CLAIMS

What is claimed is:

1. A portable device for cold chain storage, the device comprising: a container defining therein a storage region, the container including: an inner cylinder, the storage region being defined coaxially inwardly of the inner cylinder, the inner cylinder including: phase change material disposed therein, the phase change material being in thermal communication with the storage region; and evaporative coils disposed therein, the evaporative coils being embedded in the phase change material; a thermally insulated outer cylinder, an outer wall of the outer cylinder being disposed radially outwardly of an outer wall of the inner cylinder; a compressor fluidly couplable to the evaporative coils; and an electrical battery electrically couplable to the compressor.

2. The device of claim 1, wherein the inner cylinder and the outer cylinder form an annulus.

3. The device of claim 1, wherein the inner cylinder is fixedly disposed within the outer cylinder.

4. The device of claim 1, wherein the outer cylinder is removably disposable over the inner cylinder.

5. The device of claim 1, wherein the outer cylinder is thermally insulated with vacuum insulation.

6. The device of claim 1, wherein the phase change material is selected to maintain temperature of the storage region in a range between 0° C. and 10° C. for a time period of about 24 hours.

7. A portable device for cold chain storage, the device comprising: a container defining therein a storage region, the container including: an inner cylinder, the storage region being defined coaxially inwardly of the inner cylinder, the inner cylinder including: phase change material disposed therein, the phase change material being in thermal communication with the storage region; and evaporative

coils disposed therein, the evaporative coils being embedded in the phase change material; a thermally insulated outer cylinder, an outer wall of the outer cylinder being disposed radially outwardly of an outer wall of the inner cylinder, the inner cylinder being fixedly disposed within the outer cylinder, the inner cylinder and the outer cylinder forming an annulus; a compressor fluidly couplable to the evaporative coils; and an electrical battery electrically couplable to the compressor.

8. The device of claim 7, wherein the inner cylinder is defined between an inner wall of the outer cylinder and the outer wall of the outer cylinder.

9. The device of claim 7, wherein the evaporative coils include a refrigerant disposed therein.

10. The device of claim 7, wherein the outer cylinder is thermally insulated with vacuum insulation.

11. The device of claim 7, wherein the phase change material is selected to maintain temperature of the storage region in a range between 0° C. and 10° C. for a time period of about 24 hours.

12. A portable device for cold chain storage, the device comprising: a container defining therein a storage region, the container including: an inner cylinder, the storage region being defined coaxially inwardly of the inner cylinder, the inner cylinder including: phase change material disposed therein, the phase change material being in thermal communication with the storage region; and evaporative coils disposed therein, the evaporative coils being embedded in the phase change material; a thermally insulated outer cylinder, an outer wall of the outer cylinder being disposed radially outwardly of an outer wall of the inner cylinder, the outer cylinder being removably disposable over the inner cylinder, the inner cylinder and the outer cylinder forming an annulus; a compressor fluidly couplable to the evaporative coils; and an electrical battery electrically couplable to the compressor.

13. The device of claim 12, wherein an inner wall of the outer cylinder is removably disposed radially outwardly of the outer wall of the inner cylinder.

14. The device of claim 12, wherein an inner wall of the inner cylinder and the outer wall of the inner cylinder are different from an inner wall of the outer cylinder and the outer wall of the outer cylinder, respectively.

15. The device of claim 12, wherein the outer cylinder is configured to sealingly cover the storage region.

16. The device of claim 12, wherein the evaporative coils include a refrigerant disposed therein.

17. The device of claim 12, wherein the outer cylinder is thermally insulated with vacuum insulation.

18. The device of claim 12, further comprising a frame configured to receive therein the container, the compressor, and the electrical battery.

19. The device of claim 12, wherein the phase change material is selected to maintain temperature of the storage region in a range between 0° C. and 10° C. for a time period of about 24 hours.

20. A method of fabricating a portable device for cold chain storage, the method comprising: disposing evaporative coils in an inner cylinder of a container; embedding the evaporative coils in phase change material; defining a storage region of a container coaxially inwardly of the inner cylinder, the phase change material being in thermal communication with the storage region; removably disposing a thermally insulated outer cylinder of the container over the inner cylinder such that an outer wall of the outer cylinder is disposed radially outwardly of an outer wall of the inner cylinder, the inner cylinder and the outer cylinder forming an annulus; coupling a compressor in fluid communication with the evaporative coils; and electrically coupling an electrical battery to the compressor.

21. A portable device for cold chain storage, the device comprising: a container defining therein a storage region, the container including: an inner cylinder, the storage region being defined coaxially inwardly of the inner cylinder, the inner cylinder including: phase change material disposed therein, the phase change material being in thermal communication with the storage region; and evaporative

coils disposed therein, the evaporative coils being embedded in the phase change material; a thermally insulated outer cylinder, an outer wall of the outer cylinder being disposed radially outwardly of an outer wall of the inner cylinder; a compressor fluidly couplable to the evaporative coils; an electrical battery electrically couplable to the compressor; and a lid configured to sealingly cover the container.

22. The device of claim 21, wherein the inner cylinder and the outer cylinder form an annulus.

23. The device of claim 21, wherein the inner cylinder is fixedly disposed within the outer cylinder.

24. The device of claim 21, wherein the outer cylinder is removably disposable over the inner cylinder.

25. The device of claim 21, wherein the evaporative coils include a refrigerant disposed therein.

26. The device of claim 21, wherein the outer cylinder is thermally insulated with vacuum insulation.

27. The device of claim 21, wherein the compressor includes a miniaturized compressor.

28. The device of claim 21, further comprising: a temperature sensor; and a controller operatively couplable to the temperature sensor and operatively coupled to the compressor, the controller being configured to control the compressor responsive to the temperature sensor.

29. The device of claim 21, further comprising a frame configured to receive therein the container, the compressor, and the electrical battery.

30. The device of claim 21, wherein the phase change material is selected to maintain temperature of the storage region in a range between 0° C. and 10° C. for a time period of about 24 hours.