

## ***Closed Cycle Cryocooler Simplifies the Cryogenic Logistics Workflow***

***D. Dutta, Bhabha Atomic Res. Centre, Dept. of Atomic Energy, GOI, India***

A new way to ship and transport cellular materials puts patients front and center. Logistics is critical to the cell therapy workflow, because if a patient's cell therapy doesn't get there at the right time and in good shape, nothing else matters. Cell therapy companies are facing the challenges with existing liquid nitrogen-based shipments. Scheduling must be rigid to ensure that there is enough liquid nitrogen in the 'dry shipper' for door-to-door shipment. Shipments are put at risk if the manufacturing workflow is delayed, there is a transport hold-up, or the clinical site is not able to receive or manage the shipper. To mitigate the risk of running out of liquid nitrogen, which could lead to unacceptable warming of the sample inside, oversized shippers are used to add extra hold time. Aims are to change all this with features that extend beyond the logistics process right up to the patient in the clinic. Goal is to fully replace liquid nitrogen in the cryogenic cold chain. The system is powered entirely by electricity, which brings the temperature down to liquid nitrogen levels (~ 83 K) and maintains it below (153 K) for up to about five days by use of closed cycle cryocooler. The shipper can be kept 'on charge', docked with a cryocooler, for an extended period. Cryogenic temperatures are maintained the whole time, which represents good news for patients. Removing the need for liquid nitrogen reduces the burden on training and safety procedures. It also simplifies the cryogenic logistics workflow. The shipper can have more days of hold time at cryogenic temperature, which accommodates most scenarios where delays might occur.