

Name of the institute: Centre for Cellular and Molecular Platforms (C-CAMP)

Incubator: Bio-Incubator at C-CAMP

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Objective: To strengthen the World's largest vaccination drive with innovative last mile cold chain delivery technology

Type of Intervention: (Choose one)

Proposal on Cold storages and Cold chains battery or solar operated for last mile connection

Details of intervention:

(Should cover details about the product/ technology, methodology, milestones, timeline, Line-item wise financials along with tentative cost of transportation, annual maintenance etc.)

The Centre for Cellular and Molecular Platforms (C-CAMP), being the leading hub of deeptech Life Sciences innovation and entrepreneurship in India, has joined nationwide fightback efforts to combat a rapidly spreading pandemic which demands an urgent response. Our one of the flagship program COVID-19 Innovations Deployment Accelerator (CCIDA) have fast-tracked 30 COVID-19 mitigating technologies by assisting in product development, pilot deployment, and scaling up at different COVID-19 care/healthcare centres. Emvólio – a last mile cold chain vaccine delivery device developed by Blackfrog Technologies is one such innovation supported by C-CAMP.

Blackfrog Technologies is a Manipal, Karnataka based technology startup that seeks to improve the efficiency of immunization supply chains. They have developed precision cold-chain and vaccine traceability systems with support from BIRAC (DBT) to provide logistical support in the last-mile delivery of vaccines.

India has initiated the first phase of World's largest immunization drive but the safety and efficacy of vaccines depend largely on efficient cold-chain management. In remote, low-resource settings that rely on ice-based technologies, compliance issues and lack of temperature control and monitoring are significant problems. According to the Immunization Technical Support Unit (ITSU) of the Indian Health Ministry, 25% of all vaccines are wasted due to suboptimal cold-chain management practices. Further, a recent study found that nearly 65% of all vaccine vials across 10 Indian states showed evidence of freezing in storage. With the COVID-19 vaccine in the horizon, it is imperative to ensure

the vaccines do not lose their efficacy in the last mile of delivery, which is when they are most susceptible to thermal degradation. This is where Blackfrog Technologies device Emvólio could create an impact in the efficient vaccine delivery.

Emvólio is a portable, battery-powered refrigeration device that will strictly maintain any preset temperature for over 12 hours for last mile transport of vaccines. Emvólio's 2-litre capacity enables it to carry 30-50 vials, which is standard for a daylong immunization campaign. Further device capabilities include continuous temperature monitoring, location tracking, state-of-charge indication, communication with headquarters via live tracking, and vital statistics for improved coverage. This system, at a pilot



scale, has been helping remote hospitals relieve the economic burden of wasted vaccines. Further, it helps optimize human resources in vaccine delivery by removing the need for repeated immunization visits to account for the administration of unviable vaccines. Most importantly, the battery-powered device stands apart from the competition with its unmatched portability and ease of charging.

Both COVISHIELD and COVAXIN are freeze-sensitive and ice-boxes meant to deliver the vaccines in the last-mile are notorious for dropping temperatures below zero degrees Celsius and thus degrading the vaccines. Emvólio's user-independent freeze-protection and 100% accountability and monitoring will ensure that the vaccines delivered have not been thermally degraded due to poor temperature maintenance.

Emvólio's role in mitigating vaccine wastage

A group of researchers from the UK and Thailand conducted a study in 2017 on the 'Cost, health impacts and cost- effectiveness of ice-less refrigeration in India's vaccine cold chain' (<https://cutt.ly/4jDIrww>) to better understand the economic benefits of using a battery-operated device as a replacement for conventional iceboxes. The team concluded that the costs of wastage in the context of just rural India alone of the ice-based cold chain system is USD 7,512,930 and that even at a unit cost-price of USD 2000 (INR 1,47,420) for an iceless, battery-powered vaccine carrier, the cost-benefit ratio that avoids this wastage would 0.28, indicating that this is cost-beneficial.

Emvólio is an affordable solution and has been purchased by multiple hospitals and non-profit organizations engaged in improving healthcare and livelihood (SELCO Foundation, CInI TATA Trusts, Support Jharkhand, etc.).

One of Blackfrog's clients, SVYM Hospital in Sargur, near Mysore (Karnataka) have used Emvólio for a full year now. They report saving INR 13,000 every month as a direct consequence of not having to discard unused vaccines at the end of the day's field trip. The field doctors report that with

Emvólio’s battery performance, they are now able to immunize twice as many children in tribal regions as they were previously able to with ice-based systems.

Emvólio: Technology

Emvólio’s patented technology ensures that all contents in the cold chamber are blanketed in strictly temperature-controlled air. The underlying refrigeration mechanism is solid-state cooling with a smart PID (Proportional Integral Derivate) controller, which guarantees precise temperature maintenance without the risk of noxious refrigerant leakage or cross-contamination. It is easily adaptable with DRE (Solar power). The lack of motors/compressors or any moving parts enables low-maintenance operation. The unique design of Emvólio promises:

1. Uniform cooling: No hot spots/cold spots within the cold chamber.
2. Minimal freeze-thaw cycles: This means every time a user opens the lid to retrieve a vial and subjects the cold-chamber to ambient air, the rapid-cooling system onboard Emvólio brings the cold-chamber back to safe limits (i.e. 2-8 degrees Celsius) over 96% faster than an ice-based product would.

Emvólio - IoT and eVIN

The eVIN (Electronic Vaccine Intelligence Network) program adopted by MoHFW provides live intelligence on vaccine availability and status until the last point of storage. However, the accountability ends when the vaccines leave the storage facilities and head into the field. Emvólio is a battery-powered system that carries vaccines until the point of administration, implying there is now unprecedented potential to bring traceability in the last mile of the supply chain. The GSM-GPS system onboard transmits live vital statistics like temperatures, location, and usability patterns to the cloud, which Blackfrog provides as a service to the client via an online dashboard at a nominal cost. This system is easily integrated into the existing eVIN system using APIs, thus providing MoHFW end-to-end visibility of all vaccines.

Deployment

The objective of this project is to deploy 100 units of Emvólio to Karnataka State Health authorities to replace the conventional ice-boxes for storage at administering sites and for transport into rural and remote areas. Karnataka has been facing a shortage of deep-freezers meant to freeze ice-packs for use in insulated carriers, and has placed additional request with GoI’s MoHFW for further supplies. This project will negate the need for this purchase since Emvólio is a plug-n-play system that does not require ice-packs.

Milestone No.	Responsibility	Milestone	Activities	Timeline (In Months)
M1	C-CAMP & Blackfrog		- Execution of agreement and detailed project plan	0-01

		Planning and Sourcing Components	- Identifying/planning deployment sites/schedules	0-01
			- Procurement of BOM	0-01
M2	Blackfrog Technology	Manufacturing & Deployment	- Planning for Manufacturing	0-01
			- Manufacturing of 100 units	0-02
			- Quality Check and Packaging	01-02
			- Devices shipped and deployed at designated sites	02-03
M3	C-CAMP & Blackfrog	Monitoring Value Addition		
			- Device vital parameters are tracked, monitored and reports are generated	04-05
			- Daily reports will be generated	04-05
			- Final report submission on Impact due to the intervention	05-06

Budget Summary (100 devices)	
Particulars	Total Cost in INR
Programme (Manufacturing, quality check, shipment, and Installation of 100 devices; Training of healthcare staff, incubation, expert meetings, impact assessment reports, branding and publicity outreach, travel and contingency)	1,48,00,000
Personnel (technology deployment, mentorship, coordination and monitoring, impact analysis & dissemination)	17,20,000
Equipment (office costs)	1,80,000
Institutional (administration and management)	8,00,000
Total	1,75,00,000

Budget Summary (50 devices)	
Particulars	Total Cost in INR
Programme (Manufacturing, quality check, shipment, and Installation of 50 devices; Training of healthcare staff, incubation, expert meetings, impact assessment reports, branding and publicity outreach, travel and contingency)	90,00,000

Personnel (technology deployment, mentorship, coordination and monitoring, impact analysis & dissemination)	17,20,000
Equipment (office costs)	1,80,000
Institutional (administration and management)	8,00,000
Total	1,13,00,000

Do you have State Government connection, or will you require support from CSR –

The Centre for Cellular and Molecular Platforms, or C-CAMP an initiative supported by Department of Biotechnology, Govt of India has also established connections with various State Governments under different programmes. C-CAMP works very closely with the Government of Karnataka, through three key flagship programs, namely 1. K-TECH Technology Business Incubator 2. K-TECH Centre of Excellence for Agri Innovation 3. Karnataka Start-up Advancement Program - K-SAP BIO 50. Blackfrog Technologies has been a beneficiary of K-SAP BIO50 program.

C-CAMP will coordinate, mentor and provide deployment assistance C-CAMP will also perform Impact Monitoring and Assessment and disseminate the Impact Report for Technology Scale-up.

States that you can provide technology to – Karnataka

Please answer following questions depending on the intervention you choose and if applicable to you:

Can you do the Community engagement yourselves or will need help by CSR- We will do it ourself.

If you have a Market ready technology available,

- How do you plan to deploy:
We plan to provide a demo to HCW's on the use of Emvólio, which requires minimal training. The product is easily operable by lay-person since it has been designed to be self-evident in operation in similar lines to a domestic refrigerator.
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- Number of units available: 100

Do u wish to partner with an NGO? If yes, name the NGO and provide details on how u will partner? (item wise costing should include cost to NGO for their scope of work)

C-CAMP is a Non-Government Organization supported initiated by Department of Biotechnology, GoI. C-CAMP will work closely with Blackfrog Technologies on this project.

Project Outcome

The project will be implemented as an aid to Government's initiative of World's largest vaccination drive to combat the COVID pandemic. The last mile vaccine cold chain could be used in delivery of vaccines and post vaccination drive the devices can be used for all other biologicals like blood, serums, viral culture which require to be kept strictly between 2°C and 8°C for up to 12 hours in the field. The proposed project is in alignment with the Sustainable Development Goals (SDG) 3 and 9 to ensure healthy lives and promoting well-being for all and Building resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation respectively.

The impact of deployed technologies will be closely assessed during the project and will also be widely disseminated across various public and private health institutions and government departments. The impact report generated as a part of this project will build a case for system-wide scale up of these innovative and indigenous technologies which is in alignment with the nation's call for Atmanirbhar Bharat.

Visibility to the Supporting Organization

- Display of logos on the devices
- Visibility in news articles, reports and publications
- Visibility on the website and social media
- Visibility in impact dissemination reports
- Supported technologies could be given at special discounted prices to the extent possible to the supporting organisation and its referred partners and collaborators to continue strengthening public health system beyond project duration

**** For this type intervention, please send a separate 1-2 pager proposal that will include abstract of the planned/proposed work, methodology, tentative budget, and estimated timeline.**