How coronavirus vaccines are being shipped and distributed using 'cold chain' technologies

Both the Pfizer-BioNTech and Moderna vaccines will require low temperatures and careful logistics

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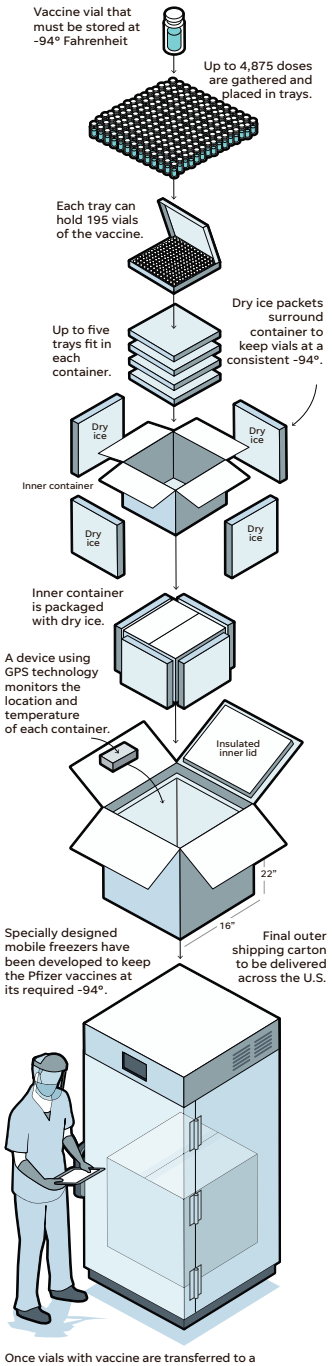
The Pfizer-BioNTech COVID-19 vaccine was the first to be authorized by the U.S. Food and Drug Administration, with first doses shipped out around the country last month. Another vaccine, this one made by Moderna, has received emergency authorization as well, and the first shipments arrived last week. The next major hurdle is transporting the vaccine safely. This is how it works:

Vaccines need to stay in a certain temperature range, usually refrigerated, to remain effective. More than half of vaccines may be wasted globally every year because of temperature control, logistics and shipment-related issues, according to the World Health Organization.

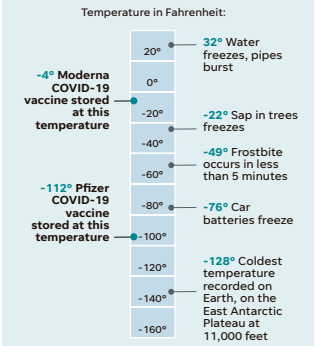
Pfizer's COVID-19 vaccine shipping box

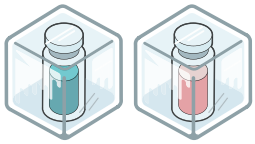
Pfizer makes its U.S. vaccine in Kalamazoo, Michigan. It ships boxes with vaccine via companies such as UPS and FedEx to locations around the country. The company also plans to use a distribution center in Pleasant Prairie, Wisconsin.



Once vials with vaccine are transferred to a refrigerator, they must be used within five days. A single vial should provide five doses of vaccine after dilution. However, pharmacists have reported that vials contain extra doses. At that point, the solution is good for six hours.

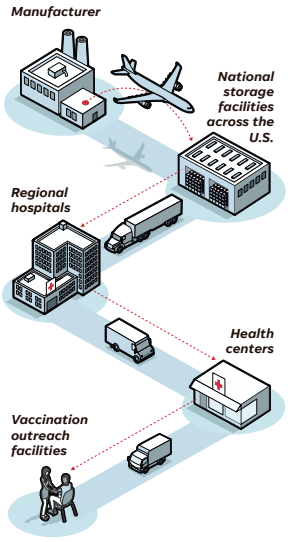
How cooling requirements differ between Pfizer's and Moderna's COVID-19 vaccines





Distributors' cold chain infrastructure

Multiple steps are needed to deliver vials of vaccine to local hospitals and pharmacies for injection into a person's arm. The low-temperature "cold chain" that runs from vaccine production to administration represents one of the biggest challenges of the vaccine distribution effort. During each part of the process, the vaccine boxes must be kept at exactly the right temperature.

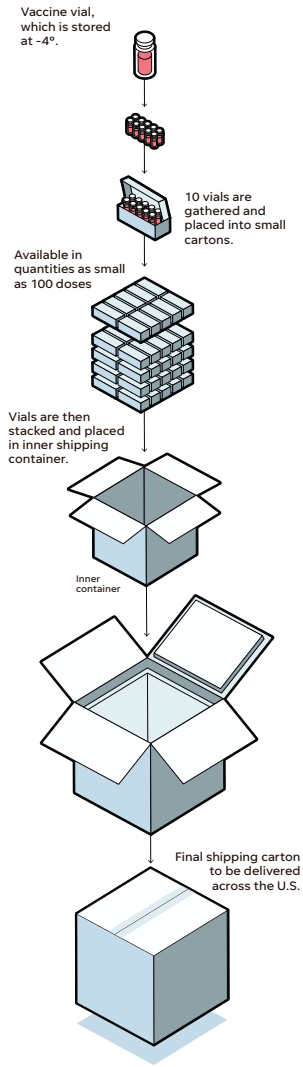


Another hurdle for the cold chain is that the vaccines from Pfizer and Moderna both require two doses, spaced several weeks apart. This means the right number of doses must be available at the right time for injection of the second dose. Operation Warp Speed, the U.S. government vaccine development effort, planned to have 20 million doses available in December, another 30 million in January, and another 50 million in February.

Moderna's COVID-19 vaccine shipping box

As for Moderna, the vials with vaccine will travel from Massachusetts, New Hampshire and Indiana to McKesson Corporation's distribution center in Irving, Texas, the hub of the federal government's Operation Warp Speed vaccination initiative. The center is equipped with freezers to store the vaccine for longer periods. From there, the vaccine kits are distributed to hospitals, pharmacies and other vaccine administration sites.

U.S. officials expect to ship almost 6 million doses of Moderna's COVID-19 vaccine across the country. The vaccine can be stored for up to 6 months using standard freezer temperatures.



The Moderna vaccine can tolerate much higher temperatures during shipping than the one from Pfizer, and has a longer shelf life once it reaches the administration location. After thawing, Moderna vaccine can last in the refrigerator for 30 days and does not require dilution. Once the vaccine is removed from the refrigerator for injection, it can keep at room temperature for up to 12 hours.

SOURCE Pfizer; Moderna; USA TODAY research