Baby Steps

How two low-cost, made-in-India innovations are helping save the lives of newborns

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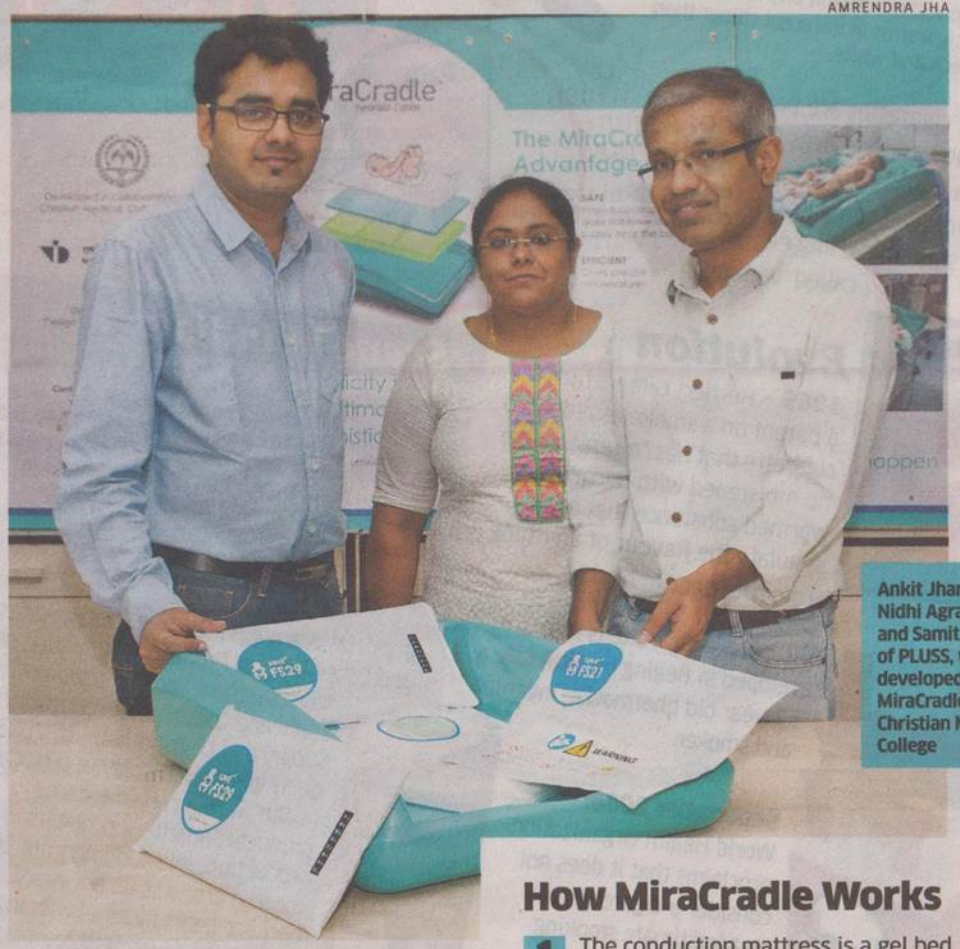


Ankit Jhanwar (L), Nidhi Agrawal and Samit Jain, of PLUSS, which developed MiraCradle with Christian Medical College

:: Indulekha Aravind & KP Narayana Kumar

When Niranjan Thomas, head of the neonatology department at Christian Medical College (CMC) in Vellore, returned from stints in Australia and Canada, he tried to replicate practices he had seen there to tackle birth asphyxia, the condition resulting from newborns being deprived of oxygen.

"Poor nutrition and early marriage of parents are a major cause for birth asphyxia. This is why more cases are reported from rural areas and among the urban poor," says Thomas. But the machines that would help cool the newborns cost over ₹15 lakh and most hospitals in India do not have them. This is despite the fact that close to 1,50,000 infants in India lose their lives to birth asphyxia annually, according to the World Health Organization (WHO). Instead, inspired by the ice packs he had seen being used abroad, Thomas and his team began using cooling ice gel packs to bring down the temperature of babies, which would shoot up to 37 degrees.

While the doctors were able to intervene successfully, the ice packs were also making the babies shiver. Searching online for ways to lower infants' temperatures without harmful side-effects, Thomas came across phase-change materials. These materials help adjust temperatures by either releasing a coolant or heat, as required, when the material changes from solid to liquid, or vice-versa. The team at CMC began experimenting with the material in 2007, and the results looked promising.

Coincidentally, phase change material came to be at the heart of the Embrace Nest, a low-cost infant warmer that began taking shape in a classroom in Stanford University in 2008. In their 'Design for Extreme Affordability' class, Rahul Alex Panicker, Jane Chen, Linus Liang and Naganand Murty were given the challenge of designing a device to combat neonatal hypothermia, which would be significantly cheaper than $20,000-incubators in the US.

Premature babies, who are also of low birth-weight, are placed in incubators to keep them warm because their tiny bodies don't have enough fat to do it on their own. But, in developing countries like India, not everyone can afford to use an incubator. Uninterrupted power needed to run conventional incubators was an equally big challenge, the team realised.

The four came up with an infant warmer resembling a small sleeping bag that the baby could be strapped into. A phase change material, which would be heated separately for half an hour using electricity, is slipped into the 'nest' and keeps the newborn warm for up to six hours. At around ₹15,000, it cost a fraction of conventional incubators. For their efforts, they won funding from Echoing Green, a two-year fellowship offering over $2 million in seed funding to social enterprises.

Off the Drawing Board

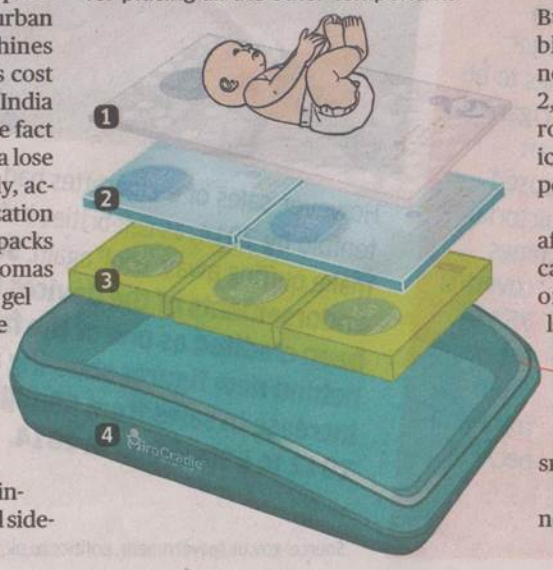
But from a project in design class to the blue-and-orange Embrace Nest that is now manufactured in India and reached 2,00,000 babies in 11 countries was a long road. "Things haven't been easy," Panicker says at a café in Bengaluru, and repeats the line.

Instead of accepting lucrative job offers after Stanford, the four cofounders relocated to Bengaluru to pursue their dream of taking the device to market and launched Embrace Innovations. As part of research, Panicker travelled across 15 states to understand the market and the needs of potential users. "I even went to a funeral in Rajasthan and smoked a hookah."

Back at CMC, Thomas realised they needed to have a better quality product

How MiraCradle Works

1. The conduction mattress is a gel bed which provides a smooth surface for the baby to lie on and improves heat transfer between the baby and the PCM
2. This is the middle layer of the device and used to quickly bring the temperature of the neonate down to 33°C
3. This forms the bottom layer. Three units of this phase change material are placed at the bottom. They passively extract heat from the newborn's body
4. The cradle is a plastic structure which serves as a framework for placing all the other components



Death at Birth

India accounts for the most number of cases of birth asphyxia around the world

Number of cases of birth asphyxia in 2013

- India 1,43,292
- Nigeria 76,823
- Pakistan 44,961
- China 35,488
- Congo 30,041

The shooting up of body temperature of infants due to unavailability of medical equipment is the prime reason for these deaths

...and the Life-saving Cradle

MiraCradle lowers the temperature of new-borns and maintains it at **33 DEGREES** for three days

The cost of machines that trigger a drop in body temperature in the US is between **₹15 LAKH - ₹40 LAKH**

The MiraCradle is available for **₹ 1.60 lakh**

Rajasthan, Haryana, Bihar and Orissa are the states that account for maximum number of infant deaths due to asphyxia

PLUSS plans to market the product to government hospitals especially in rural areas through the National Health Mission

It is already available in leading private hospitals in tier II towns such as Hissar, Aligarh and Davangere