



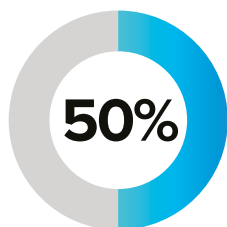
# Safe and Efficient Pharmaceutical Cold Chain Management

Protecting consumers, saving time, reducing waste

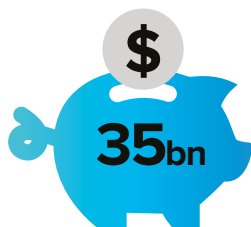


## Visibility across your pharmaceutical cold chain

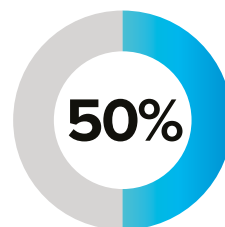
Transporting sensitive pharmaceutical goods is a challenge: the majority of vaccines need to be maintained at a narrow temperature range (between 35.6°F/2°C and 46.4°F/8°C)<sup>1</sup>, while some COVID-19 vaccines require transportation at a constant -94°F/-70°C.



**50%** of the world's top 50 drugs are temperature sensitive<sup>2</sup>



**\$35 billion** lost by the biopharma industry through temperature-control failures across their supply chains<sup>3</sup>



**50%** of the world's vaccines are wasted due to temperature control, shipment and supply chain issues<sup>4</sup>

The good news is that new technology can ensure the safe, effective and efficient supply of pharmaceutical products. Tracking solutions, such as RFID and barcode labeling, enhance visibility and transparency across supply chains. As items move, data can be recorded and shared on a distributed ledger or blockchain such as the IOTA Tangle to create an immutable record of consignment progress. Distributed ledger technology can eradicate counterfeiting. It also accelerates delivery as all parties in the supply chain can synchronize their activities based on a real-time and trusted view of consignment progress. Electronic temperature sensors and freezer compliant mobile devices play a role too; mobile devices equip your teams with clear handling instructions and accurate and fast data capture tools to look after consignments as they pass through their care.

## From production to patient: Cold chain temperature monitoring

At Zebra, we're here to help you create safe and efficient pharmaceutical cold chain operations. From product manufacturing, through storage, and transit by air, land and sea, to last-mile delivery to clinics, we can help ensure the quality and integrity of medicines and vaccines. Our solutions are constantly on watch – monitoring, sensing, recording and alerting you to any problems to protect consumers, maintain compliance (with seamless audit trails) and reduce waste.

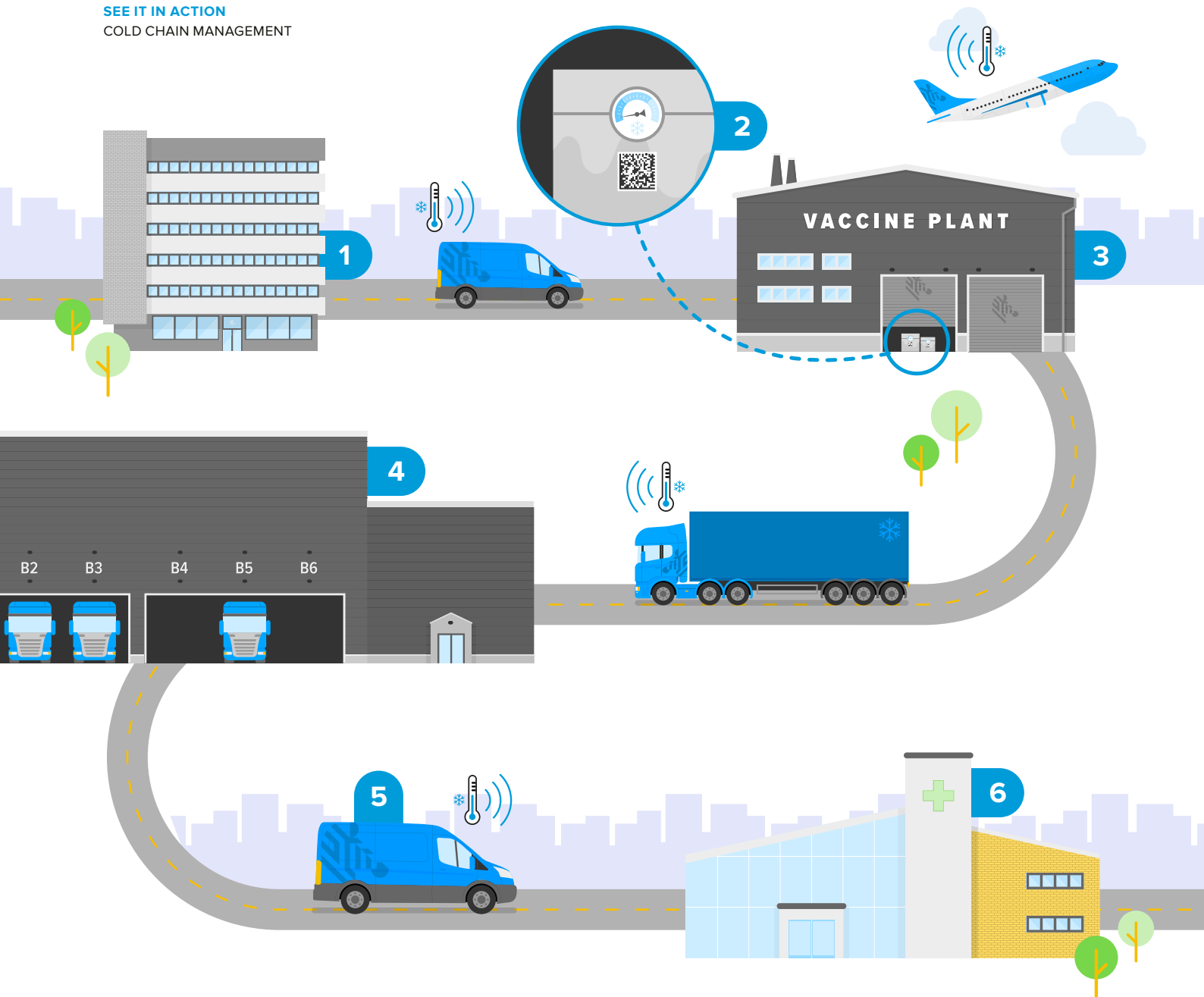
(See next page for illustration.)

Fixed RFID readers can register vaccine consignments into depots and provide pinpoint visibility into the location of all your vaccines, including assets on the move.



### Sources

- <https://www.unenvironment.org/news-and-stories/story/why-optimized-cold-chains-could-save-billion-covid-vaccines>
- <https://www.biocair.com/knowledge/white-papers-technical-articles/cold-chain-challenge>
- WHO
- <https://www.biocair.com/knowledge/white-papers-technical-articles/cold-chain-challenge>



**1.**

**Head Office**

- Track all items remotely
- Distributed ledger or blockchain – a single view of truth

**2.**

**Compliance for manufacturers:**

**Quality assurance and defeating counterfeiters**

- Unique ID labeling (2D barcodes / RFID) for vials and containers
- Printed / encoded RFID and barcode labels are rugged, secure, and reliable (labels available that remain adhered to most surfaces at temperatures as low as -65°F/-54°C)
- Accurate, easy scanning for traceability
- Electronic temperature sensors for cold chain consignments

**3.**

**Transport**

- Temperature logging at -328°F/-200°C
- Mobile devices to check items' status and handling instructions
- Audit trails seamlessly captured
- Mobile device-based paperwork for efficient border transit
- Accurate reading of dense and difficult barcodes first time

**4.**

**Monitoring and tracking goods in the distribution and fulfilment centre**

- Register goods-in (2D barcodes / fixed RFID readers) for consignment ID
- Monitor goods continuously including temperature exposure
- Accurate reading of dense and difficult barcodes first time
- Handheld devices and vehicle-mounted computers withstand various levels of condensing environments as goods are stored and moved, with temperature logging at -94°F/-70°C (and lower)

**5.**

**Accuracy at point of vaccination:**

**Record and cross-match vaccine and patient data**

- Clear, consistent ID of patients and vaccines
- ID validation, photographic capability, 4G / Wi-Fi
- A secure ledger of vaccinations
- Healthcare-compliant mobile devices for accurate data capture

## Everything you need from a trusted partner

We know that managing pharmaceutical cold chains is a big responsibility. We're here to help with a single, reliable end-to-end solution – built on proven technologies – to track, trace and protect your sensitive goods. We specialize in cold chain solutions and are a trusted worldwide leading GS1 healthcare partner delivering critical technology solutions.



Mobile computing devices  
(with RFID options)



Wearable solutions



Mobile printers (with RFID options)



Rugged scanners



Industrial labeling supplies  
(including RFID)



Electronic Temperature Sensors



Fixed RFID readers



Zebra MotionWorks® asset tracking



Distributed ledger or blockchain  
technology such as the IOTA Tangle



Device management with  
Zebra Mobility DNA™



Zebra OneCare™ support



VisibilityIQ™ Foresight

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