Dynamo Powered Vaccine Carrier for Off-Grid Locations, Year Two

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Temperature sensitive vaccines such as oral poliovirus and measles vaccines must be maintained within a 2-8oC temperature range to avoid spoilage and to ensure potency. The World Health Organization (WHO) requires vaccine carriers have a minimum 15 hour cold life, the time a 10-0oC temperature is maintained in 43oC conditions. WHO standard cold packs are chilled at 0oC and used in vaccine carriers during transport to maintain 2-8oC range. However, this simple precaution against freezing lacks precision and may cause vaccine spoilage. The researcher developed WHO-compliant vaccine carrier prototypes with a 2-8oC range for 32 hours, cooled with thermoelectric coolers (TECs), and controlled by an Arduino Nano. For cold life, the prototype was repeatedly tested without cold packs, with WHO-compliant chilled cold packs, and -18oC frozen cold packs, in 43oC external conditions for 16-57 hours and recorded by a digital temperature logger. Upon activation, the internal chamber temperature reached the 2-8oC range in less than 30mins and maintained range for 32hrs. Existing vaccine carriers lack precision when used with chilled cold packs leading to internal temperatures below 2oC, causing most vaccines to spoil. However, this prototype maintains 2-8oC with 43oC external temperatures without cold packs, with chilled cold packs, as well as -18oC frozen cold packs, exceeding the 15 hour WHO standard. Stored or dynamo harvested energy powers the circuit during transportation and use. This new vaccine carrier with freeze protection demonstrates WHO-compliance to maintain the cold chain to remote villages in need of temperature sensitive vaccines.

Awards Won:
International Council on Systems Engineering - INCOSE: First Award of $1,500