

# Relevance of Vaccine Cold Chains Around the World for the Effective Storage and Transport of Vaccines – Case Study by B Medical Systems

Ever since Dr. Edward Jenner pioneered the concept of vaccines in the West by inoculating a 13-year-old boy with the cowpox virus and subsequently demonstrating the child's immunity to smallpox because of that treatment, vaccines to many different infectious diseases were created over the centuries, saving millions of people. Some diseases such as smallpox, which had a risk of death after contracting it of about 30%, have been globally eradicated and others, such as measles, whooping cough and polio are among the many diseases that are now considered as rare in many parts of the world. This achievement has been possible by the large-scale vaccination programs which ensured the establishment of the herd immunity needed to stop the spread of the pathogens causing these diseases.

However, vaccination programs faced many challenges when immunising communities around the world. One of the most important ones is related to the molecular structure of many vaccines: to induce an immune response and the creation of antibodies in the person being administered the vaccine, antigens are used to simulate the actual pathogen. These antigens, because of their molecular structure, can be very delicate to environmental factors such as temperature variations and light. This became a serious problem when vaccination campaigns started targeting populations living in countries with high ambient temperatures, as the chemical components making up the doses would easily denature. This situation changed in 1974 when the WHO and UNICEF launched the Expanded Program on Immunisation and in 1979 met with Electrolux to discuss the start of the production for the first Vaccine Cold Chain units.

## The Vaccine Cold Chain

The Vaccine Cold Chain is the network of medical refrigerators, freezers, and transport solutions tasked to always keep the vaccines at the intended temperatures, from the point of manufacture until administration. These refrigeration and freezer units have become pivotal for the success of immunisation

campaigns around the world and in particular in countries with high ambient temperatures. They also developed over the years to solve problems such as lack of electricity and increasingly difficult vaccine storage temperature requirements. However, challenges remain, and Vaccine Cold Chain manufacturers such as B Medical Systems will play a critical role in tackling them.

## B Medical Systems

B Medical Systems S.à.r.l (formerly Dometic/ Electrolux) is a global manufacturer and distributor of vaccine cold chain and medical refrigeration solutions. Based in Hosingen, Luxembourg, the company was founded in 1979, when the WHO approached the Swedish manufacturing giant Electrolux to provide a solution to safely store and transport vaccines around the world. Across its 3 major business portfolios of Vaccine Cold Chain, Medical Refrigeration, and Blood Management solutions, the company currently offers 100+ models. B Medical Systems' major products include Vaccine Refrigerators (Ice-Lined Refrigerators and Solar Direct Drive Refrigerators), Laboratory Refrigerators, Laboratory Freezers, Pharmacy Refrigerators, Ultra-Low Freezers, Plasma Freezers, Contact Shock Freezers and Transport Boxes. All products have integrated 24/7 temperature monitoring capabilities that further ensure that these products offer the highest level of safety and reliability. Throughout its over 40 years of experience, the company has created innovative solutions to store and transport vaccines, blood components, laboratory specimens, and more across the world safely and reliably. Its commitment to supporting governments, health institutions and NGOs has not only saved innumerable lives but helped communities develop and prosper.

As the established market leader in the Vaccine Cold Chain for the past decades, B Medical Systems has provided equipment to support its partners in vaccinating more than 350 million children in developing countries. Through its long-lasting relationships with global humanitarian organisations such as UNICEF, the WHO, Gavi, Health Ministries, and more, B Medical Systems has installed more than five hundred thousand units across 140+ countries around the world

to safely store and transport vaccines, medicines, blood, and other samples. B Medical Systems is also one of the first few companies to receive the EU MDR certification for its active refrigeration products across its medical refrigeration and blood management business lines, and one of the few companies in the world to have an end-to-end refrigeration solution certified by EU MDR, US FDA and WHO PQS.

During the COVID-19 pandemic, B Medical Systems has been actively supporting governments world-wide in the establishment of their vaccine responses, by supporting the establishment of a reliable and versatile Vaccine Cold Chain able to meet any storage temperature requirement and deliver the best results in terms of safety, reliability, and efficiency.

## Supporting Country-Wide Vaccinations in Central Europe

When the first few SARS-CoV-2 vaccines were being assessed for approval by the EU EMA, one of the countries in Central Europe approached B Medical Systems to build a reliable cold chain to maintain any type of vaccine at the correct temperatures along the whole vaccine distribution chain. However, the setting up of such a cold chain presented some major challenges. For instance, at the time there was great uncertainty regarding the temperature storage profile of each vaccine: the governments were not sure which types of vaccines would be supplied to them and they needed to be ready to store doses requiring storage temperature profiles of -70°C (Pfizer/BioNTech), between -50°C and -15°C (Moderna), -20°C (Johnson & Johnson), and between +2°C and 8°C (AstraZeneca, etc.). Furthermore, the number of doses that would be provided to the member states of the EU was still uncertain, and vaccine spoilage due to malfunctioning storage equipment had to be kept to a minimum.

The company B Medical Systems worked with the government of this particular country to set up a cold chain for the safe storage of all vaccines at all stages, from the central hub to the patient. With the help of the company, this government was able to identify a series of steps needed to ensure the safe storage and transport of all the

	Pfizer/BioNTech			Moderna			AstraZeneca		Johnson & Johnson	
	Storage at: -70°C	Storage at: +2°C to +8°C	Transport: PCM +4°C	Storage at: -20°C	Storage at: +2°C to +8°C	Transport: PCM -30°C	Storage at: +2°C to +8°C	Transport: PCM +4°C	Storage at: -20°C	Transport: PCM +4°C
Ultra-Low Freezer <b>U701</b>	✓			✓					✓	
Vaccine Refrigerator <b>TCW3000AC</b>		✓		✓						
Vaccine Refrigerator <b>TCW4000AC</b>							✓			
Vaccine Refrigerator <b>TCW80AC</b>		✓			✓		✓			
Vaccine Transport Box <b>RCW25</b>			✓		✓	✓		✓		✓

COVID-19 vaccines, which can be found in the table above.

Following the steps identified, B Medical Systems provided the country enough U701 Ultra-Low Freezers for the central hub to store all the vaccine doses that had been calculated to be required, as well as enough TCW80AC, TCW4000AC and TCW3000AC vaccine refrigerators and freezers for each point of care around the country's territory. Moreover, RCW25 vaccine transport boxes were also supplied to transport the doses between the various points of care.

It is important to note that the equipment provided was chosen to be able to cover all vaccine refrigeration requirements for each step: the U701, with its ability to reach temperatures ranging from -86°C to -20°C, can easily be used to store both Pfizer/BioNTech's and Moderna's vaccines, while the TCW3000AC Vaccine Refrigerator can reliably hold doses at a set temperature of -16°C. The TCW80AC and the TCW4000AC are dependable refrigerators capable of safely storing vaccines at a temperature of +4°C, and the sturdy RCW25 transport boxes can be used to transport doses at different temperatures with the addition of ice packs, different types of phase change materials (PCMs) or dry ice inside them. With the equipment supplied, the supported country was able to safely

store the doses received and start vaccinating its citizens.

The company's experience from previous large-scale vaccinations for different diseases in other countries ensured that this European country had the perfect support to organise the entire cold chain infrastructure required ahead of time, including the setup of remote monitoring solutions to control the refrigerators and ultra-low freezers used across its territory, thus putting in place an extra level of security for the safe storage of all the vaccines. This, combined with the excellent equipment provided and the effort of all the healthcare workers involved in the immunisation program, ensured zero wastage of vaccines.

The government of this country was pleased to have worked with B Medical Systems and, together with Pfizer, stated the following:

"B Medical Systems has helped ensure that each and every COVID-19 vaccine [...] has been stored optimally with zero temperature excursions thereby ensuring zero wastage of the vaccines. This is a great achievement especially when there is news on a daily basis about improper cold chain storage and transportation around the world. [...] They have also helped us solve any vaccine cold chain logistical issue in the true spirit of partnership; as we work together to jointly fight COVID-19."



**Luc Provost,**  
CEO of B Medical Systems

Mr. Luc Provost believes in a vision that fosters innovation and customer-centricity. He is a hands-on leader who focuses on perfecting every customer interaction with efficiency and effectiveness. He has a proven executive management track record and over 20 years of experience in driving sales growth. He is passionate about helping save lives by providing solutions in the remotest areas and is also a prominent speaker and thought leader in the field of medical refrigeration. Mr. Luc Provost, CEO of B Medical Systems, a global medical refrigeration device manufacturer, has been with the company for more than 20 years. He possesses a wealth of knowledge in business ownership, technology, operations, and sales and is at the core of the company's reputation as an end-to-end medical cold chain provider. Since joining the company, he has played a pivotal role in the company's revenue growth, geographical expansions and has signed various global commercial agreements for the company including with major corporations like Toyota. He was also instrumental in the launch of 50+ new products, many of which even created new WHO PQS standards. In his official capacity as CEO, he has travelled to 100+ countries and has worked closely with several central governments, ministries of health, international humanitarian and procurement organizations like UNICEF, WHO etc. Luc Provost holds a degree in Business and Management from University of Louvain in Belgium and has studied International Marketing at Laval University in Quebec. He is a Belgian citizen and has also worked for the Belgian Army.



B Medical Systems' Ultra-Low Freezers have been utilised around the world during the COVID-19 pandemic to store Pfizer/BioNTech and Moderna vaccines.