

Following the cold chain: the journey of a vaccine



1. Manufacture

- Vaccines are manufactured mainly in the US, Europe and Asia
- In Asia, China and India are major producers
- By volume, India's Serum Institute is the world's largest vaccine manufacturer

2. 'Fill-and-finish'

- Vials are filled with vaccine and packaged for distribution
- Vaccines may be shipped to contractors to perform this final production step
- Singapore is looking to be a "fill-and-finish" site, as well as a distribution hub

3. Shipment

- Vaccines are shipped to distribution centres that serve countries or regions, usually by plane
- Upon arrival, vaccines are stored in refrigerated facilities until ready for further transport or delivery

4. Delivery

- Vaccines are repackaged into smaller shipments, for delivery to medical facilities and vaccination sites

5. Administration

- Vaccines will be administered at mass vaccination sites across Singapore
- Four centres have been activated this month at Changi Airport T4, Raffles City Convention Centre, the former Hong Kah Secondary School and Woodlands Galaxy Community Centre
- Jabs will also be available at polyclinics and GPs, and mobile teams deployed to sites such as nursing homes

Role of Logistics Players

- Vaccines must be kept in temperature-controlled environments
- Pfizer-BioNTech's vaccine needs to be shipped and stored at -70°C
 - Moderna's must be stored at -20 °C if kept for longer than 30 days.
 - The Oxford-AstraZeneca vaccine can be stored for six months at between 2°C to 8°C

The required temperatures can be achieved with the help of dry ice, gel packs and refrigerator boxes

- For example: FedEx maintains temperatures of 25°C to -150°C using insulated packaging with dry ice or gel packs, and battery-powered refrigerators called "C-safe containers"

Monitoring technologies are used to ensure proper handling

- For example: FedEx uses an in-package monitoring device called SenseAware to record temperature, location, light exposure, humidity, shock and barometric pressure of the vaccine or healthcare shipment while in transit