Claims

1. A method of forming a lenticule from donor corneal stroma, the lenticule being adapted for intracorneal implantation;

   and further characterized by

   removing water from the donor corneal stroma and

   rehydrating the donor corneal stroma in a confining space to obtain a lenticule.

2. The method of claim 1, wherein the method further comprises crosslinking at least a portion of the stroma while in the confined space to inhibit subsequent swelling.

3. The method of claim 1 or 2, wherein the step of rehydrating the donor corneal stroma in a confined space imparts an increased collagen density in at least a portion of the lenticule, or an increased stiffness.

4. The method of claim 3, wherein said portion of the lenticule exhibits an increased collagen density that is at least 15% greater, or at least 20% greater, or at least 30% greater, or at least 45% greater, or at least 60% greater than the original collagen concentration of the donor corneal stroma.

5. The method of claim 3, wherein said portion of the lenticule exhibits a modulus stiffness, μ, greater than 1.2×10^5 Pa, or greater than 1.4×10^5 Pa, or greater than 1.6×10^5 Pa, or greater than 1.8×10^5 Pa, or greater than 2×10^5 Pa, or greater than 3×10^5 Pa, or greater than 5×10^5 Pa, or greater than 8×10^5 Pa, or greater than 1×10^6 Pa, or greater than 2×10^5 Pa or greater than 2.6×10^6 Pa, or greater than 3×10^6 Pa, or greater than 4×10^6 Pa.

6. The method of any previous claim, wherein the method further comprises removing fluid from the donor corneal stroma by applying pressure, acceleration, centrifugal force, a vacuum to the scaffold, or freeze drying the stroma.

7. The method of any previous claim, wherein the method further comprises treating the stroma with a chemical decellularizing agent and, optionally, wherein the step of decellularizing occurs before or after removing water, or before or after crosslinking

and, wherein the decellularizes lenticule exhibits a residual amount of cellular material, as measured by residual DNA or RNA content, is less than one percent, or less than 0.1 percent, or less than 0.01 percent by weight of the original DNA or RNA content..

8. The method of any previous claim, wherein the step of crosslinking further comprises exposing at least a portion of the stroma to a crosslinking promoter or actinic radiation including ultraviolet radiation, x-rays, gamma radiation or an electron beam and, wherein the step of crosslinking further comprises selectively exposing a surface portion of the lenticule to a radiation such that the surface portion exhibits greater crosslinking and higher collagen density than a bulk region of the scaffold.

9. The method of any previous claim, wherein the step of crosslinking further comprises exposing at least a portion of the compressed scaffold to ultraviolet radiation by direct exposure, or by exposure at a grazing incidence angle or via an evanescent waveguide coupled to a surface of the scaffold and applying sufficient radiation to inactivate any microbial agents and/or sterilize the scaffold.

10. A collagenous lenticule comprising:

a lenticular body derived from a corneal donor tissue having an anterior surface and a posterior surface that provide the lenticule with a desired shape;

the lenticule further characterized by

the lenticule having been formed from said corneal donor tissue that has been depleted of fluid, and rehydrated in a controlled manner such that at least a portion exhibits a collagen concentration that is at least 15% greater, or at least 20% greater, or at least 30% greater, or at least 45% greater, or at least 60% greater than the original collagen concentration of the donor corneal stroma.

the lenticular body further comprising collagen that has been at least partially crosslinked such that the lenticule body exhibits a modulus stiffness, μ, greater than 2×10^4 Pa, or greater than 8×10^4 Pa or greater than 1.6×10^5 Pa or greater than 2×10^5 Pa or greater than 3×10^5 Pa, or greater than 5×10^5 Pa, or greater than 8×10^5 Pa, or greater than 1×10^6 Pa, or greater than 2×10^6 Pa, or greater than 3×10^6 Pa, or greater than 4×10^6 Pa, or greater than 5×10^6 Pa, or greater than 1×10^7 Pa.

11. The lenticule of claim 10, wherein the lenticule is decellularized such that the amount of cellular material remaining in the lenticule, as measured by residual DNA or RNA content, is less than one percent, or less than 0.1 percent, or less than 0.01 percent by weight of the original DNA or RNA content.

12. The lenticule of claim 10 or 11, wherein the lenticule is adapted for intracorneal implantation by having a disc-like planar or nonplanar shape and a diameter of 0.5 millimeters to 10 millimeters, and a maximum thickness less than 600 micrometers, less than 400 micrometers, or less than 200 micrometers or less than 100 micrometers, or less than 50 micrometers.

13. The lenticule of any of claims 10-12, wherein lenticule has sufficient optical clarity for use as an intracorneal implant and wherein the lenticule exhibits a scattering angle, theta, of less than 3 arcminutes, or less than 2 arcminutes, or less than 1 arcminutes.

14. The lenticule of any of claims 10-13, wherein the lenticule has been sterilized by radiation, including UV radiation or an electron beam.

15. The lenticule of any of claims 10-14, wherein the lenticule further comprises a container surrounding the lenticule for storage and/or shipping.