

What is claimed is:

1. A medical delivery device comprising:
 - a lubricant-free barrel having a proximal end, a distal end, and an interior surface defining a fluid chamber for containment of at least one therapeutic;
 - an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface of the barrel; and
 - a plunger rod connected to the elastomeric stopper,wherein the barrel has a region of reduced diameter located at least at the proximal end thereof to enhance an interference fit between the elastomeric stopper and the interior surface of the barrel, and,
 - wherein the elastomeric stopper includes at least one rib in abutting contact within the region of reduced diameter while the elastomeric stopper is in an undepressed state.
2. The medical delivery device of claim 1, wherein the barrel contains the region of reduced diameter, a region of greater diameter positioned at the distal end of the barrel, and a transition section positioned therebetween to provide a gradual transition between the region of reduced diameter and the region of greater diameter.
3. The medical delivery device of claim 1 or claim 2, wherein two or more ribs are in abutting contact with the region of reduced diameter while the elastomeric stopper is in the undepressed state.
4. The medical delivery device of any one of claims 1-3, wherein a coating material is provided on a portion of the interior surface of the barrel to form the region of reduced diameter.
5. The medical delivery device of claim 4, wherein the coating material comprises at least one member selected from the group consisting of fluorinated ethylene propylene, expanded fluorinated ethylene propylene, epoxy resins and acrylics.

6. The medical delivery device of claim 4, wherein at least one rib is in contact with the coating material when the syringe is in the undepressed state.
7. The medical delivery device of claim 4, wherein the coating material further comprises an oxygen-absorbing material, an oxygen-adsorbing material, or a combination thereof.
8. The medical delivery device of any one of claims 1-7, wherein the elastomeric stopper is at least partially covered with an expanded polytetrafluoroethylene membrane or a densified expanded polytetrafluoroethylene membrane.
9. The medical delivery device of any one of claims 1-8, wherein at least one insert is in contact with the interior surface of the barrel to form the region of reduced diameter, said at least one insert being a gas barrier to inhibit oxygen infiltration into said barrel.
10. The medical delivery device of claim 9, wherein said insert is affixed to the interior surface of the barrel via an adhesive.
11. The medical delivery device of claim 9 or claim 10, wherein said insert is integrally formed on the interior surface of the barrel.
12. The medical delivery device of any one of claims 9-11, wherein the insert comprises a solid polymer tube that is bonded to the interior surface of the barrel.
13. The medical delivery device of any one of claims 9-12, wherein the insert comprises a laminate including one or more fluoropolymer membranes attached to the interior surface of the barrel.

14. The medical delivery device of any one of claims 1-13, wherein said at least one therapeutic is selected from DNA fragments of Target genes or DNA Target receptors genes of a group consisting of genes Coagulation Factors, Cytokines, Epigenetic protein families, Growth Factors, Hormones, Peptides, Signal Transduction molecules, Vaccines, and combinations thereof.
15. The medical delivery device of any one of claims 1-14, wherein said at least one therapeutic is selected from mutations of DNA fragments of Target genes or DNA Target receptors genes.
16. The medical delivery device of any one of claims 1-15, wherein the therapeutic is factor VII.
17. The medical delivery device of any one of claims 1-16, used for treatment of ocular disease.
18. The medical delivery device of any one of claims 1-17, wherein the medical delivery device is a syringe, an auto-injector, or a pen.
19. A medical delivery device comprising:
a lubricant-free barrel having a proximal end, a distal end, and an interior surface defining a fluid chamber for containment of at least one therapeutic;
an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface of the barrel, wherein the elastomeric stopper comprises a plurality of ribs, each pair of ribs having a valley therebetween; and
at least one ring member positioned within at least one valley,
wherein the at least one ring member comprises an oxygen-absorbing material, an oxygen-adsorbing material, or a combination thereof.
20. The medical delivery device of claim 19, wherein two or more valleys comprise said at least one ring member.

21. The medical delivery device of claim 19 or claim 20, further comprising a coating material positioned on a portion of the interior surface of the barrel adjacent to the proximal end of the barrel to form a region of reduced diameter to enhance an interference fit between the elastomeric stopper and the interior surface of the barrel.
22. The medical delivery device of any one of claims 19-21, wherein said at least one therapeutic is selected from DNA fragments of Target genes or DNA Target receptors genes of a group consisting of genes Coagulation Factors, Cytokines, Epigenetic protein families, Growth Factors, Hormones, Peptides, Signal Transduction molecules, Vaccines, and combinations thereof.
23. The medical delivery device of any one of claims 19-22, wherein said therapeutic is selected from mutations of DNA fragments of Target genes or DNA Target receptors genes.
24. The medical delivery device of any one of claims 19-23, wherein the therapeutic is factor VII.
25. The medical delivery device of any one of claims 19-24, used for treatment of ocular disease.
26. The medical delivery device of any one of claims 19-25, wherein the medical delivery device is a syringe, an auto-injector, or a pen.
27. A medical delivery device comprising:
a silicone-free barrel having a proximal end, a distal end, and an interior surface defining a fluid chamber for containment of at least one therapeutic;
an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface;

a plunger rod attached to the stopper and mounted within the barrel for moving the stopper distally within the barrel; and

a barrier coating positioned on at least a portion of the elastomeric stopper, wherein the barrier coating comprises an oxygen barrier material.

28. The medical delivery device of claim 27, wherein the barrier coating surrounds a portion of the elastomeric stopper that is not exposed to the fluid chamber.

29. The medical delivery device of claim 27 or claim 28, wherein the barrier coating surrounds the entirety of the elastomeric stopper.

30. The medical delivery device of any one of claims 27-29, wherein the barrier coating is positioned on the plunger rod.

31. The medical delivery device of any one of claims 27-30, wherein the elastomeric stopper is at least partially covered with an expanded polytetrafluoroethylene layer or a densified expanded polytetrafluoroethylene layer.

32. The medical delivery device of any one of claims 27-31, wherein said at least one therapeutic is selected from DNA fragments of Target genes or DNA Target receptors genes of a group consisting of genes Coagulation Factors, Cytokines, Epigenetic protein families, Growth Factors, Hormones, Peptides, Signal Transduction molecules, Vaccines, and combinations thereof.

33. The medical delivery device of any one of claims 27-32, wherein said therapeutic is selected from mutations of DNA fragments of Target genes or DNA Target receptors genes.

34. The medical delivery device of any one of claims 27-33, wherein the therapeutic is factor VII.

35. The medical delivery device of any one of claims 27-34, used for treatment of ocular disease.

36. The medical delivery device of any one of claims 27-35, wherein the medical delivery device is a syringe, an auto-injector, or a pen.

37. A medical delivery device comprising:

- a lubricant-free barrel having proximal and distal ends and an interior surface defining a fluid chamber for containment of at least one therapeutic;

- an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface;

- a plunger rod attached to the elastomeric stopper and mounted within the syringe barrel for moving the elastomeric stopper distally within the barrel; and

- a coating material positioned on a portion of the interior surface of the barrel adjacent to the proximal end of the barrel to form a region of reduced diameter, said region of reduced diameter having a diameter that is less than a diameter of an uncoated region of the barrel, and

- an expanded polytetrafluoroethylene film having a first side and a second side, said first side being secured to said outer surface of said elastomeric stopper,

- wherein the stopper includes at least one rib in abutting contact within the coating material while the stopper is in an undepressed state, and

- wherein at least one rib is in contact with the uncoated region of the interior surface while the stopper is in a depressed state.

38. The medical delivery device of claim 37, wherein the elastomeric stopper comprises a plurality of ribs, each pair of ribs having a valley therebetween.

39. The medical delivery device of claim 38, further comprising at least one ring member positioned within at least one valley, wherein the ring member comprises an oxygen-absorbing material, an oxygen-adsorbing material, or a combination thereof.

40. The medical delivery device of claim 38 or claim 39, wherein each said valley comprises at least one said ring member.
41. The medical delivery device of any one of claims 37-40, further comprising a barrier coating on a portion of the elastomeric stopper is not exposed to the fluid chamber, wherein the barrier coating comprises an oxygen barrier material.
42. The medical delivery device of any one of claims 37-41, further comprising a barrier coating the entirety of the elastomeric stopper, wherein said barrier coating comprises an oxygen barrier material.
43. The medical delivery device of any one of claims 37-42, wherein said at least one therapeutic is selected from DNA fragments of Target genes or DNA Target receptors genes of a group consisting of genes Coagulation Factors, Cytokines, Epigenetic protein families, Growth Factors, Hormones, Peptides, Signal Transduction molecules, Vaccines, and combinations thereof.
44. The medical delivery device of any one of claims 37-43, wherein said therapeutic is selected from mutations of DNA fragments of Target genes or DNA Target receptors genes.
45. The medical delivery device of any one of claims 37-44, wherein the therapeutic is factor VII.
46. The medical delivery device of any one of claims 37-45, used for treatment of ocular disease.
47. The medical delivery device of any one of claims 37-46, wherein the medical delivery device is a syringe, an auto-injector, or a pen.

48. A medical delivery device comprising:
- a barrel having a proximal end, a distal end, and an interior surface having thereon a lubricant, said barrel defining a fluid chamber for containment of at least one therapeutic;
 - an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface of the barrel; and
 - a plunger rod connected to the elastomeric stopper,
- wherein the barrel has a region of reduced diameter located at least at the proximal end thereof to enhance an interference fit between the elastomeric stopper and the interior surface of the barrel, and,
- wherein the elastomeric stopper includes at least one rib in abutting contact within the region of reduced diameter while the elastomeric stopper is in an undepressed state.
49. The medical delivery device of claim 48, wherein the medical delivery device is a syringe, an auto-injector, or a pen.
50. A medical delivery device comprising:
- a barrel having a proximal end, a distal end, and an interior surface having thereon a lubricant, said barrel defining a fluid chamber for containment of at least one therapeutic;
 - an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface of the barrel, wherein the elastomeric stopper comprises a plurality of ribs, each pair of ribs having a valley therebetween; and
 - at least one ring member positioned within at least one valley,
- wherein the at least one ring member comprises an oxygen-absorbing material, an oxygen-adsorbing material, or a combination thereof.
51. The medical delivery device of claim 50, wherein the medical delivery device is a syringe, an auto-injector, or a pen.

52. A medical delivery device comprising:
- a barrel having proximal and distal ends and an interior surface having thereon a lubricant, said barrel defining a fluid chamber for containment of at least one therapeutic;
 - an elastomeric stopper having an outer surface forming a fluid-tight seal with the interior surface;
 - a plunger rod attached to the elastomeric stopper and mounted within the syringe barrel for moving the elastomeric stopper distally within the barrel; and
 - a coating material positioned on a portion of the interior surface of the barrel adjacent to the proximal end of the barrel to form a region of reduced diameter, said region of reduced diameter having a diameter that is less than a diameter of an uncoated region of the barrel, and
 - an expanded polytetrafluoroethylene film having a first side and a second side, said first side being secured to said outer surface of said elastomeric stopper,
 - wherein the stopper includes at least one rib in abutting contact within the coating material while the stopper is in an undepressed state, and
 - wherein at least one rib is in contact with the uncoated region of the interior surface while the stopper is in a depressed state.
53. The medical delivery device of claim 52, wherein the medical delivery device is a syringe, an auto-injector, or a pen.