CLAIMS

~~We claim:~~

1. A pharmaceutical composition for maintaining viability of a therapeutic mammalian cell comprising:

a freezing medium;

a freezing agent comprising dimethyl sulfoxide at 7.5% or lower; and

an organic polymer.

~~2. The pharmaceutical composition of claim 1, wherein the agent includes dimethyl sulfoxide.~~

~~3~~2. The pharmaceutical composition of ~~any of claims 1-2~~claim 1, wherein the medium excludes animal serum.

~~4~~3. The pharmaceutical composition of ~~any of claims 1-3~~claim 1 or 2, wherein the polymer is a hyaluronic acid.

~~5~~4. The pharmaceutical composition of any of claims 1-~~4~~3, 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.

~~6~~5. The pharmaceutical composition of any of claims 1-~~5~~4, wherein the cells are derived from disc tissue, articular cartilage, heart tissue, or bone.

~~7. 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; and

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

8. The container of claim 7, wherein the container defines a syringe barrel, and the first polymeric seal is a piston or plunger.

9. The container of any of claims 7-8, wherein the container is made of a translucent polymer.

10. The container of any of claims 7-9, wherein the container is made of a polymeric cyclic olefin.

11. The container of any of claims 7-10, 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.

12. 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 a container of a medical device 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.

13. The method of claim 12, wherein the mixture is maintained in liquid nitrogen vapor phase and less than about -130 °C or at least part of the 30 days.

14. The method of any of claims 12-13, wherein at least about 90% of the cells grow and divide at least once after 30 days.

15. The method of any of claims 12-14, wherein after maintaining the cells, the mixture is thawed to liquid form having a temperature between about 20 and 40 °C.

16. The method of any of claims 12-15, wherein the therapeutic cells are derived from human intervertebral disc tissue.

17. The method of any of claims 12-16, wherein the container comprises

a first open end with a first diameter;

a second open end with a second diameter;

a lumen, comprising a lumen wall, in fluid communication with the first and second open end, 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.

~~18. The method of any of claims 12-17, wherein the device prevents exchange of at least nitrogen gas when the device is stored at temperatures below -80°C.~~

~~19. The method of any of claims 12-18, 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.~~

~~20. The pharmaceutical composition of any of claims 12-19, wherein the cells are derived from disc tissue, articular cartilage, heart tissue, or bone.~~