Three-Part Webinar Series

Webinar 2: Global Distribution and the Flow of Vaccines Throughout the Supply Chain

Welcome
Global Distribution and Flow of Vaccines Throughout the Supply Chain

Andrea Gruber
Head, Special Cargo
IATA
This session is conducted under the Competition Law Compliance.

Microphones have been muted.

Please submit your questions through the Question box and send to Everyone.

The webinar is being recorded and will be made available afterwards, including the PPT slides.
Welcome Address

UNICEF Global logistics preparedness

Lessons learned by vaccine manufacturers

Collaborative efforts initiated in the crisis

Airline opportunities in a time of crisis

Handling Operational Challenges

Speaker biographies are available on the IATA website
Focus on industry readiness to manage globally a temperature-controlled supply chain for vaccines, health, and humanitarian supplies

Call-to-Action

- Information Sharing - Global Collaboration
- Plan – Prepare – Perform
- Engage and communicate with partners/suppliers on scale up projects and initiatives to support COVID-19 vaccines distribution or humanitarian aid
COVID-19 vaccine
UNICEF Global logistics preparedness

Mounir Bouazar
Emergency Logistics Manager & Logistics Lead COVAX
UNICEF
COVID-19 vaccine
UNICEF Global logistics preparedness

November 24, 2020
COVAX Facility - Overview
Goals of the COVAX facility

To support the largest actively managed portfolio of vaccine candidates globally

To deliver 2 billion doses by end of 2021

To offer a compelling return on investment by delivering COVID-19 vaccines as quickly as possible

To guarantee fair and equitable access to COVID-19 vaccines for all participants

To end the acute phase of the pandemic by the end of 2021

*Thanks to industry as a key partner in this endeavor*
COVAX Facility focused on transparency, global access and impact

Bold ideas and brilliant innovation for the worst global health crisis in 100 years

Pooled demand

Participants

Consolidates buying power and provides participants access to a broad and actively-managed portfolio

The COVAX Facility

Pooled supply

Manufacturers

Provides manufacturers access to a massive, demand-assured market
61 Self Financing Participants & Team Europe join the 92 AMC participants for a total of 182 participants, representing over >80% of the world's population.
Allocation of vaccines: update, status and next steps
Allocation of vaccines: update, status and next steps

Phase 1: Proportional allocation up to 20% of population

Countries receive doses proportionally to their total population given the ubiquity of the threat

Countries progressively receive doses until all countries reach 20% of their population (or less if they so requested).

The pace at which countries receive vaccines depends on country readiness and the availability of doses (not on threat and vulnerability).

The allocation moves on to phase 2 once all countries have reached 20% coverage (or less if they so requested).

Phase 2 may start ahead of this if available doses are unable to be allocated due to lack of readiness, funding or territory issues.

Phase 2: Weighted allocation beyond 20% (if supply severely constrained)

Timing may be based on consideration of vulnerability and COVID-19 threat:

In the case of a severely restricted supply, the timing of country shipments would be based on a risk assessment based on Threat and Vulnerability.

Countries with a higher risk would receive the doses they need faster than others, although all countries will receive some doses in each allocation round.

Threats and Vulnerabilities will be based on metrics defined closer to the end of phase 1, potentially related to the country's vulnerability to severe disease and its healthcare system.

All countries will receive the total doses they have requested as rapidly as possible in phase 2.
The allocation will run in successive ‘rounds’
(Illustrative example for Phase 1 of multiple rounds of allocation with increasing supply)

<table>
<thead>
<tr>
<th>Country</th>
<th>Coverage requested</th>
<th>Successive allocation rounds (in % of population covered)</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>40%</td>
<td>1% 4% 10% 15%</td>
<td>✔ 20% coverage reached</td>
</tr>
<tr>
<td>B</td>
<td>40%</td>
<td>1% 4% 10% 15%</td>
<td>✔ 20% coverage reached</td>
</tr>
<tr>
<td>C</td>
<td>30%</td>
<td>1% 4% 10% 15%</td>
<td>✔ 20% coverage reached</td>
</tr>
<tr>
<td>D</td>
<td>20%</td>
<td>1% 4% 10% 15%</td>
<td>✔ 20% coverage reached</td>
</tr>
<tr>
<td>E</td>
<td>10%</td>
<td>1% 4%</td>
<td>✔ 10% coverage reached</td>
</tr>
</tbody>
</table>

**Rounds:** Each allocation round is done in advance of production based on forecasts. It covers a time period in which there is at least enough supply to allocate to all countries in theory (e.g., enough to cover 1% of population in all countries). Each round will usually combine multiple shipments.

**Proportionality:** All countries cover the same share of their population at the same time (where possible).

**Dose request:** Countries that chose to request less than 20% will stop receiving further doses beyond this.

**Timing:** In theory, all countries that requested 20% or more reach 20% coverage at the same time.
Procurement updates

As country participation in the COVAX Facility is firmed up, these demand forecasts will continue to be refined and the latest estimates will be communicated in due course.

The initial target of COVAX is to deliver at least 2 billion doses of Covid-19 vaccine by the end of 2021.

1. **2 billion**

   The initial target of COVAX is to deliver at least 2 billion doses of Covid-19 vaccine by the end of 2021.

2. **Preliminarily split**

   - **92 AMC economies** (estimated at least 950 million doses, with potential additional doses subject to funding and supply availability)
   - **At least 90 self-financing economies** (estimated range from 550-950 million doses)
   - **Buffer for humanitarian use** (100 million doses)

As country participation in the COVAX Facility is firmed up, these demand forecasts will continue to be refined and the latest estimates will be communicated in due course.
Request for Proposal launched last week to secure access to at least 2 billion doses of vaccine to be delivered by end 2021

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Objectives</th>
</tr>
</thead>
</table>
| Gavi, as COVAX Facility Secretariat, can establish advance purchase commitments - APCs | 1. **Speed**  
Expedite access to Covid-19 vaccines by building on push and pull contracts (established by BMGF, CEPI and Gavi) for the COVAX participating economies |
| UNICEF and PAHO will establish procurement and supply arrangements based on the APCs | 2. **Volumes**  
ACT-A target is to secure at least 2bn doses by end 2021 |
| UNICEF, as COVAX Procurement Coordinator, establishes key basic terms that COVAX self-financing self-procuring participants reference in their supply agreements with manufacturers. | 3. **Price**  
Drawing on the financing and de-risking provided by the push and pull contracts and the pooled COVAX volumes, COVAX targets to achieve the lowest price on the market |
|  | 4. **Balanced Portfolio**  
Balanced geographically diverse portfolio across multiple vaccine platforms |
Global logistics preparedness
UNICEF in 2019

- 45% of children under five reached, in over 100 countries (through only 5% of the global market share)
- 25 vaccines with different product presentations
- 2.4 billion doses procured in 2019
- 1.66 billion USD throughput in 2019

Source: UNICEF Supply Division

This map does not reflect a position by UNICEF on the legal status of any country or territory or the delimitation of any frontiers.
After a dramatic dip in March-April, weekly vaccine shipments gradually recovered to pre-Covid levels.
Requirements for the development of the COVAX Global Logistics Operational Plan

Origin
Incoterm with suppliers: Origin

Destination

Size of the cargo
in containers for sea freight, in chargeable weight (weight and volume) for air freight, truck load for road

Mode of transport
Air, Sea, Road, Multimodal

Priority
Capacity (airlines and forwarders) and space available

Time of loading
Freight validity period

Type of commodity
Dangerous goods, temperature controlled (range), cold chain, etc.
Work plan activities for the implementation of the COVAX logistics operations

- Logistics routes mapping and modelling
- Volume estimation
- Transport conditions Scenario modelling
- Global Logistics preparedness strategy & requirements definition
- Global logistics operational plan
- Global 3PLs
- Partnerships with airlines / Charter brokers
- COVAX Logistics Control Tower (LCT) UNICEF/PAHO/Global FFWs
- Information management Tracking of global COVAX orders fulfillment
The current estimation is subject to a large uncertainty of a factor of 10

Vaccine logistics assumptions and conclusions

Vaccine, boxed and ready for shipping

<table>
<thead>
<tr>
<th>Material number</th>
<th>Mat description</th>
<th>Doses/vial</th>
<th>Qty of vials/inner carton</th>
<th>Number of cartons</th>
<th>Qty vials/carton</th>
<th>Qty doses/carton</th>
<th>Total weight (kg)</th>
<th>Total volume (cbm)</th>
<th>Doses/cbm</th>
<th>Doses/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>vials + diluent 10 dose vial scenario (sanofi)</td>
<td>S359351 Measles-10</td>
<td>10</td>
<td>300</td>
<td>6</td>
<td>1800</td>
<td>18000</td>
<td>72.5</td>
<td>0.37</td>
<td>48k</td>
<td>248</td>
</tr>
<tr>
<td>Only vials 10 dose without diluent (SII)</td>
<td>S359129 DTP-HepB-Hib vac.,liquid,vial of 10 dose</td>
<td>10</td>
<td>50</td>
<td>24</td>
<td>1200</td>
<td>12000</td>
<td>33.5</td>
<td>0.12</td>
<td>102k</td>
<td>358</td>
</tr>
<tr>
<td>20 doses vial + diluent (SII)</td>
<td>S359114 BCG vaccine, vial of 20 doses</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td>2500</td>
<td>50000</td>
<td>25.1</td>
<td>0.12</td>
<td>410k</td>
<td>1992</td>
</tr>
<tr>
<td>20 doses per vial + diluent (AJ vaccine)</td>
<td>S359806 BCG vaccine, vial of 20 doses</td>
<td>20</td>
<td>50</td>
<td>60</td>
<td>3000</td>
<td>60000</td>
<td>61.0</td>
<td>0.21</td>
<td>280k</td>
<td>984</td>
</tr>
</tbody>
</table>

All analyses assume Measles-10 vaccine as the benchmark

This conservative assumption is intended to avoid underestimation of required transport capacity

Transport requirements differ by factor of 10 between vaccines

Two BCG vaccines differ by factor of 2 in number of doses per kg

To keep in mind

The final transport volume could even be higher until further specifications by suppliers are present
With natural uncertainty on some inputs on at this stage, conservative assumptions have been chosen to ensure preparedness

Main model uncertainties

<table>
<thead>
<tr>
<th>Area</th>
<th>Main uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging</td>
<td>Existing vaccines differ by <strong>factor of 10</strong> in terms of number of doses per kg; i.e. required transport volume could be lower than assumed</td>
</tr>
<tr>
<td>Number of doses</td>
<td>Assumed <strong>2 per person</strong> – could also be only one or more</td>
</tr>
<tr>
<td>Freight capacity and cost</td>
<td>Might change over time – currently <strong>treated as static</strong></td>
</tr>
<tr>
<td>Supply</td>
<td>Reliable <strong>forecast on availability</strong> and <strong>timing not possible</strong> - latest COVAX forecast used</td>
</tr>
<tr>
<td>Allocation order and sources</td>
<td>Supplier and its <strong>location unknown</strong> – iterative process including procurement decisions</td>
</tr>
<tr>
<td>Country intake capacity</td>
<td>Rough proxy used <strong>based on historical 2019 data</strong> – GAVI/WHO survey will generate more insights</td>
</tr>
</tbody>
</table>
COVAX logistics preparedness – data mapping

Key origins:
- US
- EUROPE
- INDIA
- CHINA
- AUSTRALIA

Key members:
- Procurement Coordinator / Logistics Control Tower: Washington
- : Geneva

Self financing countries to be confirmed
Supply scenarios used: instant supply and current COVAX prediction

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Instantaneous supply scenario</th>
<th>COVAX prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>All vaccines of an allocation round are available <strong>instantaneously</strong> at the PODs at the start of an allocation round</td>
<td>Vaccines of an allocation round get available continuously</td>
<td>Supply is below realistic supply scenario</td>
</tr>
<tr>
<td>All volume is sourced from one single location</td>
<td>1/4th of doses from each possible sourcing locations (EU, US, India, China)</td>
<td></td>
</tr>
</tbody>
</table>

### Cumulated supply availability

<table>
<thead>
<tr>
<th>Round 1</th>
<th>Round 2</th>
<th>Round 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>3%</td>
<td>7%</td>
</tr>
<tr>
<td>Q2</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

### Relevance

**Instantaneous supply scenario**
- Identification of bottlenecks – instantaneous supply is most challenging scenario for supply chain
- Preparedness for unexpected events – e.g. when larger amounts of vaccines become available

**COVAX prediction**
- Realistic modelling of interference between supply and allocation
- Creation of order processing plans
- Robustness analyses

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*Reality can only be between these extremes*
The logistics challenge of COVID-19 outbound logistics is unprecedented – more information from RfP required

Key insights

The expected outbound volume of 850t per month expected in Q3/4 2021 is unprecedented, even to all current UNICEF suppliers combined

A comparison with the proposed volumes in the currently ongoing COVID-19 vaccines RFP could reveal which producer will face the highest outbound logistics challenges
Even in instantaneous supply scenario 800/T week throughput not exceeded at any airport

Preliminary

Amount of vaccine shipments to be handled if supply exclusively from one region, in tons per week

Key information
- 4 scenarios with infinite supply at the beginning of Q2, Q3 and Q4
- Not clear so far: How much is usable for cold chain?
- US not planned through one airport but several, therefore not comparable

Recommended next steps
- Do RFI with freight forwarders to clarify available cold chain capacity at airports - can 800T be stored?
- Reserve required cooling capacity at airports and potentially extend
- Verify airport capacity for possible other PODs, e.g. in US

T/week

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation of 3%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Allocation of 7%</td>
<td>746</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Allocation of 10%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Weekly throughput at POD capping at around 800T / week when inbound capacity limit of countries reached

Current airport maximum weekly throughput

Exclusive supplying region
- China
- Europe (AMS)
- India

1. Remaining shipments of allocation neglected for beginning of next allocation, India shipments from other regions are included

Capacity: Logistics will, with few considerations, be able to execute exactly according to the allocation – however, allocation need to take into account SC considerations for the overall efficiency of the distribution.

**Required air cargo capacity for vaccine distribution large – but not a bottleneck on a global scale**

**Structuring allocation rounds of small countries could further simplify distribution**

(see deep-dive)

Logistics does not constrain overall vaccine delivery in most cases – Supply chain needs the priority provided by COVAX/allocation

The prioritization by COVAX on programmatic requirements suggested

1% of critical life saving vaccines
Vaccines to cover 20% of the population of COVAX countries need to be procured and shipped in 2021 – from currently unknown origin with changing supply forecast

### How much needs to be shipped?

<table>
<thead>
<tr>
<th>Vaccines needed to immunize ... %, tons</th>
<th>Population, bn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3%</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>UNICEF (AMC 82)</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>PAHO (AMC10)</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>FSF countries</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>+</td>
</tr>
</tbody>
</table>

### What airlines are interested/relevant to be involved?

Currently expected freight volumes per airline – subject to changes depending on place of production facility:

- Currently unknown vaccine origin with changing supply: will constantly develop over coming months

### What are current assumptions on temperature, weight and volume?

Current planning assumes 2-8 °C cold chain for transportation: recent news regarding Pfizer/BioNTech vaccine may heavily complicate things.

- Limitations on dry ice per plane not yet included: difficult to obtain as no clear rules
- All information regarding volume and weight based on conservative estimates: remaining high degree of uncertainty regarding correct numbers

unicef
9,100 tons of vaccines will be shipped to 182 countries – 5% of volume going to more than half of them while 9 countries receive 50% of volume.

Expected COVID-19 vaccine transport volume in 2021, with target to cover 20% of population, countries sorted by population size.

Key insights

High number of small countries to serve

50% of volume will go to largest 9 COVAX countries.
Just above half of the AMC92 countries require 5% of vaccine air freight

Relative share of vaccines per AMC92 country

Key insights

43 countries responsible for less than 5% of total vaccine volume
Allocation between the countries, especially the small ones, is key driver for overall complexity of logistics

1. India excluded since presumably handled differently from logistical standpoint
Accessibility: Only 2% of AMC92 population can not be directly accessed from all regions via commercial flights
Clustering of countries and their access to commercial flights

### Key insights
- **India** reported to have commercial connections to all AMC92 countries
- Remaining countries with some restrictions with respect to commercial flight make 2% of AMC92 population
- Chartering of flights unlikely to be necessary at a large scale

### Note limited availability of data
- Some connections reported as available, however no capacity reported
- Connections and their capacity subject to changes over time

### Approach
Four freight forwarders (FFS) have been asked for outbound traffic their regions (EU, India, US, China)
Following analysis is for orientation and subject to changes over time

<table>
<thead>
<tr>
<th>No commercial route from US and CN</th>
<th>No commercial route from US</th>
<th>No commercial route from EU, US, CN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marshall Islands</td>
<td>Solomon Islands</td>
<td>North Korea</td>
</tr>
<tr>
<td>&lt;0.1%</td>
<td>Kosovo</td>
<td>West Bank and Gaza</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Samoa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eritrea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yemen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tonga</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lao PDR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tuvalu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vanuatu</td>
</tr>
<tr>
<td>&lt;0.1%</td>
<td></td>
<td>Bhutan</td>
</tr>
<tr>
<td>&lt;0.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No commercial route from CN and EU

| Mongolia                          | São Tomé and Principe       |
|                                   | Micronesia                  |
|                                   | Eswatini                    |
|                                   | Saint Lucia                 |
|                                   | Syrian Arab Republic        |
|                                   | Kiribati                    |
|                                   | Dominica                    |
|                                   | Saint Vincent               |
|                                   | Lesotho                     |
|                                   | Grenada                     |
| 0.6%                              |                              |

1. Availability of commercial flights reported from Freight Forwarders. However, available freight volumes not known in all cases.
COVAX supply chain success criteria

- **Availability of vaccines: manufacturing and logistics capacity of manufacturers**
- Clear allocation process ensuring supply chain considerations taken into account
- **Efficient information flow & collaboration with logistics stakeholders to ensure capacity adjustment, availability and affordable pricing**
- Close coordination with countries during shipment planning based on storage availability absorption capacity and countries’ readiness
Access to preferred and stable pricing

Giving priority to Covid-19 vaccine and other vaccines and humanitarian supplies

Secure the necessary logistics capacity for Covid-19 vaccines as well as existing vaccine shipments

Transport schedules

Temperature control management for cold chain during transit and at arrival

Access to countries

Network and services

Capacity

Priority

Schedule Reliability

Cold Chain

Pricing

Logistics industry contribution to UNICEF/COVAX efforts
What do we need to address as a global community for successful COVID-19 vaccine deployment? Lessons learned by vaccine manufacturers from both routine and emergency scenarios

Leena Scaria
Global Vaccine Public Policy
Merck
What do we need to address as a global community for successful COVID-19 vaccine deployment? Lessons learned by vaccine manufacturers from both routine and emergency scenarios

Leena Scaria
Global Vaccine Public Policy, MSD
Co-lead, IFPMA COVID-19 Distribution Working Group
The “vaccination” value chain is complex and stretches from R&D by biopharma to vaccination of target populations.

Safe, effective, quality vaccines that are delivered as safely, quickly, and efficiently as possible.

- Clinical development
- Regulatory submission & approval
- Manufacturing at scale
  - Formulation
  - Filling
  - Packaging
  - Lot release
- Vaccine administration
  - Waste management
- Cold chain
  - Air cargo, cross-border transfers, in-country freight & storage

Vaccines are heavily regulated across the value chain. This adds complexity, which can increase time to vaccine access for populations.
Regulatory harmonization can enable the movement of high volumes of COVID-19 vaccines across the globe in a short amount of time

- Regulatory reliance
- Streamlined labeling requirements
- Streamlined packaging and artwork
- GMO authorization
- Dynamic expiry dates
- Accelerated post-approval changes
COVID-19 vaccines have to be delivered rapidly to vaccination sites to conserve shelf life but distribution obstacles can slow their movement

- Air cargo capacities
- Product entry into countries
- In-country cold chain transport & storage systems
- BSL classification
- Customs procedures
- Testing on importation
- Existing cold chain
Successful deployment of vaccines during a pandemic will require a broader systems approach.
Now and in the future: what we need to get right to distribute vaccines as quickly, safely, and efficiently as possible

**Regulatory pathways**
- Advocate for use of regulatory reliance particularly for epidemics and pandemics as critical enabler of safe and rapid distribution of vaccines globally
- Appropriate regulatory framework in place to allow use of pre-licensure products (e.g. emergency use regulations)
- Ensure appropriate authorizations are in place for product shipment, reception and distribution

**Vaccine distribution & logistics**
- Systems approach for end-to-end visibility of distribution process for increased performance
- Define chain of command, expectations, and responsibility for team members through each node of supply chain
- Consolidated distribution systems for more efficient ordering and distribution worldwide (e.g. regional hubs)

**Partnership and coordination**
- Invest time upfront to understand processes, communication and resource needs, and operational supply chain requirements and align
- Coordinate on deliverables: documentation, release procedures, request/delivery timelines, communication flow, etc.
Leena Scaria
Global Vaccine Public Policy, MSD
Co-lead, IFPMA COVID-19 Distribution Working Group
Showcasing the collaborative efforts initiated in the crisis

Patricia Cole
Global Head of Temperature Management Solutions
DGF
What does it take to deliver 10bn vaccine doses worldwide?

Starting from Q4 2020 vaccines for emergency use are expected to be shipped around the globe; Emerging actors like governments and NGOs face similar challenges in orchestrating vaccine distribution as for PPE – yet the stakes are even higher.

<table>
<thead>
<tr>
<th>10+ bn vaccines needed</th>
<th>200,000 movements by pallet shippers</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.8 bn global population</td>
<td>15,000,000 deliveries in cooling boxes</td>
</tr>
<tr>
<td>~70% immunization in population to achieve herd immunity</td>
<td>15,000 flights</td>
</tr>
<tr>
<td>~1.8 avg. doses/person needed for immunization</td>
<td></td>
</tr>
</tbody>
</table>

Source: World Bank; DHL; McKinsey
The shortened development cycle of vaccines to meet ambitious schedules can require distribution at deep-frozen temperatures for a potentially sizeable volume share

- Today, most vaccines are distributed at 2 – 8°C for broader use
- As COVID-19 has been leapfrogging phases to reduce time, stringent temperature requirements might be imposed due to lack of stability data
- Temperature requirements might also vary across technical vaccine platforms

![Diagram showing possible stringent distribution temperatures and announced production capacities, 2021](source: Press search, company statements, expert interviews, DHL, McKinsey. Note: No production volumes have been announced for COVID-19 vaccines developed on an attenuated virus platform. Therefore only 6 platforms shown. Overview current as of August 15, 2020.)
Storage and transport requirements along Supply Chain phases

Example for sensitive vaccines

1. **Stringent Scenario**
   Requirement to keep drug substances and finished product at frozen temperature during the end to end Supply Chain

2. **Conventional Scenario**
   Opportunity to distribute finished products at conventional 2 – 8°C

Source: Expert interviews, DHL, McKinsey
Logistical implications of cold chain requirements

Equipment example for a potential Supply Chain setup

Highest risk of bottlenecks expected in downstream distribution, due to:

1. **The sheer number of shipments**
   - Imagine 15mn cooling boxes –with the required volume of cooling bricks or dry ice

2. **Ensuring consistent temperature**
   - Increased complexity for ~50 boxes/parcels than it is for one pallet shipper

3. **Handling of ultra-deep frozen shipments**
   - Special requirements, processes and training for couriers and consignees
Vaccine distribution addressing 2 levels of Supply Chain temperature stringency and 3 Supply Chain archetypes

2 TEMPERATURE SCENARIOS

Stringent scenario  
(-70 to -80°C)
Expected to be multi-dose vials, densely packed without syringe and additional contents to maximize frozen chain efficiency

Conventional scenario  
(2 to 8 °C)
Typically single dose vials, individually packed with syringe and additional space to improve convenience for end users

3 SUPPLY CHAIN ARCHETYPES

Direct shipment  
Direct shipment of cooling box (or pallets) from fill-finish to point of use

Local cross-docking  
Shipping in cooling boxes on pallets, local crossdocking in destination country for last mile in cooling boxes

Local warehousing  
Shipping in pallets with warehouse storage in destination region, breakdown and last mile in cooling boxes

Packaging and temperature management
- Cooling bricks
- Dry ice

Dosing per vial
- Multi dose – 4 doses per vial
- Single dose – 1 dose per vial

Packaging and complements
- Only vial
- Vial + single packaging + syringe
Challenge of vaccine distribution lies in transporting within destination

In-country logistics at destination

**Stringent scenario**
- Feasible\(^1\) to distribute in 25 countries with total population of 2.5bn
- Cold chain capacity to ship frozen vaccines (<-20°C or <-70°C) has to be built up and scaled worldwide for emergency use

**Conventional scenario**
- Feasible\(^1\) to distribute in 60 countries with total population of 5.0bn
- In conventional scenario, refrigerated vaccines (2~8°C) can be shipped leveraging existing infrastructures

**Background**
- Due to early stage instability COVID vaccines will likely to be first transported in frozen form and later at refrigerated temperature
- Specific transportation requirements in different states raise different challenges on existing in-country logistics worldwide

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Source: World Bank Global Logistics Performance Index, DHL;
\(^1\) “Feasible” considered as high and relatively high feasibility to distribute COVID-19 within destination countries (marked with dark green and green color code)
Delivering a vaccine will face other challenges and opportunities

Limited production capacity in different parts of the supply chain may further stress the distribution of the vaccine

Supply chain capacity

- Can vaccines be transported in bulk on all trade lanes?
- Do airports have sufficient cool facilities to accommodate vaccines?
- Will temperature-controlled containers form a bottleneck? How to manage their imbalance?

Air cargo security

- What measures need to be taken to guarantee safe & secure transport?
- How to ensure vaccines can’t be tampered with?

Required accessories

- Will medical equipment (e.g. vials, syringes, needles) be transported by air?
- Will raw materials for vaccines and accessories require air capacity?
- Will dry ice limitations be a bottleneck to transport the vaccine in bulk?

TAPA WARNS OF A SIGNIFICANT SPIKE IN CARGO THEFTS

In April alone, the Associations […] recorded as a series of seven-figure losses, including thefts of two million face masks in Spain, sports equipment in the United Kingdom and mobile phones in Kenya.

LOGISTICS REPORT

From ‘Freezer Farms’ to Jets, Logistics Operators Prepare for a Covid-19 Vaccine

The distribution operation – taking drugs from far-flung manufacturing sites to medical teams via warehouses, cargo terminals, airports and final storage points (…) promises to be a logistics high-wire act with risks at every stage. Breakdowns in refrigeration equipment, transportation delays, broken packaging […] could leave many thousands of doses useless.”

Without Vials and Needles, a Virus Vaccine Is Just a Formula

“When a vaccine is finally approved for manufacture, the rush to stock up on ancillary products will be unprecedented. […] Manufacturers of vaccine ancillaries, accustomed to sedate and reliable cycles of demand, will have to meet a near-instantaneous clamor for their products”
Dry Ice the need and limitations

• The ultra frozen vaccine can require up to 276kg of dry ice per pallet. Currently the acceptable amounts of dry ice per flight can range from 1000kg to 15000 kg dependent on the aircraft type.

• The number of pallets per flight can be as little as 4 pallets for the lower rated aircraft. These ranges will ultimately limit the amount of vaccines that can be transported to certain areas creating a greater gap in the supply and demand for capacity.

• Training will also be required for the handling of dry ice as is the requirement for any dangerous goods materials.
DHL Life Sciences & Healthcare: combining forces during the global crisis

Where you need us globally

A network strategically positioned and developed where our customers and their partners need us

- Industry leading capabilities and network for Air and Ocean Freight in > 150 countries worldwide
- Global network of Life Sciences certified stations represented in > 40 countries across all continents
- DHL Regional Hubs in Panama, Istanbul, Dubai and Singapore providing market access to next tier growth markets globally

... at the right LS&H quality and service level

A wide range of services that consistently meet the highest quality standards in the industry

- Market leading Life Sciences qualified Air and Ocean Freight capabilities
  - DHL Air & Ocean Thermonet
  - LS Freight
  - Ocean Secure
  - ‘White glove’: LifeConEx
  - ‘Time critical’: DHL Same Day
- 115+ DHL Air Thermonet Life Sciences certified stations
- Global quality organization and global, GxP level, auditable quality standards (temperature management/cold chain)

... allowing you to focus on your core

A Global Expert Community dedicated to serving our customers with industry competence

- Proven excellence for business processes/data management services complementing logistics services
  - Control tower and lead logistics services
  - Customs brokerage services
- Value added services around cold chain, e.g., procurement, management and conditioning of packaging materials, gel packs, ULDs and reefers

... extending your brand’s reach to your customers

Wide range of services consistently meeting the highest performance standards

- Providing and managing Road Freight services to your customers’ door complementing air and Ocean Freight
- Providing time-critical, door-to-door transport services for medical shipments with DHL Same Day
- Further ‘last mile’ services available via other divisions in DHL
Global Star broker Flight Network

41 weekly flight rotations
GxP compliant
LifeConex product

Current network valid until Dec. 15th 2020
Deutsche Post DHL has globally leading capabilities in logistics for life science and healthcare goods...

CAPABILITIES DELIVERING HEALTHCARE TO THE WORLD

AIR THERMONET
118 life sciences–certified air freight stations (IATA CEIV)

OCEAN THERMONET
30+ certified reefer competence center for ocean freight

GDP COMPLIANCE - VISIBILITY - ANALYTICS
→ Customer specific operational procedures & GDP compliant SOPs
→ Global validated life sciences dedicated IT platform (LifeTrack)
→ Trade lane risk assessment & data analytics

170+ GDP-qualified warehouses in 43 countries
23 clinical trials depots serving 80 countries
90 countries served via Medical Express
250 pharmacists in our warehouses

TEMPERATURE
15-25°C
2-8°C
up to -196 °C

A more connected experience for customers along the entire patient journey from clinical trials to the point of care and everything in between delivered by 9,000+ dedicated Life Sciences & Healthcare Specialists
THANK YOU
Opportunities in a Time of Crisis

Kirsten de Bruijn
Senior Vice President,
Cargo Sales and Network Planning
Qatar Airways Cargo
Opportunities in a Time of Crisis

Kirsten de Bruijn
Senior Vice President Cargo Sales & Network Planning

Tuesday, 24 November 2020
LESSONS LEARNT

Manpower & Decision Making

Partners

Aircraft type & Aircraft Capacity

Product Strategy
WE QARE
Concrete air cargo actions, creating a positive impact

Built on four fundamental pillars of sustainability:
Economy, Environment, Society and Culture

We not only remain focused on business. Care is reflected in everything we do.
The We Qare project was triggered by the crisis caused due to the COVID-19 pandemic

‘1 Million Kilos’ – The First Chapter, where charities use the services of Qatar Airways Cargo to transport humanitarian aid and medical supplies all over the world*, free of charge

*until the end of December 2020

Moved by people
THANK YOU
Operational and Infrastructure Challenges

Rupert Batstone
Vice President Business Support
Swissport
Swissport Interview

- Introduction
- Capabilities & Infrastructure
- Operations
- Collaboration and partnership
- Opportunities
- Expectations
Industry Call To Action

• Sharing information - Global Collaboration
  • “Continuous improvement is better than delayed perfection” quote from Mark Twain
  • Edition 1 accessible on iata.org/cargo
    Stay tuned for Edition 2

• Capabilities & infrastructure industry platform – ONE Source
  • Visibility and demonstrated competencies
  • Showcase adherence to quality standards
Additional Outreach & Resources

THREE-PART WEBINAR SERIES: TRANSPORT OF VACCINES AND LIFE SCIENCE PRODUCTS BY AIR CARGO

Webinar 1: Readiness for vaccine and life science products transportation - 21 October 2020
Webinar 2: Global distribution and the flow of vaccines throughout the supply chain - 24 November 2020
Webinar 3: Key learnings in the aftermath of the vaccine distribution effort and paving the way for the future - 2021

VISIT iata.org/events/webinars/

Action Cargo: COVID-19

Enabling global trade

Airlines transport over 52 million metric tons of goods a year, representing more than 35% of global trade by value but less than 1% of world trade by volume. That is equivalent to $6.8 trillion worth of goods annually, or $18.8 billion worth of goods every day. Find out more interesting air cargo facts (pdf)

VISIT iata.org/cargo

Transportation of COVID-19 Vaccine

Air cargo plays a key role in the distribution of vaccines through well-established temperature-sensitive distribution systems, using cutting-edge technology and procedures. This capability will prove crucial to the quick and efficient transport of COVID-19 vaccines once available. This will naturally require careful planning by every segment in the entire cargo supply chain to ensure full preparedness when vaccines for COVID-19 are approved and ready for distribution.

IATA offers solutions and services to support cold chain capacity and resources for the anticipated scale of transporting and distributing COVID-19 vaccines.

VISIT iata.org/vaccine-transport
Thank you

- Please visit [iata.org/vaccine-transport](http://iata.org/vaccine-transport) to register for the upcoming webinars

- Please visit [iata.org/cargo](http://iata.org/cargo) for all COVID-19 resources

For further information, contact us at [cargo@iata.org](mailto:cargo@iata.org)