

CLAIMS

1. A drug delivery system, comprising:  
an implantable or injectable biocompatible particle, comprising:  
a polymeric inner matrix comprising a biologically active compound;  
and  
a polymeric outer layer disposed at least partially around the inner matrix, the polymeric outer layer being substantially impermeable to the biologically active compound,  
wherein the particle is configured to exhibit zero-order or near-zero-order release of the biologically active compound.
2. The drug delivery system of claim 1, wherein the particle is configured to exhibit a release profile which on a log-log plot of cumulative release versus time has a slope greater than or equal to about 0.62, greater than or equal to about 0.75, or greater than or equal to about 0.87.
3. The drug delivery system of any of claims 1-2, wherein the particle conforms to the following mathematical conditions: the ratio  $D/(Ku)$  is greater than about 1, the ratio  $LK/D$  is less than about 0.1, and the aspect ratio  $L/d$  is between about 1 and about 50, where  $L$  is the length of the particle,  $d$  is the diameter of the inner matrix,  $D$  is the diffusion constant, and  $K$  is the dissolution constant of the active compound in the inner matrix, and  $u = 1$  cm.
4. The drug delivery system of any of claims 1-3, wherein the polymeric inner matrix is biodegradable.
5. The drug delivery system of any of claims 1-3, wherein the polymeric inner matrix is non-biodegradable.
6. The drug delivery system of any of claims 1-5, wherein the particle is cylindrical or rod-like in shape.
7. The drug delivery system of any of claims 1-6, wherein the polymeric inner matrix comprises one or more fluoroelastomers or fluorogreases.
8. The drug delivery system of any of claims 1-7, wherein the particle is void of any mechanically movable parts.
9. The drug delivery system of any of claims 1-8, wherein the active compound comprises one or more anti-abuse or "replacement therapy" drugs, local anesthetics, opioids, steroid, peptide hormones, insulin sensitizers, multiple sclerosis related drugs, anticancer drugs, statins, TNF inhibitors, cannabinoids, migraine

related drugs, vasodilators, anticonvulsants, weight loss agents, gastrointestinal ("GI") tract drugs, cardiac drugs, anti-HIV drugs, psychiatric drugs, systemic drugs, ophthalmic related drugs, or glaucoma related drugs.

10. The drug delivery system of any of claims 1-9, wherein the particle further comprises at least one coating disposed on an exterior surface of the polymeric outer layer.

11. A method of delivering a biologically active compound to a mammal, comprising:

obtaining a biocompatible particle, comprising:

a polymeric inner matrix comprising a biologically active compound; and

a polymeric outer layer disposed at least partially around the inner matrix, and

injecting or implanting the particle into a body of a mammal,

wherein the particle is configured to exhibit zero-order or near-zero-order release of the biologically active compound.

12. The method of claim 11, further comprising:

explanting the particle after the active compound has been exhausted from the particle.

13. The method of claim 11, wherein the particle is configured to be left within the body of the mammal.

14. The method of any of claims 11-13, wherein injecting or implanting the particle comprises subcutaneous, intramuscular, intradermal, or intraocular injection or implantation.

15. The method of any of claims 11-14, wherein the method is used in the treatment of a cancer.

16. The method of claim 15, wherein the cancer is selected from at least one of bone cancer and breast cancer.

17. The method of any of claims 11-16, wherein the particle comprises one or more materials that promote the ingrowth of tissue onto the particle.

18. The method of any of claims 11-17, wherein the polymeric inner matrix comprises one or more fluoroelastomers or fluorogreases.

19. The method of any of claims 11-18, wherein the polymeric inner matrix is biodegradable.

20. The method of any of claims 11-18, wherein the polymeric inner matrix is non-biodegradable.

**CLAIMS**

1. A drug delivery system, comprising:  
  
an implantable or injectable biocompatible particle, comprising:  
  
a polymeric inner matrix comprising a biologically active compound; and  
  
5 a polymeric outer layer disposed at least partially around the inner matrix, the polymeric outer layer being substantially impermeable to the biologically active compound,  
  
in which the particle is configured to exhibit zero-order or near-zero-order release of the biologically active compound.
2. A drug delivery system according to Claim 1, in which the particle is configured to  
10 exhibit a release profile which on a log-log plot of cumulative release versus time has a slope greater than or equal to about 0.62, greater than or equal to about 0.75, or greater than or equal to about 0.87.
3. A drug delivery system according to Claim 1 or 2, in which the particle conforms to the following mathematical conditions: the ratio  $D/(Ku)$  is greater than about 1, the ratio  $LK/D$  is  
15 less than about 0.1, and the aspect ratio  $L/d$  is between about 1 and about 50, where  $L$  is the length of the particle,  $d$  is the diameter of the inner matrix,  $D$  is the diffusion constant, and  $K$  is the dissolution constant of the active compound in the inner matrix, and  $u = 1$  cm.
4. A drug delivery system according to Claim 1, 2 or 3, in which the polymeric inner matrix is biodegradable.
- 20 5. A drug delivery system according to Claim 1, 2 or 3, in which the polymeric inner matrix is non-biodegradable.
6. A drug delivery system according to any preceding claim, in which the particle is cylindrical or rod-like in shape.
7. A drug delivery system according to any preceding claim, in which the polymeric inner  
25 matrix comprises one or more fluoroelastomers or fluorogreases.
8. A drug delivery system according to any preceding claim, in which the particle is void of any mechanically movable parts.

9. A drug delivery system according to any preceding claim, in which the active compound comprises one or more anti-abuse or “replacement therapy” drugs, local anesthetics, opioids, steroid, peptide hormones, insulin sensitizers, multiple sclerosis related drugs, anticancer drugs, statins, TNF inhibitors, cannabinoids, migraine related drugs, vasodilators,
- 5 anticonvulsants, weight loss agents, gastrointestinal (“GI”) tract drugs, cardiac drugs, anti-HIV drugs, psychiatric drugs, systemic drugs, ophthalmic related drugs, or glaucoma related drugs.
10. A drug delivery system according to any preceding claim, in which the particle further comprises at least one coating disposed on an exterior surface of the polymeric outer layer.
- 10 11. A biocompatible particle for use in a method of delivering a biologically active compound to a mammal, in which the biocompatible particle comprises: a polymeric inner matrix comprising a biologically active compound; and a polymeric outer layer disposed at least partially around the inner matrix, in which the particle is configured to exhibit zero-order or near-zero-order release of the biologically active compound, and in which the particle is
- 15 injected or implanted into a body of a mammal.
12. A biocompatible particle according to Claim 11 for a use as specified therein, in which the particle is explanted after the active compound has been exhausted from the particle.
13. A biocompatible particle according to Claim 11 or 12 for a use as specified therein, in which the particle is configured to be left within the body of the mammal.
- 20 14. A biocompatible particle according to any of Claims 11 to 13 for a use as specified therein, in which injecting or implanting the particle comprises subcutaneous, intramuscular, intradermal, or intraocular injection or implantation.
15. A biocompatible particle according to any of Claims 11 to 14 for a use as specified therein, in which the method is used in the treatment of a cancer.
- 25 16. A biocompatible particle according to Claim 15 for a use as specified therein, in which the cancer is selected from at least one of bone cancer and breast cancer.
17. A biocompatible particle according to any of Claims 11 to 16 for a use as specified therein, in which the particle comprises one or more materials that promote the ingrowth of tissue onto the particle.

18. A biocompatible particle according to any of Claims 11 to 17 for a use as specified therein, in which the polymeric inner matrix comprises one or more fluoroelastomers or fluorogreases.
19. A biocompatible particle according to any of Claims 11 to 18 for a use as specified  
5 therein, in which the polymeric inner matrix is biodegradable.
20. A biocompatible particle according to any of Claims 11 to 18 for a use as specified therein, in which the polymeric inner matrix is non-biodegradable.