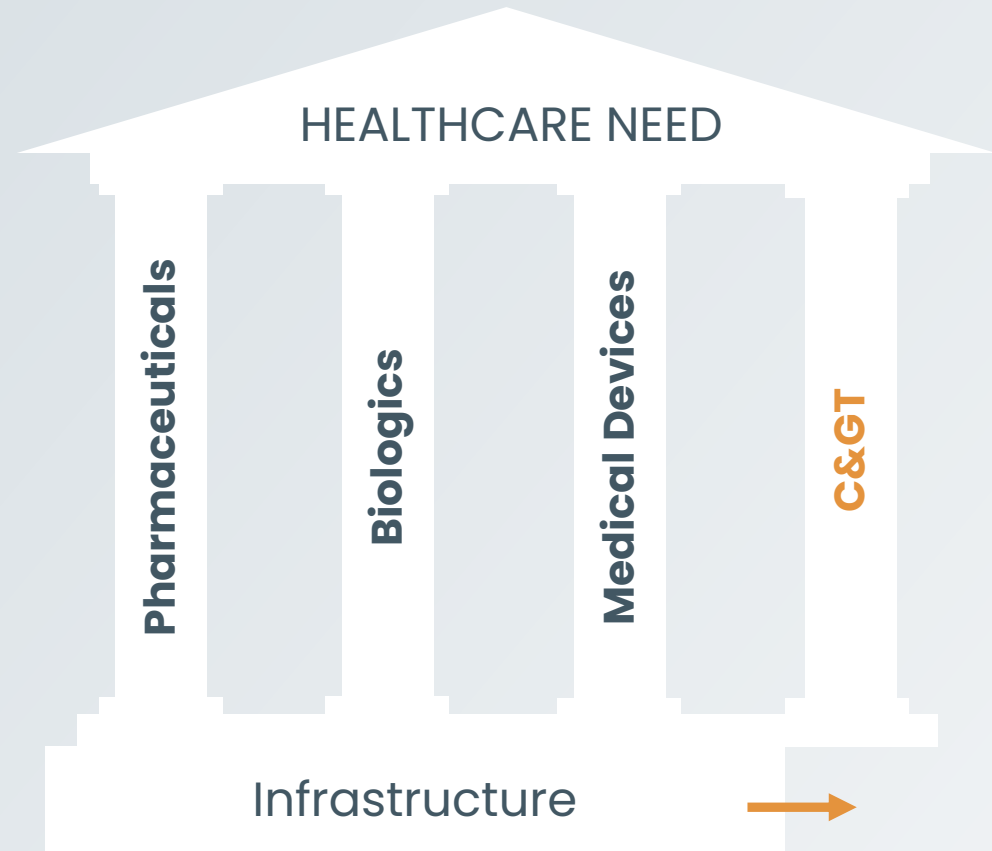
No elution peaks and valleys!

Global Bioprocessing Market by Sector



<https://www.grandviewresearch.com/industry-analysis/viral-vector-manufacturing-market>; PitchBook; Company Database

Cell & Gene Therapies: The Fourth Pillar



Infrastructure Needs:

- **Scalable manufacturing**
- Regulatory structure
- Reimbursement structure
- Adoption as standard of care

Chromatography is a critical element of infrastructure.

Why Are Viral Vector (AAV, LV) Products Not Suited for Column Chromatography?

- **AAVs and LVs are larger and more sensitive products than protein therapeutics.**
- **Low product recoveries (AAVs <60%; LVs <40%).**
- **Products are sensitive to process conditions:**
 - Column-based processes negatively impact product quality
 - High pressures cause high shear degradation leading to column blockage
 - Difficult to control local product concentrations
 - Long residence times in unfavorable conditions
- **Very expensive resins, with low utilization:**
 - **\$25,000** per liter resin
 - **1-2 cycles** typically used per campaign
 - In clinical production, expensive resins are discarded after 1-2 cycles
- **Current platforms do not provide scalable solutions**
- **Standardized production systems yet to evolve.**

Viral-Vector Therapies at Scale: **Challenges, Opportunities & Drivers**

MARKET:
Preparative &
Process
Chromatography

\$4B

Leading Edge

- Large CDMOs have **invested** heavily (\$8B) in this space, with several large acquisitions in the past few years.

Patient Access

- Leveraging developments in viral-vector manufacturing to **accelerate** patient access.

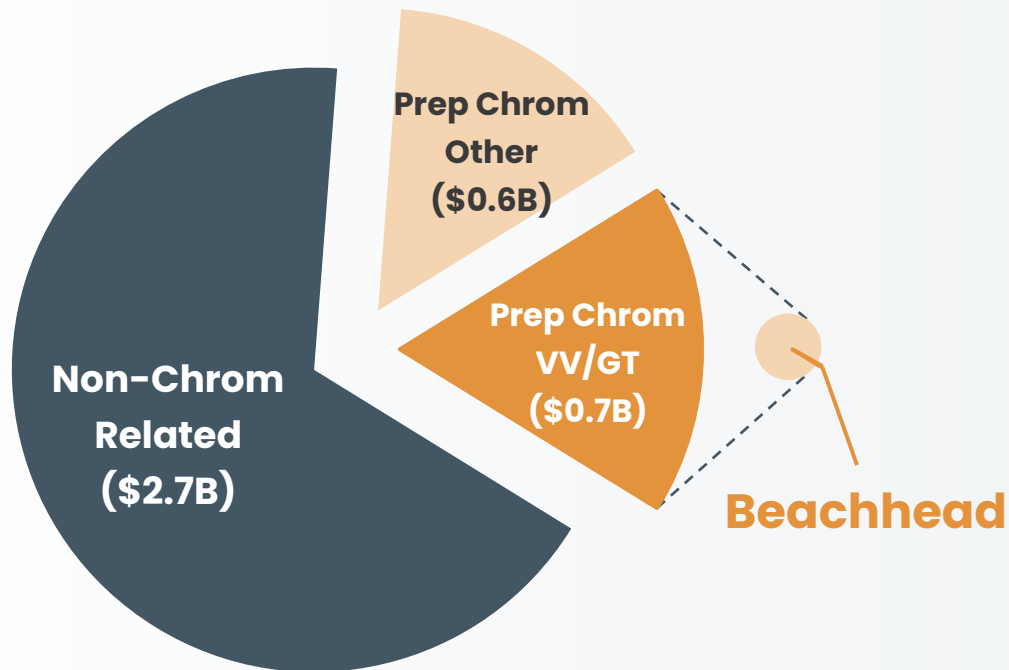
Downstream Processing

- Increasing demand and broader application of viral-vector-based gene therapies requires **higher** yields and **lower** cost of goods (COGs).

Our Beachhead Market

Viral Vector & Gene Therapy

Global VV & GT Manufacturing Market (2022/23)



Examples of Drug Development Companies

1. Spark Therapeutics
2. Miltenyi/Lentigen
3. Capsida Biotherapeutics
4. Ultragenyx
5. Gilead/Kite Pharma
6. Moderna-mRNA

Examples of CDMOs and Other

1. ViveBiotech-LV Pureplay
2. Resilience
3. FujiFilm Diosynth
4. Thermo Fisher
5. Repligen
6. BioVectra

<https://www.grandviewresearch.com/industry-analysis/viral-vector-manufacturing-market>

Listed in no particular order.

Record-Breaking **Competitive Advantage**

CCTC Serves Many Verticals

PROTEIN-BASED	OTHER	GENE THERAPY
Monoclonal Antibodies	Plasma purification	AAV, LV, mRNA

Several Successful Campaigns

Solid Proof-of-Concept Data

- **Paid collaborative development programs** with blue-chip biopharma clients
- End-to-end **continuous integrated** biomanufacturing platform
- Highly innovative and technically advanced **single-use flow path design**

Efficient Bioprocessing

CCTC Outperforms Conventional Chromatography

90%-95%
less resin
usage

10x-20x
more
productive

20%-40%
higher
recoveries

The Beachhead

Viral Vector & Gene Therapy

GENE THERAPY

Adeno-Associated Viruses
Lenti Viruses, mRNA¹
Other Viral and Non-Viral Vectors

Meets Growing Gene Therapy Demands

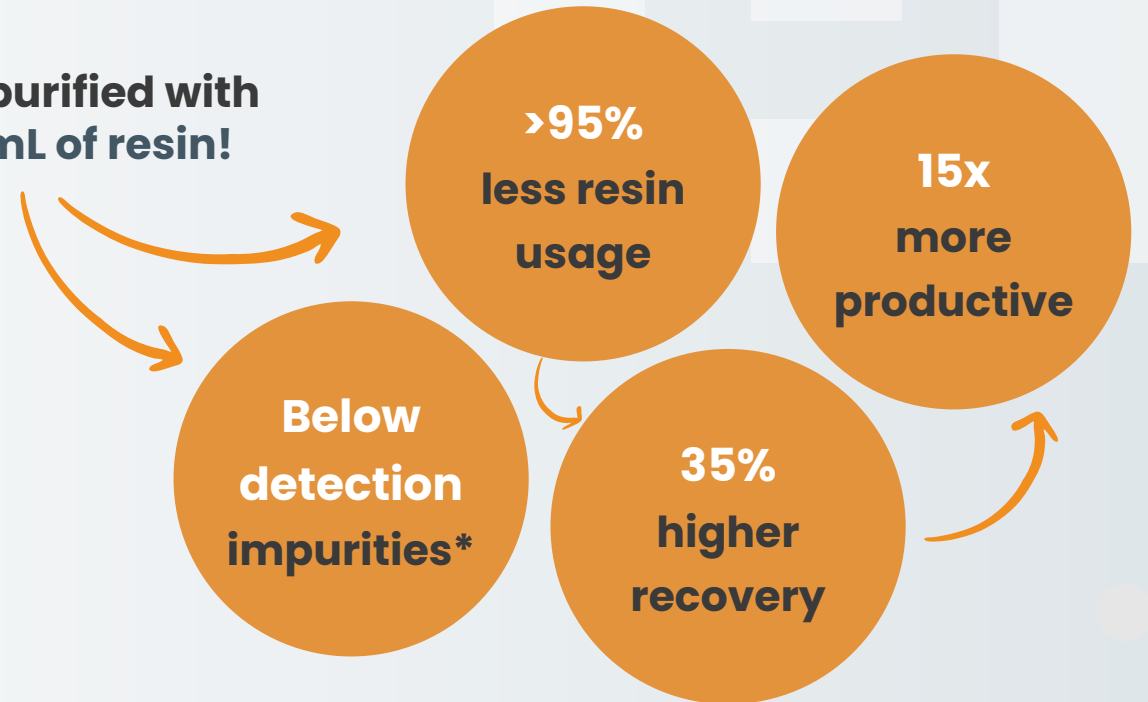
Captures the Highest-Margin Opportunity

- **Fastest-growing market** segment (22%-27% CAGR)
- **2,220** active clinical trials globally²
- 95% of programs have **not locked in CMC**
- **Significant cost savings** to using vastly smaller amounts of expensive resin

Record-Breaking Performance

CCTC Outperforms Conventional Chromatography





**40L AAV purified with
only 14 mL of resin!**



¹ mRNA: messenger RNA. ² bionewsletter@bio.org, Wed, Jun 21, 2023

* Host cell protein & DNA

Dominating the Competition: Unmatched Potential

	 ChromaTan	 Millipore Sigma	 SARTORIUS	 YMC PROCESS TECHNOLOGIES
Column-free	✓	⊗	⊗	⊗
Continuous elution	✓	⊗	⊗	⊗
Single-use	✓	✓	✓	⊗
Scalability	✓	⊗	⊗	✓
Cost savings	✓	✓	✓	✓
Ease of use	✓	⊗	✓	✓
SCORE	6	2	3	3

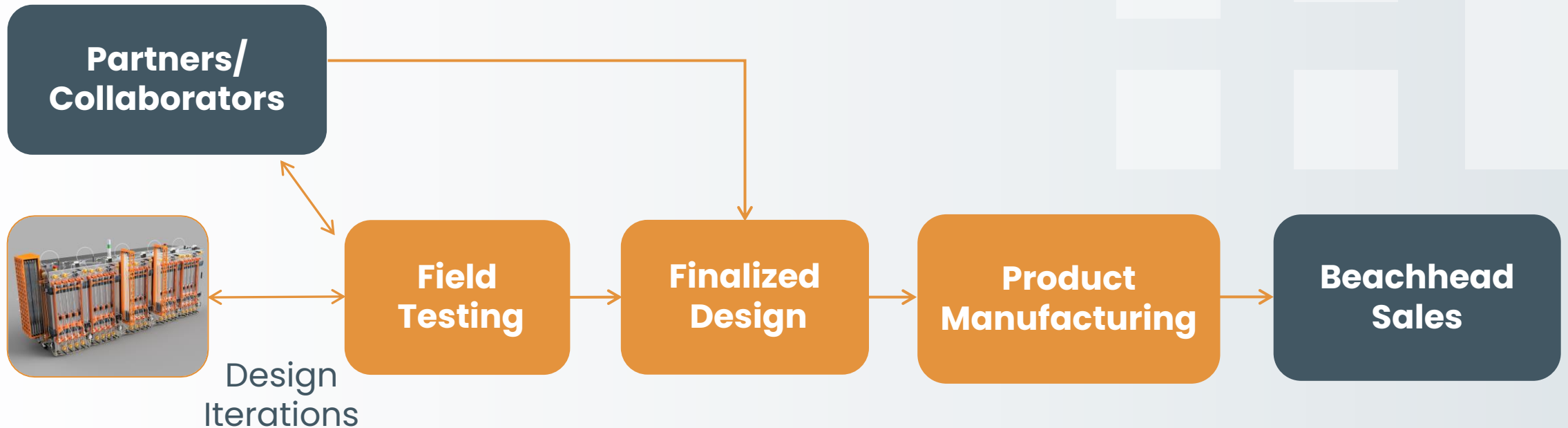
Go-To-Market Strategy

2Q23/3Q23

Product Design | Field Testing

4Q23/2024

Manufacturing | Beachhead Sales



ChromaTan **Market Launch**: 3-Phase Process

Phase I

Launch of **CCTC Mini** for **Process Development**

- Formal launch in September 2023 at BPI, Boston
- Target market Viral Vector and Gene Therapy

Phase II

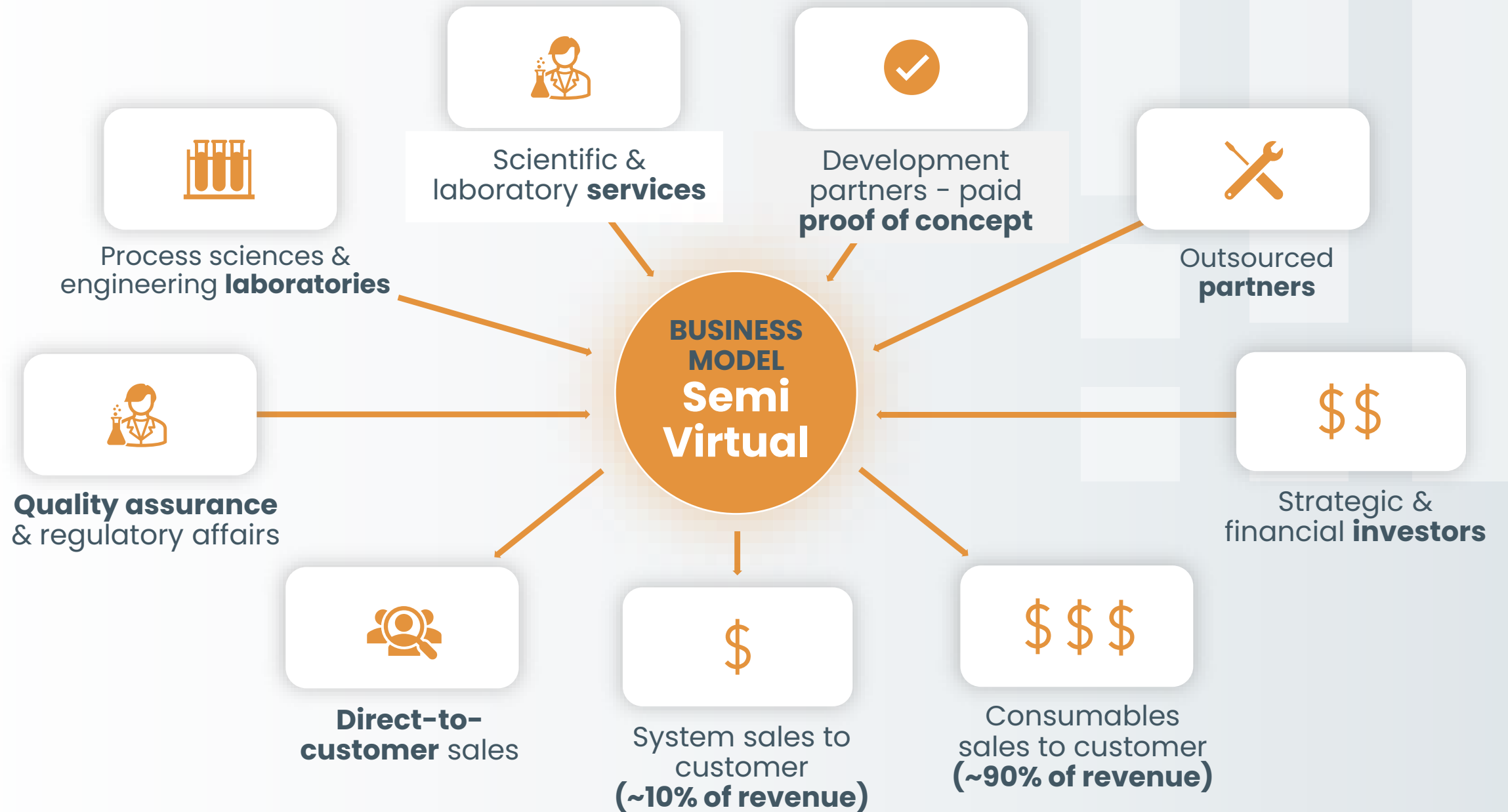
Launch of **CCTC Mini** for **small-scale** cGMP batches

- Target Q2 2024

Phase III

Launch of **CCTC scale up** system

- Target Q4 2024





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Post-Doc/Doc MIT/KTH; MIT EDP '23



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Adjunct Instructor, Tufts, Worcester Poly. Inst.



Industry Traction

- '22 ————— '23 ————— '24 ————— '25 ————— '26 —————>
- **Raised \$2.1m Bridge**
 - Team build to 20
 - Positive POC for 2 paid client development programs
 - **Raised \$2.4m Bridge**
 - **Appointed CEO (Q2)**
 - Launch go-to-market strategy for PD units (Q3)
 - **Deliver first PD units (Q1)**
 - Close first PO for large-scale CCTC unit (Q3)
 - **Deliver first large-scale CCTC unit (Q4)**
 - Scale revenue
 - Pursue new applications

FUNDING

\$5m Raised | \$10m Awarded  

US PATENT NOS.

11110374 | 10859542 | 10324070 | 7988859 | 7947175





YEAR	ACQUIRER	TARGET	DEAL SIZE	REVENUE	DEAL/REVENUE	DEAL/INVESTMENT	DEAL/EBITDA	CATEGORY
1998	Perkin Elmer	PerSeptive Bio	\$360M	\$96M	3.7x	6x		Bioinstrumentation
2013	Sartorius	TAP Biosystems	\$45.1M	\$27.2M	1.7x		227x	Cell culture & fermentation systems
2014	Repligen	Refine Technology	\$26.5M	\$8.3M	3.2x			Cell retention & separation systems
2015	Pall Corp	Tarpon Biosystems		\$1M-\$5M				Multi-Column Chromatography
2015	Danaher	Pall Corp	\$13.6B	\$2.8B	4.9x ¹			Conglomerate
2016	Repligen	TangenX	\$37.2M	\$5.1M	7.2x ¹			Bioprocessing - MF & UF products
2017	Thermo Fisher	Finesse Solutions	\$221M	\$50M	4.4x			Bioproc tech management software
2017	Millipore Sigma	Natrix	\$22M (14+7)					Membrane chromatography
2017	Repligen	Spectrum Labs	\$371M	\$39M	9.4x ¹			Bioprocessing - broad
2020	Sartorius	WaterSep	\$33M	\$2.5M	13.1x ¹			Hollow-fiber membranes/devices
2021	Mettler-Toledo	PendoTECH	\$205M (185+20)	\$36M-\$37M ²	5.6x			Biopharma - single use sensors, etc.
2021	Donaldson	Solaris Biotechnology	\$45.7M	\$0.55M	82.9x			Bioproc. equipment - fermenters, bioreactors, TFFs, sensors, etc.
2022	Donaldson	Purilogs	\$48.9M (19.9+29)			9.1x (Deal/Grants)		Disposable membrane chromatography
2023	Donaldson	Isolere Bio	\$62.5M			8.6x		TFF tech for AAV and MAb production
2023 (Jun 29)	Donaldson	Univercells	€136M	€10M	13.6x ¹			Single-use fixed-bed bioreactor for intensified production

6.7x: Average of categories (excl. Donaldson outlier)
¹ **9.6x: Bioprocessing average (excl. Donaldson outlier)**

Source: PitchBook.

² <https://www.sec.gov/Archives/edgar/data/1037646/000103764622000008/mtd-20211231.htm>, page 36.



ChromaTan
Continuous Column-Free Chromatography

The future of **single-use,**
column-free purification is here.

Contact — investors@chromatan.com

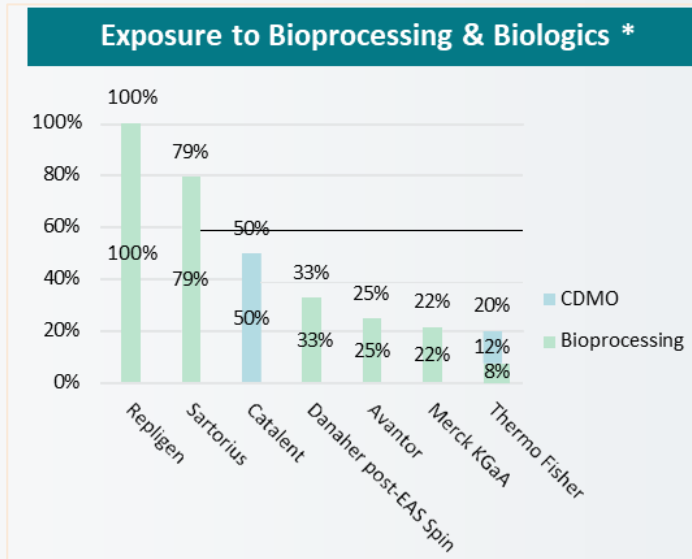
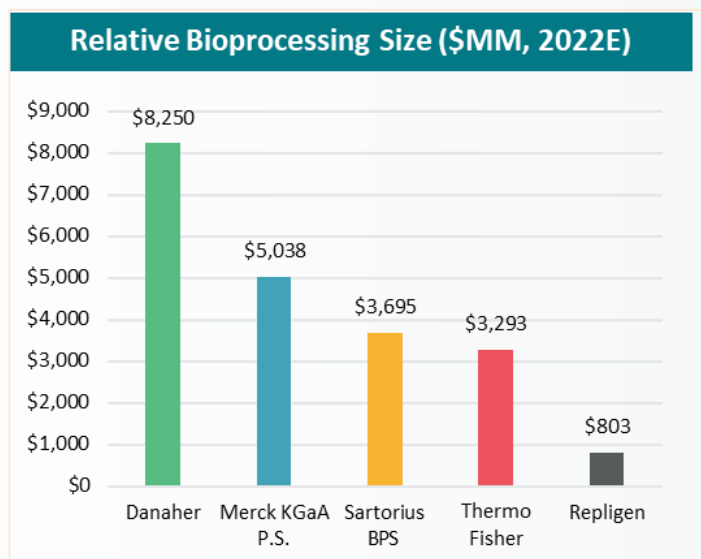
www.chromatan.com

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Appendix | Data Room

Bioprocessing: Competitors & Collaborators



- Combined, the Bioprocessing Sales of the top 5 companies are estimated to be **~\$21B.**
- The dominant supplier is **Danaher**, with a portfolio spanning upstream and downstream solutions.
- Historical bioprocessing compounded **growth** has been solidly in the double digits.

Source: Nephron; ChromaTan Database

Record-Breaking Competitive Advantage

SORBENTS: PROTEIN A ANION EXCHANGE (AEX)	PALL DATA					MILLIPORE ³	CHROMATAN CCTC ⁴	
	BATCH ¹	MULTI-COLUMN (SMB) ¹	MULTI-COLUMN (SMB) ¹	BATCH ²	MULTI-COLUMN (SMB) ²	MULTI-COLUMN (MOBIUS)	PRO A-MAb	AEX Polish
No. of columns	1	3	4	1	5	2	0	0
Residence time (min)	5	1	1	3	3	6	Steady-state	Steady-state
Loading product concentration (g/L)	0.4	0.4	2.2	5.8	5.8	4.0	2.3	8.5
Cycle time (h)	8.6	4.9	1.3	4.0	0.9	1.2	0.25	0.25
Productivity (g prod/L resin/h)	3	8	31	16	56	40	140	350

ChromaTan's CCTC technology is **dramatically more productive** than competing technologies



¹ Pall SMB. <https://biopharma-asia.com/featured-article/productivity-economic-advantages-coupling-Single-Pass-Tangential-Flow-Filtration-Multi-Column-Chromatography-continuous-processing/>

² Pall SMB. <https://biopharma-asia.com/magazine-articles/scale-up-of-multi-column-chromatography-using-the-cadence-biosmb-process-system/>

³ mobius-multi-column-capture-system-ds8089en-ms.pdf (sigmaldrich.com)

⁴ ChromaTan CCTC: Continuous Countercurrent Tangential Chromatography. <https://onlinelibrary.wiley.com/doi/abs/10.1002/bit.27232>. Company documents.

Collaborative Case Example: Increased Productivity and Higher Loadings



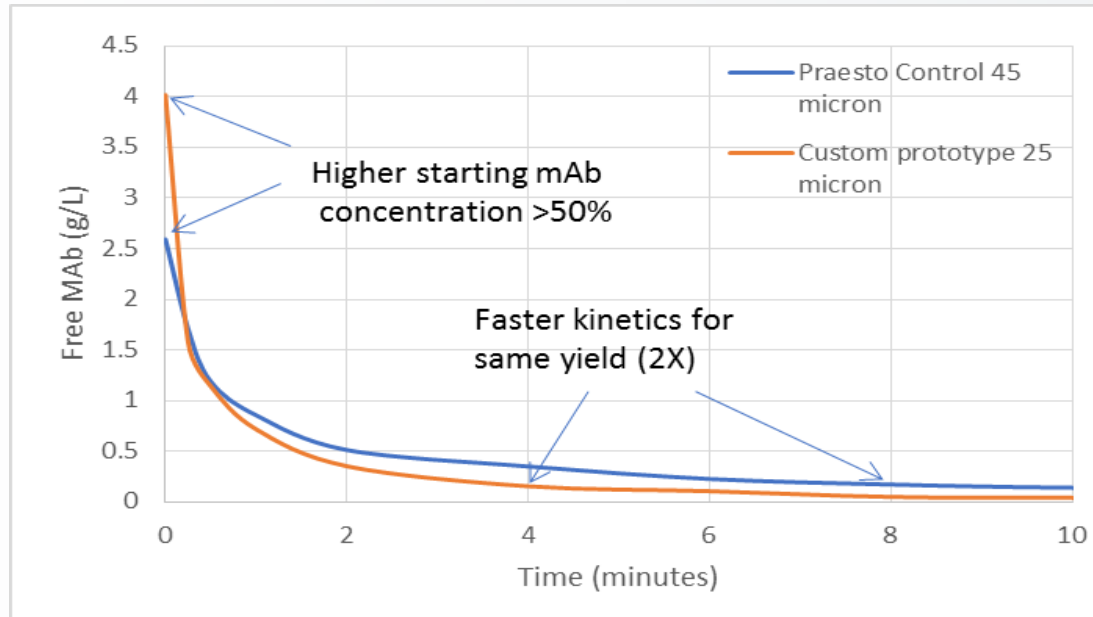
OPERATION	YIELD	PRODUCTIVITY (G/L/HOUR)	BUFFER USAGE L/G	RESIN VOLUME ML	PROCESS TIME (HRS)	BATCH VOLUME (L)
CCTC - CaptoAdhere Impres	95%	101	3.3	51	5	4
CCTC - CaptoAdhere	95%	67	3.3	78	4	3.2
Column Operation	90%	9.3	1.3	404	5	4

11-fold increase in steady-state productivity vs. batch column:

- 8-fold increase counting startup and shutdown;
- 8-fold savings on resin volume;
- CCTC - 5 resin cycles per hour with CaptoAdhere Impres;
- 2 cycles per 8 shift in column batch operation.

Higher loadings - ~6.5 g/L for CCTC; ~4.7 g/L for batch column operation.

Collaborative Case Example: Novel Resin Design Leads to Record-Breaking CCTC Productivity

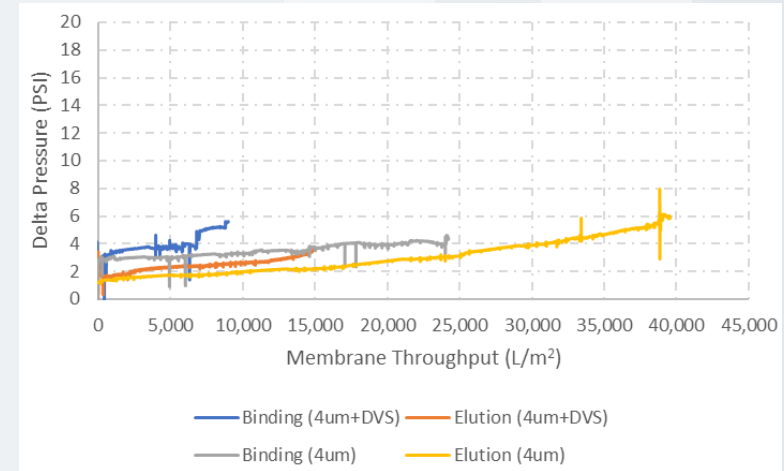


- **New CCTC protein A resin design: 2X faster** kinetics compared to control resin.
- **Specific productivity: 140 g** of MAb/L resin/h (**3X higher** than closest competitor).
- **Dynamic binding capacity: increased by 70–80%** vs. control: 60–70 g/L vs. 35–40 g/L.

Integrated Continuous Processing Example: CCTC Mock Perfusion Purification

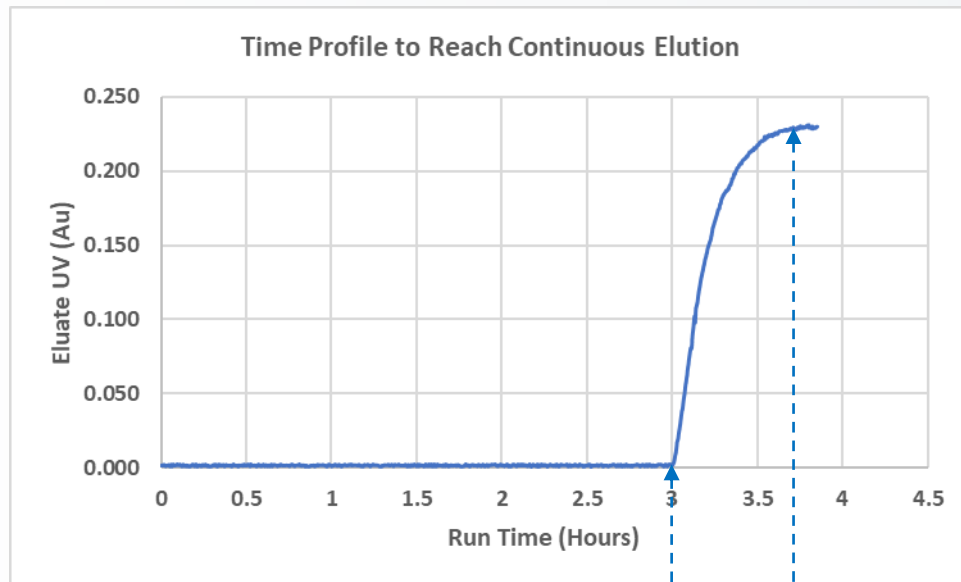
Steady State Purification

- Bi-specific antibody purified
- Accelerated run – high loading purification mocking a 20-day operation in 4 days
- Steady state run of 115 hours
- Constant product quality over run duration
- Resin cycle time of 1 hour used; 115 cycles
- Only **2-3 Liters** of proA resin was used for **400 L/day** throughput



A 4-Day Continuous Elution Run Using the CCTC System

- **Adsorbent:** Protein A
- **Feed:** Bi-specific monoclonal antibody



Start of elution → 40-45 mins → Continuous elution

