CLAIMS

1. A medical device comprising coated bone filler particles, the coated bone filler particles coated with a matrix composition comprising: (a) a biodegradable polyester selected from PLA, PGA and PLGA; (b) cholesterol; (c) a combination of phosphatidylcholines having fatty acid moieties of 16-18 carbons; and (e) an antibiotic agent.
2. The medical device of claim 1, wherein the bone filler is selected from the group consisting of allogeneic bone filler, xenogeneic bone filler, synthetic bone filler and a combination thereof.
3. The medical device of claim 2, wherein the bone filler is synthetic bone filler.
4. The medical device of claim 3, wherein the synthetic bone filler is Tri-Calcium Phosphate (β-TCP).
5. The medical device of claim 4, wherein the β-TCP has an average particles size of up to 1mm.
6. The medical device of claim 1, wherein the coated bone filler particles comprise between about 80-90% (w/w) of bone filler and between about 10-20% (w/w) of the matrix composition.
7. The medical device of claim 1, further comprising non-coated bone filler particles.
8. The medical device of claim 7, wherein the non-coated bone filler particles are selected from the group consisting of autogenous bone, allogeneic bone filler, xenogeneic bone filler, synthetic bone filler and a combination thereof.
9. The medical device of claim 8, wherein the non-coated bone filler particles are β-TCP.
10. The medical device of claim 8, wherein the non-coated bone filler particles are an autogenous bone.
11. The medical device of claim 7, wherein the weight ratio between the coated bone particles and the non-coated bone particles is between 1:3 – 10:1.

12. The medical device of claim 11, wherein the weight ratio between the coated bone particles and non-coated bone particles is about 1:1.

13. The medical device of claim 7, wherein the antibiotic agent is present at 0.4-2% (w/w) of the total weight of the medical device.

14. The medical device of claim 24, wherein the antibiotic agent is present at 0.5-1% (w/w) of the total weight of the medical device.

15. The medical device of any one of claims 1-14 wherein the antibiotic agent is doxycycline.

16. The medical device of claim 15 comprising (a) 90-95% (w/w) of β-TCP; (b) 1.0-2.0% (w/w) PLGA; (c) 0.4-0.8% (w/w) cholesterol; (d) 2.0-4.0% (w/w) of DPPC; (e) 0.7-1.3% (w/w) of DSPC; (f) 0.4-2% (w/w) of doxycycline.

17. The medical device of any one of claims 1-16 for implantation at a location at which bone growth is desired.

18. A biodegradable matrix composition comprising: (a) a biodegradable polyester selected from PLA, PGA and PLGA; (b) cholesterol; (c) a combination of phosphatidylcholines having fatty acid moieties of 16-18 carbons; and (e) an antibiotic agent.

19. The biodegradable matrix composition of claim 18, wherein the antibiotic agent is doxycycline.

20. The biodegradable matrix composition of claim 18, comprising between 1-20% (w/w) of an antibiotic agent.

21. The biodegradable matrix composition of claim 18, wherein the biocompatible polyester is PLGA.

22. The biodegradable matrix composition of claim 18, comprising between 10-30% (w/w) of a biodegradable polyester.

23. The biodegradable matrix composition of claim 18, comprising a combination of DPPC and DSPC.

24. The biocompatible matrix composition of claim 23, wherein the weight ratio between DPPC and DSPC is between about 10:1 and 1:1.

25. The biodegradable matrix composition of claim 18, wherein the weight of the combination of phosphatidylcholines is at least 40% (w/w) of the total weight of the composition.

26. The biodegradable matrix composition of claim 25, wherein the weight of the combination of phosphatidylcholines is between 50-70% (w/w) of the total weight of the composition.

27. The biocompatible matrix composition of claim 18, comprising between 5-15% (w/w) of cholesterol.

28. The biocompatible matrix composition of claim 18, comprising: (a) 15-25% (w/w) PLGA; (b) 5-15% (w/w) of cholesterol; (c) 50-70% (w/w) of a mixture of DPPC and DSPC, wherein the ratio of DPPC to DSPC is between 5:1 and 2:1 and (d) 7-12% (w/w) of doxycycline.

29. A method for treating a patient comprising implanting at a location at which bone growth is desired a medical device comprising coated bone filler particles, the coated bone filler particles coated with a matrix composition comprising: (a) a biodegradable polyester selected from PLA, PGA and PLGA; (b) cholesterol; (c) a combination of phosphatidylcholines having fatty acid moieties of 16-18 carbons; and (e) an antibiotic agent.

30. The method of claim 29, wherein the medical device provides local prolonged release of the antibiotic agent at the location at which bone growth is desired.

31. The method of claim 30, wherein the location at which bone growth is desired is a bone void or a bone defect.

32. The method of claim 31, wherein the bone void or bone defect is a bone fracture.

33. The method of claim 32, wherein fracture is an open bone fracture.

34. The method of claim 33, wherein the open bone fracture is an open long bone fracture.

35. The method of claim 34, wherein the open long bone fractures are selected from bone fractures classified Gustillo grade II, IIIa, IIIb and IIIc.

36. The method of claim 29, wherein the subject is human.

37. The method of claim 29, wherein the coated bone void filler is selected from the group consisting of allogeneic, xenogeneic, synthetic bone void fillers or any combination thereof.

38. The method of claim 29, wherein the antibiotic agent is doxycycline.

39. The method of claim 29, wherein the medical device further comprises non-coated bone void fillers.

40. The method of claim 39, wherein the weight ratio between the coated and non-coated bone void fillers is between 1:3 and 10:1.

41. The method of claim 27, wherein the medical device is applied at a dose of 50 grams or lower per bone void site.

42. The method of claim 39, wherein the medical device is applied at a dose ranging from 10-40 grams per bone void site.

CLAIMS

1. A pharmaceutical composition comprising coated and non-coated bone filler particles at a ratio of between about 1:3 – 10:1, in which the coated bone filler particles comprise between about 80-90% (w/w) of bone filler coated with between about 10-20% (w/w) of a matrix composition which comprises: (a) 15-25% (w/w) poly (lactic-co-glycolic acid) (PLGA) (b) 5-15% (w/w) of cholesterol; (c) 50-70% (w/w) of a mixture of 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) and 1,2-distearoyl-sn-glycero-3-phosphocholine (DSPC), in which the ratio of DPPC to DSPC is between 5:1 and 2:1 and (d) 7-12% (w/w) of doxycycline or doxycycline hyclate.

2. A pharmaceutical composition according to Claim 1, in which the bone filler is selected from the group consisting of allogeneic bone filler, xenogeneic bone filler, synthetic bone filler and a combination thereof.

3. A pharmaceutical composition according to Claim 1 or 2, in which the bone filler is synthetic bone filler.

4. A pharmaceutical composition according to Claim 3, in which the synthetic bone filler is Tri-Calcium Phosphate (β-TCP).

5. A pharmaceutical composition according to Claim 4, in which the β-TCP has an average particles size of up to 1mm.

6. A pharmaceutical composition according to any of Claims 1 to 3, in which the weight ratio between the coated bone particles and non-coated bone particles is about 1:1.

7. A pharmaceutical composition according to any of Claims 1 to 4, in which the doxycycline or doxycycline hyclate is present at 0.4-2% (w/w) of the total weight of the pharmaceutical composition.

8. A pharmaceutical composition according to Claim 5, in which the doxycycline or doxycycline hyclate is present at 0.5-1% (w/w) of the total weight of the pharmaceutical composition.

9. A pharmaceutical composition comprising (a) 90-95% (w/w) of β-TCP; (b) 1.0-2.0% (w/w) PLGA; (c) 0.4-0.8% (w/w) cholesterol; (d) 2.0-4.0% (w/w) of DPPC; (e) 0.7-1.3% (w/w) of DSPC; (f) 0.4-2% (w/w) of doxycycline or doxycycline hyclate.

10. Use of a pharmaceutical composition according to any preceding claim for the preparation of a medicament for the treatment of an open bone fracture in a patient.

11. Use according to Claim 10, in which the treatment provides local prolonged release of doxycycline or doxycycline hyclate at the fracture site.

12. Use according to Claim 10, in which the open bone fracture is an open long bone fracture.

13. Use according to any of Claims 10 to 12, in which the open bone fracture is selected from the group consisting of bone fractures classified Gustillo grade II, IIIa, IIIb and IIIc,.

14. Use according to Claim 13 in which the open bone fracture is selected from bone fractures classified Gustillo grade IIIa and IIIb.

15. Use according to any of Claims 10 to 14, in which the pharmaceutical composition is to be applied at a dose of 50 grams or lower per bone fracture site.

16. Use according to any of Claims 10 to 15, in which the treatment comprises implanting the pharmaceutical composition during a first surgical intervention at the bone fracture.

17. Use according to Claim 16, in which implanting is performed during the first surgical intervention at the bone fracture site after an irrigation and debridement (I&D) procedure.