

A gloved hand in a blue nitrile glove holds a clear test tube with a blue cap. The test tube contains a red liquid and has volume markings for 0.5, 1.0, and 1.8 ml. The hand is positioned over a large container filled with blue granules. The background is a soft-focus laboratory setting.

Growth in the biopharma cold chain market

A perspective on new pockets of value

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A close-up photograph of a person's hands wearing white nitrile gloves. The hands are carefully handling a small, clear glass vial with a blue cap. The vial is being placed into a white plastic tray that has a red and blue label. The background is a blurred laboratory setting with various equipment and containers. The overall tone is professional and scientific.

01

Understanding the biopharma cold chain market

Six key components drive the biopharma cold chain



Manufacturing

Production of temperature-sensitive biologics, vaccines and therapies requiring stringent temperature controls to maintain product stability and efficacy



Packaging

Active and passive packaging solutions designed to protect products against temperature excursions during transit, using insulation, refrigerants and monitoring devices



Warehousing

Temperature-controlled facilities like cold rooms, freezer farms and cryogenic storage to maintain products within specified temperature ranges during bulk and interim storage



Transportation

Air freight, refrigerated ground transport and last-mile delivery solutions to ship temperature-sensitive products while maintaining product integrity



Monitoring

Real-time tracking of temperature, location and other environmental conditions using internet of things (IoT) sensors, data loggers and analytics to mitigate risks



Consulting

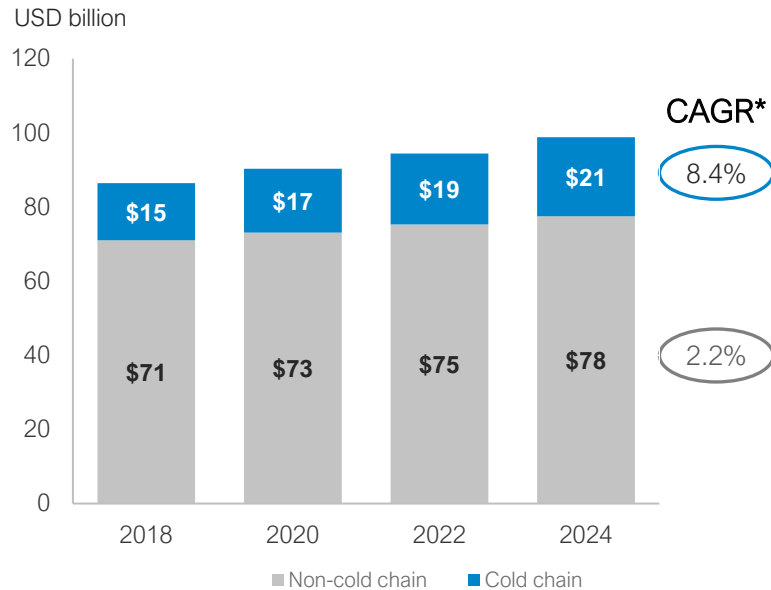
Advisory and engineering services adhere to global regulatory standards, process validation, stability testing and associated processes

Biopharma is experiencing a profound shift towards temperature-sensitive biologics and advanced therapies

...With \$21 billion to be spent this year on cold chain logistics

A higher % of cold chain medicines are being transported globally¹

Global biopharma logistics spending



*Compound annual growth rate

...And are expected to grow at a rate of 13% with 45% of current top 20 drugs needing refrigeration...

13% increase



Cold chain medicines grew more than twice as fast at 13% compared to 6% for the total market between 2017 and 2022²

45% share

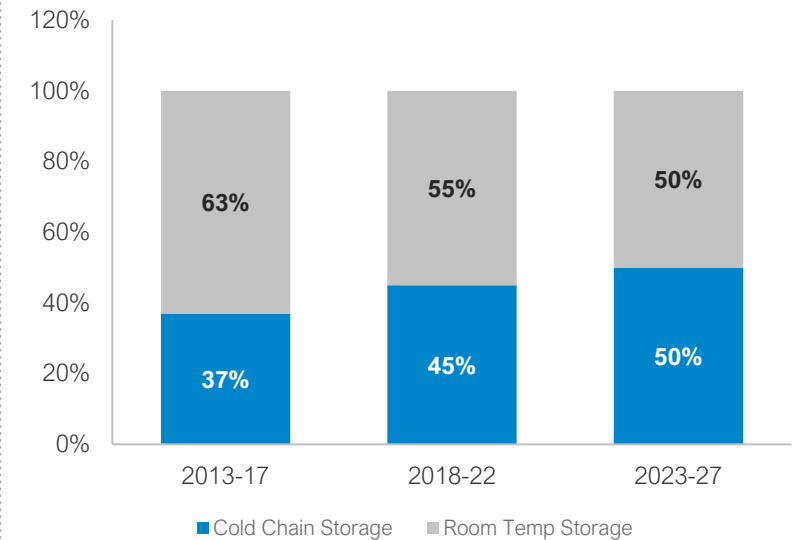


45% of top 20 pharma sales result from medicines that require refrigeration, and this segment was also growing faster than their ambient counterparts at 14% vs. 2% respectively²

50% of new medicines will require cold chain storage ...

The trend is continued with new medicines being approved in 2023-27 horizon³

Global launches of novel active substances (NAS) by product attributes, 2013-2027



Biopharma cold chain market is highly complex, but offers opportunities for those looking to expand or enter the space

1

Enhanced Quality Controls

- With the rise of specialty pharmaceuticals, products are more temperature-sensitive
- More sensitive products bring logistics complexity and greatly expanded risk

2

Support Expanding Distribution

- Biopharma products are moving further—and through more climatical zones—than ever before
- At the same time, there is a demand to have products closer to the patient to improve access

3

The End-to-End Solution

- Asset buy-ups to keep pace with existing players and new entrants, specifically around monitoring needs, artificial intelligence and ultra-cold storage capacities

4

Optimized Cost Structure

- Relentless competition and margin pressures demand a better understanding of total cost of ownership and pulling on the levers, like outsourcing, to drive down costs

In today's dynamic biopharma cold chain landscape, understanding key trends and shifting value pools is essential for informed decision-making and strategic positioning – especially for new entrants or existing players looking to expand

An aerial photograph of a forest with trees in shades of orange, brown, and dark green. A road with white dashed lines runs vertically through the center-right of the image. A vibrant, multi-colored rainbow is superimposed over the road, stretching from the top to the bottom of the frame.

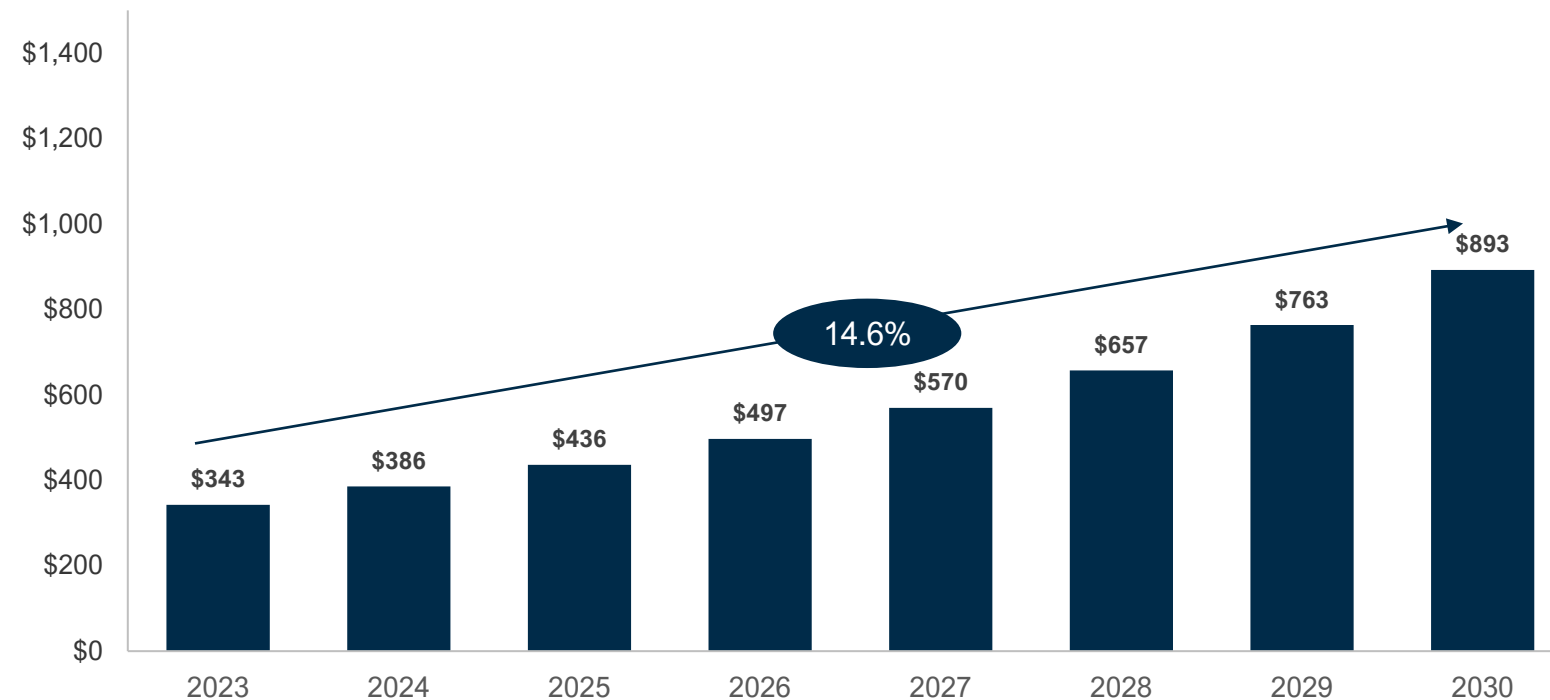
02

Identifying the market trends and drivers

The outlook for the overall cold chain market is very promising

Cold Chain Logistics Market, 2023 to 2030

USD, billions



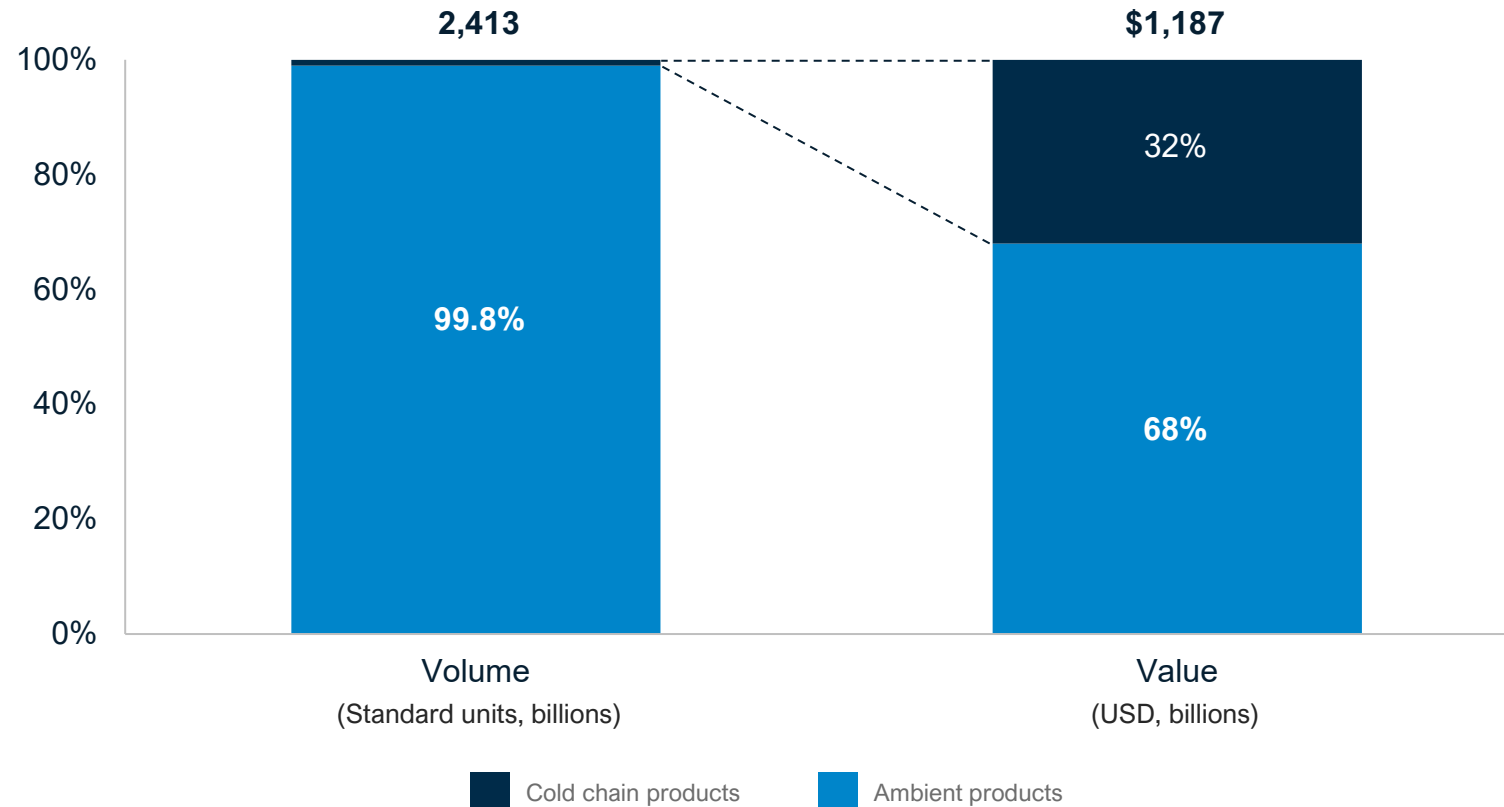
Insights into the market segments

- By Process, pre-coding facilities segment valued at \$171 billion in 2023
- By Technology, dry ice segment garnered the highest market share at 53% in 2023
- By type, refrigerated warehouse segment was valued at \$211+ billion in 2023
- North America CAGR project to outpace other geographies at 14.9%
- Growth factors include a growing demand for refrigerated warehouses, especially in developing countries; growth of the frozen foods market; growth of temperature-sensitive medicines

Biopharma industry will continue to be a primary driver of overall growth in cold chain logistics

While volume is low, biopharma cold chain products are the most valuable...

2021 Global biopharma market by unit volume and market value (excl. vaccines)



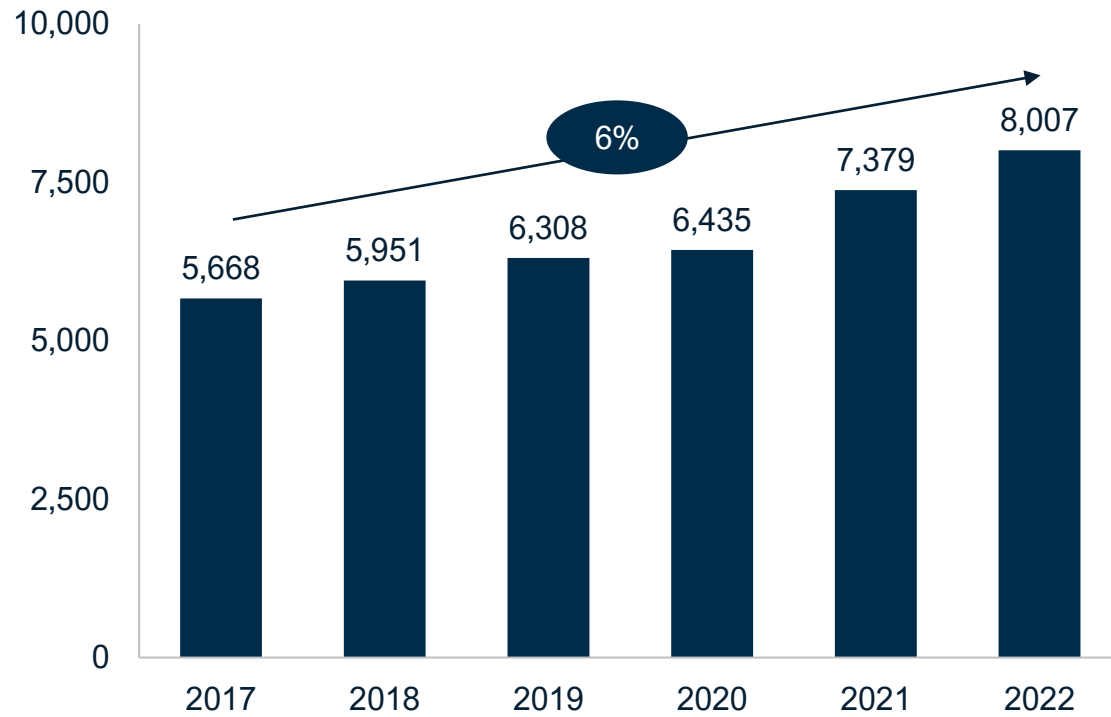
Key insights

- In 2021, only 0.2% of the cold chain pharma volume accounted for 32% in value; this suggests high value drugs volumes are still in low single digits of total pharma volumes
- Cold chain supply chain providers with existing and updatable infrastructure will be well positioned to expand their offerings into the biopharma space, but investment will be required to match increasingly stringent needs and technical requirements
- Fragmented nature of the current biopharma cold supply chain providers suggests an opportunity for a dominant entrant to gain competitive advantage should they prove capability in meeting technical requirements

...and the fastest growing in terms of both volume and value

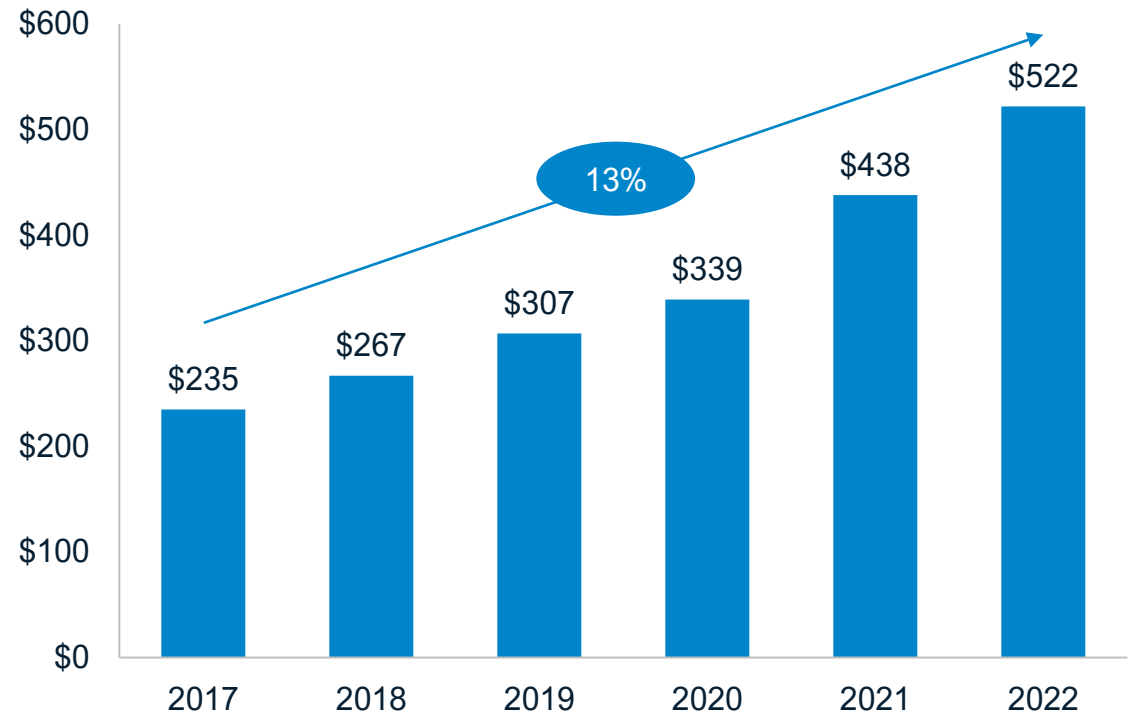
By volume, cold chain products grew at a 6% CAGR
(Ambient units grew at 3% over the same period)

Standard units, billions



By value, cold chain products grew at a 13% CAGR
(Ambient value grew at 3% over the same period)

USD, billions



Several key drivers are fueling growth and investment in the biopharma cold chain market

Biopharma Cold Chain Industry Drivers

Revenue and Volume Growth

- Biopharma industry growth, particularly in **biologics**, **vaccines**, and **gene therapies**
- Private equity investment as the market becomes more attractive
- **Population shifts**: increase in the aging population and middle class in developed countries, increasing need/ability to serve developing countries safely/reliably
- **New technologies** and advanced capabilities command higher relative margins
- High growth pace in **demand for biopharma** cold shipments, growing twice the overall industry rate
- Emerging need to accommodate **patient home delivery**
- Consolidation of **suppliers and partnerships** with biopharma industry will improve ability to scale and diversify scope of offerings

Investment Growth

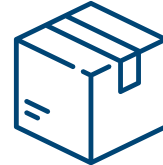
- Meeting **higher standards** compared to traditional cold storage require additional investments in process, people and technology to be credible and compliant
- Increasingly **complex transportation needs/standards**, real-time supply chain visibility, etc.
- **Automation technologies** to better leverage use of the labor force and keep pace with demand growth via scale, detect fraud/theft, forecast demand more accurately, offer personalization and operations oversight, and so forth
- **ESG considerations** spurring need to invest in sustainable, energy efficient operations

Emerging trends are shaping the biopharma cold chain landscape



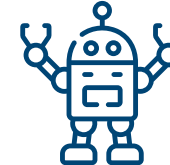
Realtime monitoring and data analytics

Regulatory requirements for chain of identity and custody drive needs for monitoring



Advanced packaging innovations

New biopharma drug types are increasingly requiring new packaging solutions due to stability and potency issues



Technological advancements

Blockchain, robotics and automation are increasingly used in the cold chain



Increasing focus on last-mile delivery

Specialized skills and complex temperature transition / processing prompts focus

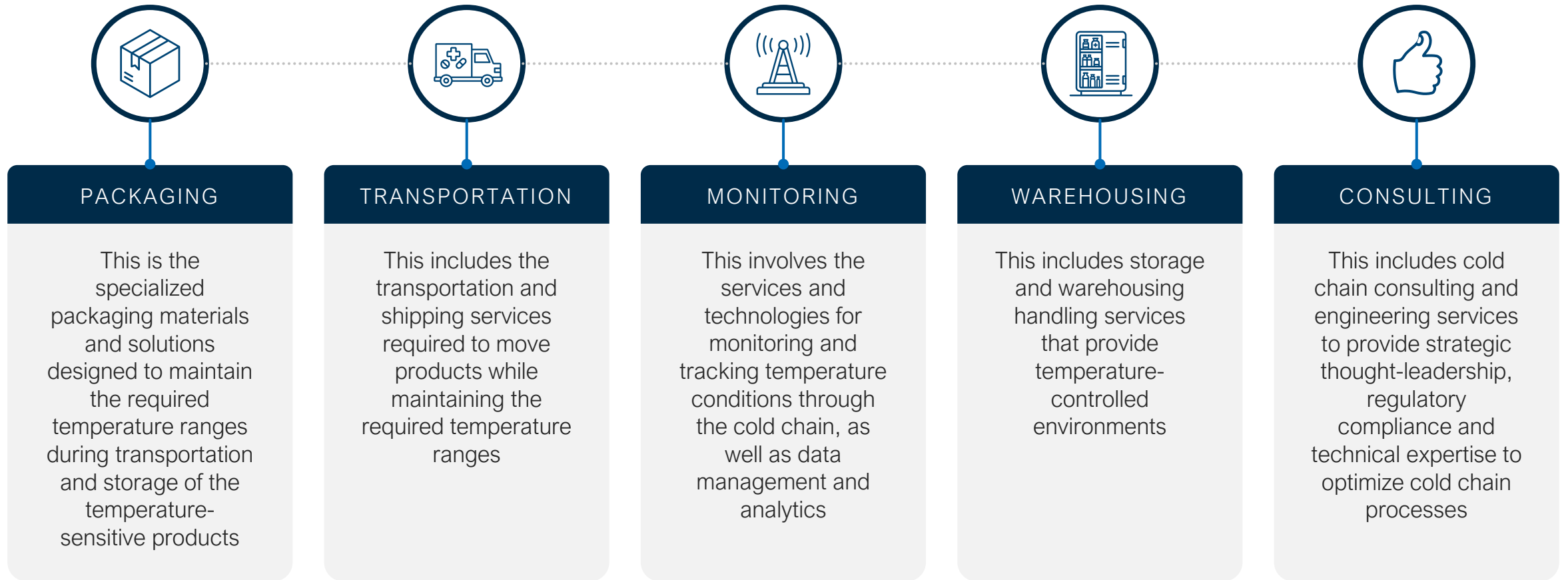


03

**How the value
pools are shifting**

Analyzing the market in five value pools

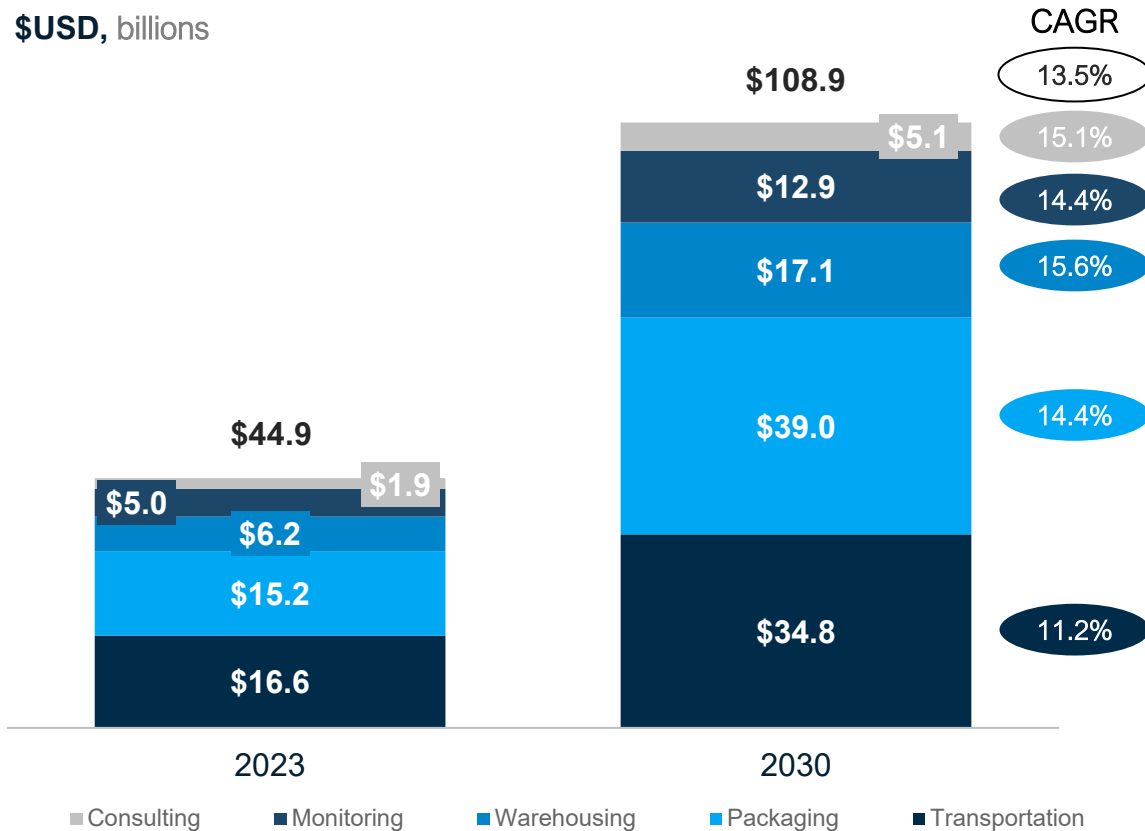
Major Value Pools In Biopharma Cold Chain



The rising tide fills each of the value pools at a high growth rate, but the window of opp. is closing as the market matures

Global Spending on Biopharma Cold Chain Services

\$USD, billions



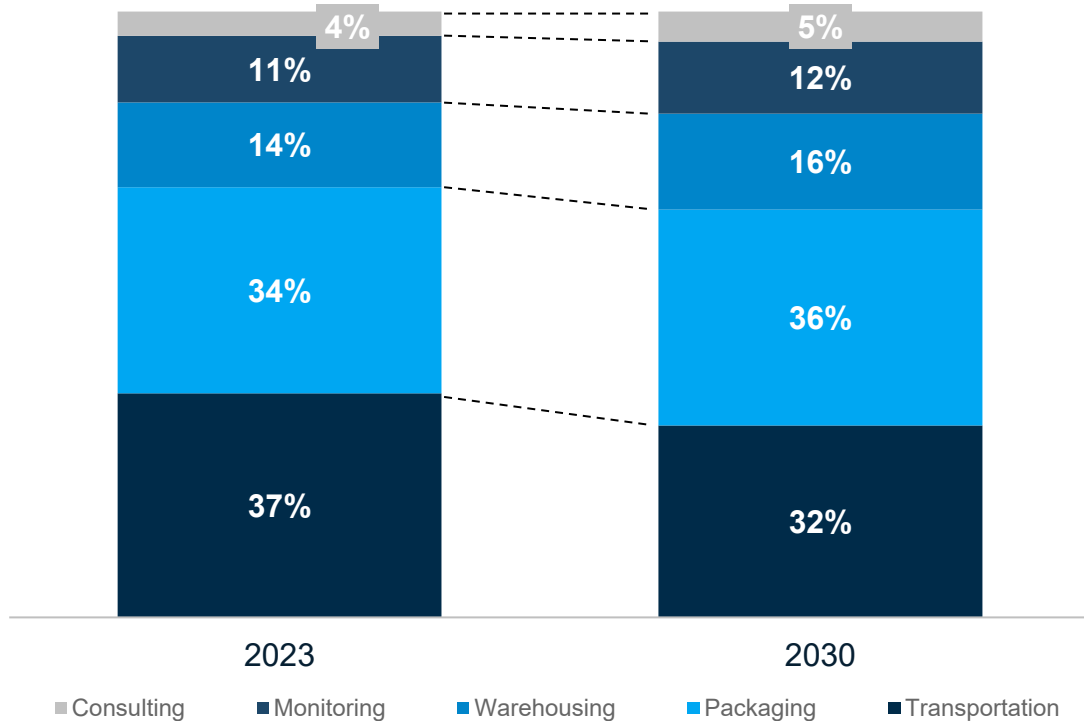
Key takeaways

- **Robust growth across all value pools:** The entire market is experiencing strong growth, indicating a rising tide of demand for these services
- **Warehousing and Consulting lead the charge,** highlighting the increased importance of specialized cold storage facilities and the need for expert guidance in navigating the complexities of the cold chain logistics landscape
- **Packaging and Monitoring keeping pace:** the growth underscores the demand for advanced packaging solutions to maintain product integrity and the adoption of real-time temperature monitoring technologies
- **Transportation remains a crucial component:** While we see this as the slowest growing segment, let's not lose sight of the fact that it is still doubling by 2030
- **Window is closing as the market matures:** High growth is attracting investment and intensifying competition and bringing new entrants, new technologies and increased consolidation that will start exerting margin pressure toward the end of this current cycle

The signals of maturity have the value pools shifting slightly over the rest of the decade

Global Spending on Biopharma Cold Chain Services

Share of total (%)



Key takeaways

- **Transportation segment losing share:** Keeping in mind this is still a growing category, pressures on transportation costs, heavy existing competition and pricing pressure have it growing at a slower pace
- **Packaging solutions gaining steam** with the increasing importance of specialized packaging to maintain product integrity for these highly complex advanced therapies with unique handling requirements
- **Warehousing demand on the rise:** A robust pipeline of biologics and other advanced therapies shows major investments by pharma for the next decade
- **Monitoring and data analytics grow in importance:** This segment is often the most discussed, reflecting the increased need for real-time temperature monitoring and data analytics solutions for supply chain visibility and compliance. However, advances in AI and technology generally can be applied in this segment, creating a rapid cycle of innovation that helps controls costs. This is why we don't see spending growing faster
- **Consulting is small, but mighty:** Spending on engineering, quality and other consulting services will grow as companies look to third-party support in these areas

Packaging expected to become the largest value pool as spending shifts



We anticipate strong growth in primary and secondary packaging, largely driven by the boom in the development of advanced therapies

\$39B

Spent on primary and secondary packaging solutions in 2030

36%

Is the share of wallet for packaging as a percent of total spend on biopharma cold chain logistics

We expect that

- **Pharma is looking for packaging solutions tailored to their most expensive therapies**
 - Growth will be driven by an increasing demand for reliable cold chain packaging to ensure product integrity and meet regulatory requirements
 - Companies investing in innovative packaging technologies like phase change materials, vacuum insulation panels and thermal blankets
- **Margin protections in place** as packaging solutions tend to have higher profit potentials due to specialized offerings
 - Material cost inflation is a concern but is otherwise well-insulated due to the continuous need for innovative solutions
- **Regulatory scrutiny = premium pricing:** Increasing regulatory requirements and demand for advanced packaging solutions have allowed players to command premium pricing

Transportation will continue to grow, but loses share of wallet as competition grows



We see the transportation segment doubling by 2030, largely driven by the complexity of temperature-sensitive advanced therapies serving more targeted patient populations

\$35B

Spent on transportation in 2030

32%

Is the share of wallet for transportation as a percent of total spend on biopharma cold chain logistics

We expect that

- **Companies will invest in specialized refrigerated transportation solutions**, driven by the increasing demand for reliable cold chain logistics services to transport biopharmaceuticals, vaccines and other temperature-sensitive drugs
- **Advanced therapies will continue to focus on smaller patient populations**
 - Delivering these specialized therapies to dispersed, smaller patient populations can be more logistically complex, requiring more intricate transportation networks
 - Having drugs closer to patients ensures timely delivery and minimizes potential temperature excursions during transport, leading to a desire for optimized distribution networks
- **Margins are at risk:** This segment has seen margin erosion over the past few years due to rising fuel costs, driver shortages and increased competition

The monitoring value pool is rising in importance to maintain product integrity, enhance supply chain visibility and meet regulatory requirements

\$13B

Spent on monitoring and tracking capabilities in 2030

We expect that

- **Visibility is paramount:** Adoption is driven by stringent regulations and the need for end-to-end cold chain visibility and control
- **Maintain quality and ensure compliance:** Real-time visibility and tracking of temperature excursions to maintain product quality and compliance
 - Regulatory bodies have stringent requirements for temperature monitoring, data logging and documentation during transportation and storage
- **Data analytics capabilities are central** to deriving insights that can be used for predictive maintenance, route optimization, product integrity and continuous improvement of cold chain processes
- **Intensifying competition** and pricing pressure are expected to start taking root as the market matures

Warehousing is the fastest-growing value pool in the biopharma cold chain market

15.6%

Annual growth in spending on warehousing in the biopharma cold chain services is expected through 2030

\$12B

Increase in the annual spending in the biopharma cold chain market for warehousing services

We expect that

- **Storage space is in short supply:** Many existing facilities are outdated or insufficient to meet current needs, especially in biopharma
 - Renovating to spec is on the rise as leveraging unused commercial space is a faster and cheaper alternative to new construction
- **Warehousing more than storage:** Handling services and management systems help ensure product availability and compliance
 - Automated storage and retrieval systems can enhance accuracy, reduce labor costs and optimize utilization
 - Operations need to reduce environmental impact while also driving cost savings
- **Headwinds are a challenge:** Slower adoption of needed automation technologies, increased real estate cost and high interest rates all pose strong headwinds

The consulting value pool will grow with the market as pharma wants to keep pace with measures to deliver product safely and reliably

\$5B

Spent on consulting services
in 2030

We expect that

- **Complexity drives growth:** Growth is largely driven by increasing complexity in cold chain logistics and the need for specialized expertise to ensure regulatory compliance and operational efficiency
- **Engineering, validation and quality control testing services** are growing in demand as the market grows, and these are preferred third-party services to manufacturers, so there is little risk of in-sourcing
- **Add-on services:** While traditional consulting firms exist, players in other value pools are adding consulting services to better serve their clients' full range of needs
- **Compliance takes center stage:** With hundreds of storage locations and vehicles in any given player's portfolio – even at an individual client level – the need for constant vigilance is of paramount concern for the biopharma customer set



04


A look at the
competitive landscape

The biopharma cold chain market is fragmented, with both large and small players seeking to differentiate

NON-EXHAUSTIVE

PACKAGING	TRANSPORTATION	MONITORING	WAREHOUSING	CONSULTING
Aerosafe	Agility Logistics	Alloga	AGRO Merchants Group	Almac Group
Cold Chain Technologies Inc.	Air Canada Cargo	Amega Sciences	Alcami Corp	Biocair
CoolPac	Cardinal Health	Berlinger & Co. AG	Burris Logistics	Cardinal Health
Cryopak Industries Inc.	Cencora	Cellbox	Cardinal Health	Cavalier Logistics
Envirotainer	CEVA Logistics	Coldspace	Cencora	Fisher Clinical Services (ThermoFisher)
Intelsius (A DGP Company)	DB Schenker	Controlant	Cloverleaf Cold Storage	ICON plc
Klinge	DHL	ELPRO-BUCHS AG	Frialsa	Marken
Peli BioThermal LLC	FedEx	LogTag Recorders Ltd	Lineage Logistics	McKesson
PolarTech Industries	Gelders Forwarding	NanoThings	McKesson	Modality Solutions
Sealed Air Corporation	Kuehne + Nagel	Omega Compliance	MD Logistics	Movianto
Sofrigam Company	McKesson	Sensified.io	Nordic Cold Storage	Parexel
Softbox Systems Ltd.	Panalpina World Transport	Sensitech Inc. (incl TempTale)	Preferred Freezer Services	World Courier (Cencora)
Sonoco Thermosafe	Reliance Logistics Group	Smart Sense	United States Cold Storage	
Titan Containers	SF Express	Trackcel	Wabash National Corporation	
Tower Cold Chain	UPS (Marken)	Tive	VersaCold Logistics Services	

A company's positioning will influence the competitive strategy

	Strategic Area		Description
01	Vertical integration across value pools		<ul style="list-style-type: none">▪ Building capabilities in the biopharma cold chain can be done collectively or over time by staggering investments and integrating vertically over time horizons, mitigating financial and operational risk▪ A&M can offer perspectives on how these development horizons might look depending on each company's current size, scope and operational capability
02	Specialization in niche segments		<ul style="list-style-type: none">▪ Biobanking, e.g., is an area of growing importance in biopharma research, offering biospecimens to universities, hospitals and other research organizations▪ One consideration is profitability, as most of the revenues are returned to research
03	Technological innovations		<ul style="list-style-type: none">▪ Monitoring technology is of increasing importance in the biopharma cold chain, given the propensity of these products to become unusable▪ AI/machine learning tech is emerging in this space as a means for not only managing inventories and logistics but also providing chatbots to customers to respond to inquiries in real-time
04	Geographic expansion into emerging markets		<ul style="list-style-type: none">▪ Emerging markets and the developing world have been historically underserved despite having large patient populations in need of medications – particularly in rare diseases▪ Developing nations are noted by most industry analysts as a key growth factor for growing cold model requirements and capabilities within biopharma supply chains
05	M&A to enhance capabilities		<ul style="list-style-type: none">▪ Mergers and partnership opportunities are ripe in the space, given the current competitive mix of smaller players with diverse capabilities, as well as larger and established players with broad scale▪ Trend allows for new entrants to become established quickly and pilot expansions into areas important to Biopharma, but perhaps less so in the more mature categories such as Food/Beverage

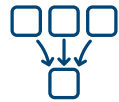
While the outlook for the biopharma cold chain market is positive, the demands of the industry are ever changing



Increasing competitiveness as market grows

Current market represents blend of smaller, fragmented competitors as well as larger, established providers

Established players and some niche players are investing significantly to gain market share and keep pace



Continued consolidation through M&A

As new technologies and capacities come to fruition, opportunistic M&A becomes prevalent (vertical integration plays, PE investment, deeper customer connections, etc.)



Focus on sustainable packaging

Environmental considerations become mainstream due to higher volumes of cold chain medicine and energy-intensive nature of current technologies

Existing/traditional providers require asset upgrades or equipment replacement (e.g., new regulations around refrigerant gases)



Adoption of emerging technologies

Cold chain medicines require new ways to transport and deliver to patients (e.g., cold boxes, cryogenics, etc.)

AI and machine learning can help companies scale more cost effectively and operate more lean operations



Expansion into more advanced therapies

About half of new medicines launched in the next five years will require cold storage, at a significant volume increase outpacing the overall industry by roughly twofold

A woman wearing a bright yellow puffer jacket and a red knit beanie is looking down at a smartphone in her hands. She is standing on a snowy street at night, with snowflakes falling around her. The background is blurred, showing city lights and buildings. The overall mood is cold and urban.

05 Strategic considerations



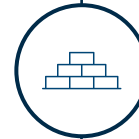
Careful strategic analysis is crucial for companies to capitalize on emerging opportunities effectively

EVALUATE INTERNAL STRENGTHS



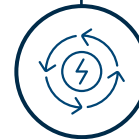
- Existing logistics network and infrastructure
- Cold chain expertise and technical know-how
- Financial resources and investment capacity
- Regulatory compliance and quality management capabilities
- Relationships with biopharma customers

IDENTIFY HOW TO GET CAPABILITIES



- Strategic evaluation of make vs. buy options based on specific requirements and constraints
- In-house development of cold chain solutions core to business
- Strategic partnering with specialized providers in non-core business or areas requiring large capital commitment or high risk

ASSESS SYNERGIES AND EFFICIENCIES



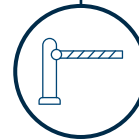
- Vertical integration to offer end-to-end cold chain services
- Potential synergies and operational efficiencies
- Increased control over the supply chain
- Ability to manage increased complexity

EXAMINE HIGH MARGIN SEGMENTS



- Specializing in specific temperature ranges
- Targeting specific product categories (e.g., CGT)
- Developing deep expertise and tailored solutions
- Potential for premium pricing and differentiation

UNDERSTAND BARRIERS TO ENTRY



- Regulatory compliance and validation requirements
- High capital and operational costs
- Technological disruptions and innovation cycles
- Competitive intensity and saturation of the market segment
- Geopolitical risks and trade barriers

The time to act is now

In this rapidly evolving landscape, companies must act decisively to capitalize on the emerging opportunities

What to think about next

01

While we generally know the direction of travel, the real question is the velocity of change. How can we build resiliency and agility as we brace for change?

02

How can you keep innovating and improving services while driving down operating costs to remain competitive?

03

As the value of the pharmaceuticals requiring cold chain capabilities continues to grow, how will your value proposition and risk exposure change?

What to do next

01

Assess your ability to meet the stringent temperature requirements and invest in the necessary infrastructure, equipment and expertise

02

Ensure your capabilities and offerings are aligned and agile enough for the change needs of the new wave of advanced therapies

03

Immerse yourself in the ecosystem, seek to partner and ensure your capabilities can contribute to a frictionless experience for your customers

Thank you

