Innovations in Transportation of Time and Temperature-Sensitive Healthcare Products (TTSHP)

Revolutionizing Sustainability, Product Design, and Monitoring

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Introduction

Context: Ensuring the safe delivery of TTSHPs is critical for global health outcomes.

Challenges: Climate conditions, storage infrastructure gaps, and environmental impact.

Objective: Present innovative and sustainable solutions to improve TTSHP transportation.

The Sustainable Development Goals

UNFPA's Solution...

	A	B	C	D	E	F	G
1	UNFPA Freight Conditions Requirements for RH medical products						
10		**Product category**	**Subcategory / or product name**	**SEA Freight conditions AND ROAD transport over TWO WEEKS**	**Air freight**	**Road transport LESS THAN ONE WEEK TRANSIT TIME**	**Road transport LONGER THAN ONE WEEK BUT NOT MORE THAN TWO WEEKS**
11		Pharmaceuticals - Temperature sensitive products	Currently Oxytocin, Ergometrin (under Oxytocics category), Anti-D (RhO) immunoglobulin 300mcg, Test Rhesus, anti-D (other pharmaceuticals) and Test blood-group, anti-A, Test blood-group, anti-AB, Test blood-group, anti-B (under Diagnostics and Lab reagents category).	Temperature controlled 2-8 °C (Reefer containers) AND DATA LOGGER	1. Up to three days, PASSIVE Container can be used 2. Longer than 3 days- ACTIVE Container 3. Smaller aircrafts (cannot accommodate reefer container)- PASSIVE	1. Up to three days, PASSIVE Container should be used 2. Longer than 3 days- ACTIVE Container	Temperature controlled 2-8 °C (Reefer containers) AND DATA LOGGER
12		Medical Devices	Anatomical Models (as categorized in UNFPA catalog)	General cargo and NO data logger	NO data logger	NO data logger	NO data logger

Sustainability in Transportation

Key Innovations:

1. Shift from Air to Sea Freight:
    - Reduced carbon footprint.

1. Reusable Packaging:
    - Insulated containers with extended lifespans.
    - Collaboration with manufacturers for closed-loop reuse systems.

1. Multi-use Packaging:
    - Packaging with secondary uses in developing countries (e.g., water storage).
2. E-Leaflets:
    - Digital information reduces paper waste.

Product Design Innovations

Designing for the Environment of Use:

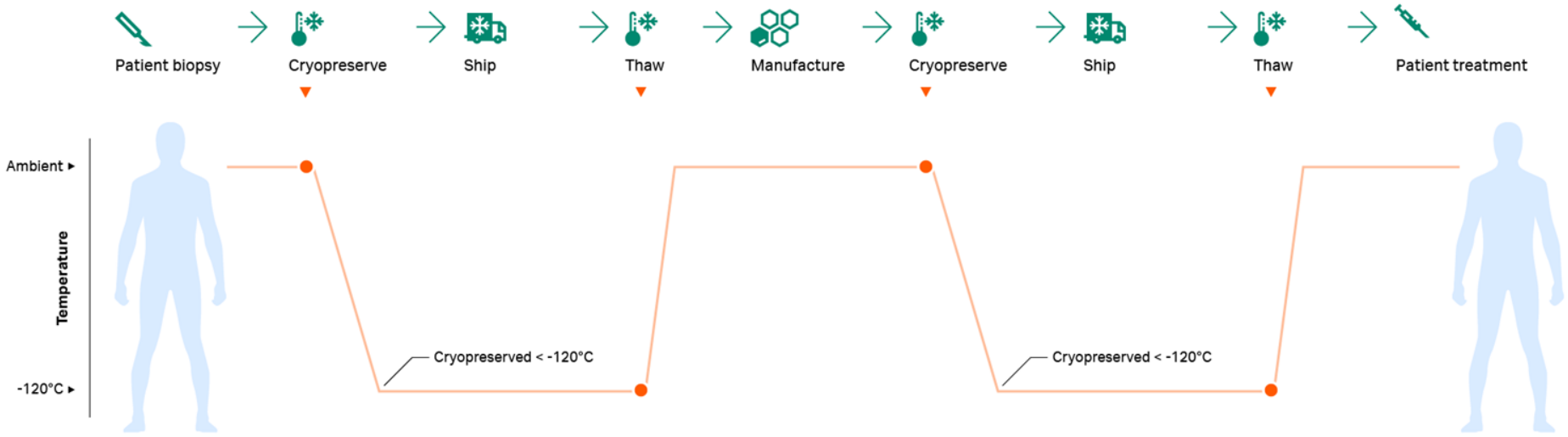
1. **Thermal Stability:**
   - Adapt vaccines/pharmaceuticals for higher temperature ranges (e.g., from 15–25°C to 40°C).
2. **Cold-Chain Feasibility:**
   - Avoid ultra-low (-80°C) storage requirements in regions lacking infrastructure.
3. **Localized Manufacturing:**
   - Decentralized production to minimize transportation needs and improve responsiveness.

Short-term vs. Long-term Storage Conditions

Key Innovations:

1. **Separation of Storage Requirements:**
    - Short-term storage at moderate temperatures for immediate use.
    - Long-term solutions like inert gas environments as alternatives to ultra-low freezing.

Freeze-thaw cycle in T-cell processing



Patient site	Transit	Manufacturing site	Transit	Patient site
• Controlled-rate cryopreservation	• Controlled temperature during cryogenic shipping	• Frozen storage until manufacturing • Cell therapy manufacturing process • Cryopreservation of final product	• Controlled temperature during cryogenic shipping	• Short-term frozen storage • Thawing of cells before release and administration

Innovations in Temperature Monitoring

1. **Data Loggers:**
   - Transition from single-use to multi-use loggers.
   - Cost-effective and environmentally sustainable.
2. **Remote Monitoring:**
   - Use of systems for real-time monitoring of sea freight.
3. **Integrated Logistics Team Approach:**
   - Logistics professionals actively monitor data for improved decision-making.

Conclusion

- Technology
- Partnerships
- Sustainability