

CLAIMS

The invention is claimed as follows:

1. A microbial growth inhibiting solution comprising a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL, and the buffer comprises citrate.
2. The microbial growth inhibiting solution of claim 1, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.05 mg/mL to 5 mg/mL.
3. The microbial growth inhibiting solution of claim 1, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL.
4. The microbial growth inhibiting solution of claim 1, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL.
5. The microbial growth inhibiting solution of claim 1 further comprising a pharmacologically acceptable carrier solution.
6. The microbial growth inhibiting solution of claim 5, wherein the pharmacologically acceptable carrier solution comprises saline, Ringer's solution, or water pH adjusted to 5.2 or less.
7. The microbial growth inhibiting solution of claim 1 wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.071 mg/mL to 1.15 mg/mL, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL.
8. The use of a C₄-C₉ carboxylate antimicrobial agent and a chelating agent for the preparation of a microbial growth inhibiting solution for the disinfection of a lumen of an implanted catheter from bacteria and fungi, wherein the microbial growth inhibiting solution comprises a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from 0.05 mg/mL to 5 mg/mL, the chelating agent comprises disodium

ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL, and the buffer comprises citrate.

9. The use of claim 8, wherein at least a portion of the catheter is sufficiently porous to permit diffusion of the solution outwardly from the lumen to the outer surface of the catheter and into tissues or the bloodstream surrounding the catheter to inhibit infection.

10. The use of claim 8, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL.

11. The use of claim 8, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL.

12. The use of claim 8, wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.071 mg/mL to 1.15 mg/mL, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL.

13. A method for coating a medical device, the method comprising:

exposing the medical device to a microbial growth inhibiting solution for a sufficient amount of time to provide a coating on the exposed surface of the device, wherein the microbial growth inhibiting solution comprises a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from 0.05 mg/mL to 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL, and the buffer comprises citrate.

14. The method of claim 13 further comprising treating the device with a surfactant before exposing the device to the microbial growth inhibiting solution.

15. The method of claim 14, wherein the surfactant is selected from the group of surfactant consisting of tridodecylmethyl ammonium chloride, benzalkonium chloride and combinations thereof.

16. The method of claim 13, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL.

17. The method of claim 13, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL.

18. The method of claim 13, wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.071 mg/mL to 1.15 mg/mL, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL.

19. A medical device coated with a microbial growth inhibiting solution comprising a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from 0.05 mg/mL to 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL, and the buffer comprises citrate.

20. The medical device of claim 19, wherein the medical device is selected from the group of devices consisting of a central venous catheter, a peripheral intravenous catheter, an arterial catheter, a Swant-Ganz catheter, a hemodialysis catheter, an umbilical catheter, a percutaneous nontunneled silicone catheter, a cuffed tunneled central venous catheter and a subcutaneous central venous port.

21. The medical device of claim 19, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL.

22. The medical device of claim 19, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL.

23. The medical device of claim 19, wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.071 mg/mL to 1.15 mg/mL, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL.

24. The use of a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer for the preparation of a microbial growth inhibiting solution for the locking and/or flushing a lumen of an implanted catheter from bacteria and fungi, wherein the lumen of the implanted catheter open to a body lumen, and wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from 0.05 mg/mL to 5

mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL, and the buffer comprises citrate.

25. The use of claim 24, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL.

26. The use of claim 24, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL.

27. The use of claim 24, wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.071 mg/mL to 1.15 mg/mL, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL.

28. A kit for locking and/or flushing an implanted catheter, the kit comprising:
a container holding a volume of a microbial growth inhibiting solution comprising a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from 0.05 mg/mL to 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL, and the buffer comprises citrate; and
an implantable catheter lumen that receives the microbial growth inhibiting solution.

29. The kit of claim 28, wherein the container comprises a syringe.

30. The kit of claim 28, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL.

31. The kit of claim 28, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL.

32. The kit of claim 28, wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.5 mM to 8 mM, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL.

33. A kit for locking and/or flushing an implanted catheter, the kit comprising:

a container having a first compartment holding a C₄-C₉ carboxylate antimicrobial agent and a chelating agent in powder form and a second compartment holding a pharmacologically acceptable carrier solution, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from 0.05 mg/mL to 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from 0.01 mg/mL to 2 mg/mL when mixed with the pharmacologically acceptable carrier solution, and wherein the first or second compartment further comprises a buffer comprising citrate.

34. The kit of claim 33, wherein the container comprises an implantable catheter lumen.

35. The kit of claim 33, wherein the container comprises a syringe.

36. The kit of claim 33, wherein the chelating agent is present in an amount ranging from 0.1 mg/mL to 1 mg/mL when mixed with the pharmacologically acceptable carrier solution.

37. The kit of claim 33, wherein the chelating agent is present in an amount ranging from 0.25 mg/mL to 0.5 mg/mL when mixed with the pharmacologically acceptable carrier solution.

38. The kit of claim 33, wherein the buffer is present in an amount ranging from 1.5 to 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from 0.071 mg/mL to 1.15 mg/mL, and the chelating agent is present in an amount ranging from 0.0625 mg/mL to 1 mg/mL when mixed with the pharmacologically acceptable carrier solution.

CLAIMS

The invention is claimed as follows:

1. A microbial growth inhibiting solution comprising a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL, and the buffer comprises citrate.
2. The microbial growth inhibiting solution of claim 1, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL.
3. The microbial growth inhibiting solution of claim 1, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL.
4. The microbial growth inhibiting solution of claim 1, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL.
5. The microbial growth inhibiting solution of claim 1 further comprising a pharmacologically acceptable carrier solution.
6. The microbial growth inhibiting solution of claim 5, wherein the pharmacologically acceptable carrier solution comprises saline, Ringer's solution, or water pH adjusted to 5.2 or less.
7. Claim 12 (currently amended): The microbial growth inhibiting solution of claim 1 wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.071 mg/mL to about 1.15 mg/mL, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL.

8. The use of a C₄-C₉ carboxylate antimicrobial agent and a chelating agent for the preparation of a microbial growth inhibiting solution for the disinfection of a lumen of an implanted catheter from bacteria and fungi, wherein the microbial growth inhibiting solution comprises a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL, and the buffer comprises citrate.

9. The use of claim 8, wherein at least a portion of the catheter is sufficiently porous to permit diffusion of the solution outwardly from the lumen to the outer surface of the catheter and into tissues or the bloodstream surrounding the catheter to inhibit infection.

10. The use of claim 8, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL.

11. The use of claim 8, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL.

12. The method of claim 8, wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.071 mg/mL to about 1.15 mg/mL, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL.

13. A method for coating a medical device, the method comprising:
exposing the medical device to a microbial growth inhibiting solution for a sufficient amount of time to provide a coating on the exposed surface of the device, wherein the microbial growth inhibiting solution comprises a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL, and the buffer comprises citrate.

14. The method of claim 13 further comprising treating the device with a surfactant before exposing the device to the microbial growth inhibiting solution.

15. The method of claim 14, wherein the surfactant is selected from the group of surfactant consisting of tridodecylmethyl ammonium chloride, benzalkonium chloride and combinations thereof.

16. The method of claim 13, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL.

17. The method of claim 13, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL.

18. The method of claim 13, wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.071 mg/mL to about 1.15 mg/mL, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL.

19. A medical device coated with a microbial growth inhibiting solution comprising a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL, and the buffer comprises citrate.

20. The medical device of claim 19, wherein the medical device is selected from the group of devices consisting of a central venous catheter, a peripheral intravenous catheter, an arterial catheter, a Swant-Ganz catheter, a hemodialysis catheter, an umbilical catheter, a percutaneous nontunneled silicone catheter, a cuffed tunneled central venous catheter and a subcutaneous central venous port.

21. The medical device of claim 19, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL.

22. The medical device of claim 19, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL.

23. The medical device of claim 19, wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.071 mg/mL to about 1.15 mg/mL, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL.

24. The use of a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer for the preparation of a microbial growth inhibiting solution for the locking and/or flushing a lumen of an implanted catheter from bacteria and fungi, wherein the lumen of the implanted catheter open to a body lumen, and wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL, and the buffer comprises citrate.

25. The use of claim 24, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL.

26. The use of claim 24, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL.

27. The use of claim 24, wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.071 mg/mL to about 1.15 mg/mL, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL.

28. A kit for locking and/or flushing an implanted catheter, the kit comprising:
a container holding a volume of a microbial growth inhibiting solution comprising a C₄-C₉ carboxylate antimicrobial agent, a chelating agent and a buffer, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL, the chelating agent comprises disodium

ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL, and the buffer comprises citrate; and
an implantable catheter lumen that receives the microbial growth inhibiting solution.

29. The kit of claim 28, wherein the container comprises a syringe.

30. The kit of claim 28, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL.

31. The kit of claim 28, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL.

32. The kit of claim 28, wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.5 mM to about 8 mM, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL.

33. A kit for locking and/or flushing an implanted catheter, the kit comprising:
a container having a first compartment holding a C₄-C₉ carboxylate antimicrobial agent and a chelating agent in powder form and a second compartment holding a pharmacologically acceptable carrier solution, wherein the C₄-C₉ carboxylate antimicrobial agent comprises sodium caprylate and is present in an amount ranging from about 0.05 mg/mL to about 5 mg/mL, the chelating agent comprises disodium ethylenediaminetetraacetic acid and is present in an amount ranging from about 0.01 mg/mL to about 2 mg/mL when mixed with the pharmacologically acceptable carrier solution, and wherein the first or second compartment further comprises a buffer comprising citrate.

34. The kit of claim 33, wherein the container comprises an implantable catheter lumen.

35. The kit of claim 33, wherein the container comprises a syringe.

36. The kit of claim 33, wherein the chelating agent is present in an amount ranging from about 0.1 mg/mL to about 1 mg/mL when mixed with the pharmacologically acceptable carrier solution.

37. The kit of claim 33, wherein the chelating agent is present in an amount ranging from about 0.25 mg/mL to about 0.5 mg/mL when mixed with the pharmacologically acceptable carrier solution.

38. The kit of claim 33, wherein the buffer is present in an amount ranging from about 1.5 to about 24 mM, wherein the C₄-C₉ carboxylate antimicrobial agent is present in an amount ranging from about 0.071 mg/mL to about 1.15 mg/mL, and the chelating agent is present in an amount ranging from about 0.0625 mg/mL to about 1 mg/mL when mixed with the pharmacologically acceptable carrier solution.