CLAIMS

1. A device for freezing and thawing a therapeutic cell mixture, comprising a container comprising;

a first open end having a first diameter;

a second open end having a second diameter that is smaller than the first diameter;

a lumen, comprising a lumen wall, in fluid communication with the first and second open end, and having a lumen diameter that is similar to the first diameter, wherein the container is constructed of one or more biocompatible materials that maintain structural integrity when frozen at less than about -130 °C and thawed;

a first polymeric seal configured to seat within the lumen and create a sealing contact with the lumen wall;

a first polymeric cap designed to seal the first open end;

a second polymeric cap designed to seal the second open end;

wherein the container defines a syringe barrel, and the first polymeric seal is a piston or plunger.

2. The device of claim 1, wherein the container is made of a polymeric cyclic olefin.

3. The device of any of claims 1-2, wherein the second open end defines a luer lock able to accept a syringe needle with a compatible structure when the second polymeric cap is removed.

4. A method of freezing a therapeutic mammalian cell, comprising:

combining a plurality of therapeutic cells and a composition to create a mixture;

placing the mixture into the container of the device of any of claims 1-3, the container having a first opening and a second opening;

positioning a first polymeric seal in contact with the mixture;

placing a first polymeric cap at the first opening and a second polymeric cap at the second opening to create a gas tight seal;

reducing the temperature of the mixture to -80 °C or less;

maintaining the mixture at a temperature of less than about -80 °C for at least 30 days, wherein after 30 days at least about 50% of the cells grow and divide at least once in cell culture.

5. The method of claim 4, wherein the mixture is maintained in liquid nitrogen vapor phase at less than about -130 °C for at least part of the 30 days.

6. The method of claim 4 or 5, wherein at least about 90% of the cells grow and divide at least once after 30 days.

7. The method of any of claims 4-6, wherein after maintaining the cells, the mixture is thawed to liquid form having a temperature between about 20 and 40 °C.

8. The method of any of claims 4-7, wherein the therapeutic cells are derived from human intervertebral disc tissue.

9. The method of any of claims 4-8, wherein the first polymeric cap and second polymeric cap prevent exchange of at least nitrogen gas between the lumen and the exterior of the device when the device is stored at temperatures below -80°C.

10. The method of any of claims 4-9, wherein the cells are derived from disc tissue, skin, muscle, intestine, bone marrow, neural, liver, heart, lung, pancreas, articular cartilage, bone, thymus, thyroid, or lymph tissue.