Marked-up Claims

1 Use of an aerosol of a solution ~~comprising levofloxacin or ofloxacin and a divalent or trivalent cation~~in the manufacture of a medicament for the ~~preparation of an aerosol for treating~~ treatment of a pulmonary infection in a human, wherein the solution comprises from ~~about~~ 75 mg/ml to ~~about~~ 150 mg/ml of levofloxacin or ofloxacin, from 100 mM to 300 mM of a divalent or trivalent cation, an osmolality from 300 mOsmol/kg to 500 mOsmol/kg, and a pH from 5 to 8, and wherein the aerosol ~~can achieve~~provides a maximum lung sputum concentration (Cmax) of at least 1200 mg/L and a lung sputum area under the curve (AUC) of at least 1500 h•mg/L.

2. The use of claim 1, wherein the solution consists essentially of levofloxacin or ofloxacin and the divalent or trivalent cation.

3. The use of claim 1, wherein the solution comprises no lactose.

4. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 1700 mg/L.

5. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 2000 mg/L.

6. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 3000 mg/L.

7. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 4000 mg/L.

8. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 1700 h•mg/L.

9. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 2000 h•mg/L.

10. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 3000 h•mg/L.

11. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 4000 h•mg/L.

~~12. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from about 50 mM to about 400 mM, and a levofloxacin or ofloxacin concentration from between about 50 mg/ml to about 200 mg/ml.~~

~~13. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from about 100 mM to about 300 mM, and a levofloxacin or ofloxacin concentration from between about 75 mg/ml to about 150 mg/ml.~~

12. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from ~~about~~ 150 mM to ~~about~~ 250 mM, and a levofloxacin or ofloxacin concentration from between ~~about~~ 90 mg/ml to ~~about~~ 125 mg/ml.

~~15. The use of claim 1, wherein the solution comprises an osmolality from about 300 mOsmol/kg to about 600 mOsmol/kg, and a pH from about 5 to about 8.~~

13. The use of claim 1, wherein the solution comprises an osmolality from ~~about~~ 350 mOsmol/kg to ~~about~~ 425 mOsmol/kg, and a pH from ~~about~~ 5 to ~~about~~ 6.5.

14. The use of claim 1, wherein the solution comprises a pH from ~~about~~ 5.5 to ~~about~~ 6.5.

15. The use of claim 1, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

16. The use of claim 1, wherein the solution comprises magnesium chloride.

17. The use of claim 1, wherein the solution comprises a levofloxacin or ofloxacin concentration between ~~about~~ 90 mg/ml to ~~about~~ 110 mg/ml, a magnesium chloride concentration between ~~about~~ 175 mM to ~~about~~ 225 mM, a pH between about 5 to about 7; an

osmolality of between ~~about~~ 300 mOsmol/kg to ~~about~~ 500 mOsmol/kg, and lacks lactose.

18. The use of claim 1, wherein the human has a pulmonary disorder selected from the group consisting of cystic fibrosis, chronic obstructive pulmonary disease, chronic bronchitis, bronchiectasis, and asthma.

19. The use of claim 1 , wherein the pulmonary infection comprises one or more bacteria selected from the group consisting of *Pseudomonas aeruginosa, Pseudomonas fluorescens, Pseudomonas acidovorans, Pseudomonas alcaligenes, Pseudomonas putida, Stenotrophomonas maltophilia, Aeromonas hydrophilia, Escherichia coli, Citrobacter freundii, Salmonella typhimurium, Salmonella typhi, Salmonella paratyphi, Salmonella enteritidis, Shigella dysenteriae, Shigella flexneri, Shigella sonnei, Enterobacter cloacae, Enterobacter aerogenes, Klebsiella pneumoniae, Klebsiella oxytoca, Serratia marcescens, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Providencia alcalifaciens, Providencia rettgeri, Providencia stuartii, Acinetobacter calcoaceticus, Acinetobacter haemolyticus, Yersinia enterocolitica, Yersinia pestis, Yersinia pseudotuberculosis, Yersinia intermedia, Bordetella pertussis, Bordetella parapertussis, Bordetella bronchiseptica, Haemophilus influenzae, Haemophilus parainfluenzae, Haemophilus haemolyticus, Haemophilus parahaemolyticus, Haemophilus ducreyi, Pasteurella multocida, Pasteurella haemolytica, Helicobacter pylori, Campylobacter fetus, Campylobacter jejuni, Campylobacter coli, Borrelia burgdorferi, Vibrio cholera, Vibrio parahaemolyticus, Legionella pneumophila, Listeria monocytogenes, Neisseria gonorrhoeae, Neisseria meningitidis, Burkholderia cepacia, Francisella tularensis, Kingella,* and *Moraxella*.

20. The use of claim 1, wherein the lung infection is caused by a gram-negative anaerobic bacteria.

21. The use of claim 1 , wherein the lung infection is caused by one or more of the bacteria selected from the group consisting of *Bacteroides fragilis, Bacteroides distasonis, Bacteroides* 3452A homology group, *Bacteroides vulgatus, Bacteroides ovalus, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides eggerthii,* and *Bacteroides splanchnicus*.

22. The use of claim 1, wherein the lung infection is caused by a gram-positive bacteria.

23. The use of claim 1 , wherein the lung infection is caused by one or more of the bacteria selected from the group consisting of *Corynebacterium diphtheriae, Corynebacterium ulcerans, Streptococcus pneumoniae, Streptococcus agalactiae, Streptococcus pyogenes, Streptococcus milleri; Streptococcus (Group G); Streptococcus (Group C/F); Enterococcus faecalis, Enterococcus faecium, Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus saprophyticus, Staphylococcus intermedius, Staphylococcus hyicus subsp. hyicus, Staphylococcus haemolyticus, Staphylococcus hominis,* and *Staphylococcus saccharolyticus*.

24. The use of claim 1, wherein the lung infection is caused by a gram-positive anaerobic bacteria.

25. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of *Clostridium difficile, Clostridium perfringens, Clostridium tetini,* and *Clostridium botulinum*.

26. The use of claim 1, wherein the lung infection is caused by an acid-fast bacteria.

27. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of *Mycobacterium tuberculosis, Mycobacterium avium, Mycobacterium intracellulare,* and *Mycobacterium leprae*.

28. The use of claim 1, wherein the lung infection is caused by an atypical bacteria.

29. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of *Chlamydia pneumoniae* and *Mycoplasma pneumoniae*.

30. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from ~~about~~ 2 microns to ~~about~~ 5 microns with a geometric standard deviation less than or equal to ~~about~~ 2.5 microns.

31. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from ~~about~~ 2.5 microns to ~~about~~ 4.5 microns with a geometric standard deviation less than or equal to ~~about~~ 1.8 microns.

32. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from ~~about~~ 2.8 microns to ~~about~~ 4.3 microns with a geometric standard deviation less than or equal to ~~about~~ 2 microns.

33. The use of claim 1, comprising producing the aerosol with a vibrating mesh nebulizer.

~~37. The use of claim 35, wherein the vibrating mesh nebulizer is a PARI E-FLOW® nebulizer.~~

34. The use of claim 1, wherein a respirable drug dose (RDD) of at least ~~about~~ 20 mg of levofloxacin or ofloxacin is administered to the lung.

35. The use of claim 1, wherein a respirable drug dose (RDD) of at least ~~about~~ 100 mg of levofloxacin or ofloxacin is administered to the lung.

36. The use of claim 1, wherein a respirable drug dose (RDD) of at least ~~about~~ 125 mg of levofloxacin or ofloxacin is administered to the lung.

37. The use of claim 1, wherein a respirable drug dose (RDD) of at least ~~about~~ 150 mg of levofloxacin or ofloxacin is administered to the lung.

38. The use of claim 1, wherein a loaded dose of at least ~~about~~ 100 mg is nebulized.

39. The use of claim 1, wherein a loaded dose of at least ~~about~~ 200 mg is nebulized.

40. The use of claim 1, wherein a loaded dose of at least ~~about~~ 300 mg is nebulized.

41. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 10 minutes.

42. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 5 minutes.

43. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 3 minutes.

44. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 2 minutes.

45. The use of claim 1, wherein an additional active agent selected from the group consisting of antibiotics, bronchodilators, anticholinergics, glucocorticoids, eicosanoids, ~~inhibitors,~~ CFTR modulators, ~~agents to restore airway surface liquid,~~ anti-inflammatory agents, and combinations thereof is adapted to be co-administrable.

46. The use of claim ~~49~~45, wherein the additional active agent is adapted to be co-administrable by inhalation.

47. The use of claim ~~49~~45, wherein the antibiotic is selected from the group consisting of tobramycin, aztreonam, ciprofloxacin, azithromycin, tetracycline, quinupristin, linezolid, vancomycin, and chloramphenicol, colisitin and combinations thereof.

48. The use of claim ~~49~~45, wherein the bronchodilator is selected from the group consisting of salbutamol, levosalbuterol, terbutaline, fenoterol, terbutlaine, pirbuterol, procaterol, bitolterol, rimiterol, carbuterol, tulobuterol, reproterol, salmeterol, formoterol, arformoterol, bambuterol, clenbuterol, indacterol, theophylline, roflumilast, cilomilast, and combinations thereof.

49. The use of claim ~~49~~45, wherein the anticholinergic is selected from the group consisting of ipratropium, tiotropium, and combinations thereof.

50. The use of claim ~~49~~45, wherein the glucocorticoid is selected from the group consisting of prednisone, fluticasone, budesonide, mometasone, ciclesonide, beclomethasone, and combinations thereof.

51. The use of claim ~~49~~45, wherein the CFTR modulator VX-770, atluren, VX-809, and combinations thereof.

52. The use of claim 1, ~~49,~~ wherein an additional agent ~~the agents to restore airway surface liquid is~~ selected from the group consisting of denufosol, mannitol, GS-9411, SPI-8811, and

combinations thereof is adapted to be co-administrable.

53. The use of claim ~~49~~45, wherein the anti-inflammatory agent is selected from the group consisting of ibuprofen, sildenafil, simavastatin, and combinations thereof.

54. The use of claim ~~49~~45, wherein the eicosanoid is selected from the group consisting of montelukast, pranlukast, zafirlukast, zileuton, ramatroban, seratrodast, and combinations thereof.

55. The use of claim 1, wherein the aerosol is adapted to be administrable once daily.

56. The use of claim 1, wherein the aerosol is adapted to be administrable twice daily.

57. Use of an aerosol of a solution ~~comprising levofloxacin or ofloxacin and a divalent or trivalent cation~~in the manufacture of a medicament for the treatment of a ~~for the preparation of an aerosol for treating~~ chronic lung infection in a human, wherein the solution comprises from ~~about~~ 75 mg/ml to ~~about~~ 150 mg/ml of levofloxacin or ofloxacin, from ~~about~~ 100 mM to ~~about~~ 300 mM of a divalent or trivalent cation, an osmolality from ~~about~~ 300 mOsmol/kg to ~~about~~ 500 mOsmol/kg, and a pH from about 5 to about 8.

58. The use of claim ~~61~~57, wherein the solution consists essentially of levofloxacin or ofloxacin and the divalent or trivalent cation.

59. The use of claim ~~61~~57, wherein the solution comprises no lactose.

60. The use of claim ~~61~~57, wherein the human has a pulmonary disorder selected from the group consisting of cystic fibrosis, chronic obstructive pulmonary disease, chronic bronchitis, bronchiectasis, pneumonia, and asthma.

61. The use of claim ~~61~~57, wherein the solution comprises a divalent or trivalent cation concentration from ~~about 50~~ 175 mM to ~~about 400~~ 225 mM, ~~and~~ a levofloxacin or ofloxacin concentration from between ~~about 50~~ 90 mg/ml to ~~about 200~~ 110 mg/ml, a pH from ~~about~~ 5 to ~~about~~ 7, and an osmolality from ~~about~~ 300 mOsmol/kg to ~~about~~ 500 mOsmol/kg, and lacks

lactose.

~~66. The use of claim 61, wherein the solution comprises a divalent or trivalent cation concentration from about 100 mM to about 300 mM, and a levofloxacin or ofloxacin concentration from between about 75 mg/ml to about 150 mg/ml.~~

62. The use of claim ~~61~~57, wherein the solution comprises a divalent or trivalent cation concentration from ~~about~~ 150 mM to ~~about~~ 250 mM, and a levofloxacin or ofloxacin concentration from between ~~about~~ 90 mg/ml to ~~about~~ 125 mg/ml.

~~68. The use of claim 61, wherein the solution comprises an osmolality from about 300 mOsmol/kg to about 600 mOsmol/kg, and a pH from about 5 to about 8.~~

63. The use of claim ~~61~~57, wherein the solution comprises an osmolality from ~~about~~ 350 mOsmol/kg to ~~about~~ 425 mOsmol/kg, and a pH from ~~about~~ 5 to ~~about~~ 6.5.

64. The use of claim ~~61~~57, wherein the solution comprises a pH from ~~about~~ 5.5 to ~~about~~ 6.5.

65. The use of claim ~~61~~57, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

66. The use of claim ~~61~~57, wherein the solution comprises magnesium chloride. ~~The method of claim 1 , wherein the solution comprises a levofloxacin or ofloxacin concentration between about 90 mg/ml to about 110 mg/ml, a magnesium chloride concentration between about 175 mM to about 225 mM, a pH between about 5 to about 7; an osmolality of between about 300 mOsmol/kg to about 500 mOsmol/kg, and lacks lactose.~~

67. The use of claim ~~61~~57, further comprising co-administering an additional active agent selected from the group consisting of antibiotics, bronchodilators, anticholinergics, glucocorticoids, eicosanoids, ~~inhibitors,~~ and combinations thereof.

68. The use of claim ~~73~~67, wherein co-administering comprises inhaling the additional active agent.

69. The use of claim ~~73~~67, wherein the antibiotic is selected from the group consisting of tobramycin, aztreonam, ciprofloxacin, azithromycin, tetracycline, quinupristin, linezolid, vancomycin, and chloramphenicol, colisitin and combinations thereof.

70. The use of claim ~~73~~67, wherein the bronchodilator is selected from the group consisting of salbutamol, levosalbuterol, terbutaline, fenoterol, terbutlaine, pirbuterol, procaterol, bitolterol, rimiterol, carbuterol, tulobuterol, reproterol, salmeterol, formoterol, arformoterol, bambuterol, clenbuterol, indacterol, theophylline, roflumilast, cilomilast, and combinations thereof.

71. The use of claim ~~73~~67, wherein the anticholinergic is selected from the group consisting of ipratropium, tiotropium, and combinations thereof.

72. The use of claim ~~73~~67, wherein the glucocorticoid is selected from the group consisting of prednisone, fluticasone, budesonide, mometasone, ciclesonide, beclomethasone, and combinations thereof.

73. The use of claim ~~73~~67, wherein the eicosanoid is selected from the group consisting of montelukast, pranlukast, zafirlukast, zileuton, ramatroban, seratrodast, and combinations thereof.

74. The use of claim ~~61~~57, comprising administering the aerosol once daily.

75. The use of claim ~~61~~57, comprising administering the aerosol twice daily.

76. A pharmaceutical composition, comprising an aqueous solution consisting essentially of from ~~about~~ 80 mg/ml to 120 mg/ml levofloxacin or ofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation, wherein the solution has a pH from 5 to 7 and an osmolality from 300 mOsmol/kg to ~~about~~ 500 mOsmol/kg.

77. The composition of claim ~~82~~76, wherein the solution consists essentially of from 80 mg/ml to 120 mg/ml levofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation.

78. The composition of claim ~~82~~76, wherein the solution consists essentially of from 90 mg/ml to 110 mg/ml levofloxacin and from 180 mM to 220 mM of a divalent or trivalent cation.

79. The composition of claim ~~82~~76, wherein the solution has a pH from 6.0 to 6.5 and an osmolality from 350 mOsmol/kg to 400 mOsmol/kg.

80. The composition of claim ~~82~~76, wherein the solution consists of 80 mg/ml to 120 mg/ml levofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation.

81. The composition of claim ~~82~~76, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

CLAIMS

1. Use of a solution comprising levofloxacin or ofloxacin and a divalent or trivalent cation for the preparation of an aerosol for treating a pulmonary infection, wherein the aerosol can achieve a maximum lung sputum concentration (C_{max}) of at least 1200 mg/L and a lung sputum area under the curve (AUC) of at least 1500 h-mg/L.

2. The use of claim 1, wherein the solution consists essentially of levofloxacin or ofloxacin and the divalent or trivalent cation.

3. The use of claim 1 , wherein the solution comprises no lactose.

4. The use of claim 1, comprising achieving a maximum lung sputum concentration (C_{max}) of at least 1700 mg/L.

5. The use of claim 1, comprising achieving a maximum lung sputum concentration (C_{max}) of at least 2000 mg/L.

6. The use of claim 1, comprising achieving a maximum lung sputum concentration (C_{max}) of at least 3000 mg/L.

7. The use of claim 1, comprising achieving a maximum lung sputum concentration (C_{max}) of at least 4000 mg/L.

8. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 1700 h-mg/L.

9. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 2000 h-mg/L.

10. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 3000 h-mg/L.

11. The use of claim 1 , comprising achieving a lung sputum area under the curve (AUC) of at least 4000 h-mg/L.

12. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from about 50 mM to about 400 mM, and a levofloxacin or ofloxacin concentration from between about 50 mg/ml to about 200 mg/ml.

13. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from about 100 mM to about 300 mM, and a levofloxacin or ofloxacin concentration from between about 75 mg/ml to about 150 mg/ml.

14. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from about 150 mM to about 250 mM, and a levofloxacin or ofloxacin concentration from between about 90 mg/ml to about 125 mg/ml.

15. The use of claim 1, wherein the solution comprises an osmolality from about 300 mOsmol/kg to about 600 mOsmol/kg, and a pH from about 5 to about 8.

16. The use of claim 1, wherein the solution comprises an osmolality from about 350 mOsmol/kg to about 425 mOsmol/kg, and a pH from about 5 to about 6.5.

17. The use of claim 1, wherein the solution comprises a pH from about 5.5 to about 6.5.

18. The use of claim 1, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

19. The use of claim 1 , wherein the solution comprises magnesium chloride.

20. The use of claim 1, wherein the solution comprises a levofloxacin or ofloxacin concentration between about 90 mg/ml to about 110 mg/ml, a magnesium chloride concentration between about 175 mM to about 225 mM, a pH between about 5 to about 7; an osmolarity of between about 300 mOsmol/kg to about 500 mOsmol/kg, and lacks lactose.

21. The use of claim 1, wherein the human has a pulmonary disorder selected from the group consisting of cystic fibrosis, chronic obstructive pulmonary disease, chronic bronchitis, bronchiectasis, and asthma.

22. The use of claim 1 , wherein the pulmonary infection comprises one or more bacteria selected from the group consisting of Pseudomonas aeruginosa, Pseudomonas fluorescens, Pseudomonas acidovorans, Pseudomonas alcaligenes, Pseudomonas putida, Stenotrophomonas maltophilia, Aeromonas hydrophilia, Escherichia coli, Citrobacter freundii, Salmonella typhimurium, Salmonella typhi, Salmonella paratyphi, Salmonella enteritidis, Shigella dysenteriae, Shigella flexneri, Shigella sonnei, Enterobacter cloacae, Enterobacter aerogenes, Klebsiella pneumoniae, Klebsiella oxytoca, Serratia marcescens, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Providencia alcalifaciens, Providencia rettgeri, Providencia stuartii, Acinetobacter calcoaceticus, Acinetobacter haemolyticus, Yersinia enterocolitica, Yersinia pestis, Yersinia pseudotuberculosis, Yersinia intermedia, Bordetella pertussis, Bordetella parapertussis, Bordetella bronchiseptica, Haemophilus influenzae, Haemophilus parainfluenzae, Haemophilus haemolyticus, Haemophilus parahaemolyticus, Haemophilus ducreyi, Pasteurella multocida, Pasteurella haemolytica, Helicobacter pylori, Campylobacter fetus, Campylobacter jejuni, Campylobacter coli, Borrelia burgdorferi, Vibrio cholera, Vibrio parahaemolyticus, Legionella pneumophila, Listeria monocytogenes, Neisseria gonorrhoeae, Neisseria meningitidis, Burkholderia cepacia, Francisella tularensis, Kingella, and Moraxella.

23. The use of claim 1, wherein the lung infection is caused by a gram-negative anaerobic bacteria.

24. The use of claim 1 , wherein the lung infection is caused by one or more of the bacteria selected from the group consisting of Bacteroides fragilis, Bacteroides distasonis, Bacteroides 3452A homology group, Bacteroides vulgatus, Bacteroides ovalus, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides eggerthii, and Bacteroides splanchnicus.

25. The use of claim 1, wherein the lung infection is caused by a gram-positive bacteria.

26. The use of claim 1 , wherein the lung infection is caused by one or more of the bacteria selected from the group consisting of Corynebacterium diphtheriae, Corynebacterium ulcerans, Streptococcus pneumoniae, Streptococcus agalactiae, Streptococcus pyogenes, Streptococcus milleri; Streptococcus (Group G); Streptococcus (Group C/F); Enterococcus faecalis, Enterococcus faecium, Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus saprophyticus, Staphylococcus intermedius, Staphylococcus hyicus subsp. hyicus, Staphylococcus haemolyticus, Staphylococcus hominis, and Staphylococcus saccharolyticus.

27. The use of claim 1, wherein the lung infection is caused by a gram-positive anaerobic bacteria.

28. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of Clostridium difficile, Clostridium perfringens, Clostridium tetini, and Clostridium botulinum.

29. The use of claim 1, wherein the lung infection is caused by an acid-fast bacteria.

30. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of Mycobacterium tuberculosis, Mycobacterium avium, Mycobacterium intracellular e, and Mycobacterium leprae.

31. The use of claim 1, wherein the lung infection is caused by an atypical bacteria.

32. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of Chlamydia pneumoniae and Mycoplasma pneumoniae.

33. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from about 2 microns to about 5 microns with a geometric standard deviation less than or equal to about 2.5 microns.

34. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from about 2.5 microns to about 4.5 microns with a geometric standard deviation less than or equal to about 1.8 microns.

35. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from about 2.8 microns to about 4.3 microns with a geometric standard deviation less than or equal to about 2 microns.

36. The use of claim 1, comprising producing the aerosol with a vibrating mesh nebulizer.

37. The use of claim 36, wherein the vibrating mesh nebulizer is a PARI E-FLOW® nebulizer.

38. The use of claim 1, wherein a respirable drug dose (RDD) of at least about 20 mg of levofloxacin or ofloxacin is administered to the lung.

39. The use of claim 1, wherein a respirable drug dose (RDD) of at least about 100 mg of levofloxacin or ofloxacin is administered to the lung.

40. The use of claim 1 , wherein a respirable drug dose (RDD) of at least about 125 mg of levofloxacin or ofloxacin is administered to the lung.

41. The use of claim 1, wherein a respirable drug dose (RDD) of at least about 150 mg of levofloxacin or ofloxacin is administered to the lung.

42. The use of claim 1, wherein a loaded dose of at least about 100 mg is nebulized

43. The use of claim 1, wherein a loaded dose of at least about 200 mg is nebulized

44. The use of claim 1, wherein a loaded dose of at least about 300 mg is nebulized

45. The use of claim 1, wherein the aerosol is administered to the lung in less than about 10 minutes.

46. The use of claim 1, wherein the aerosol is administered to the lung in less than about 5 minutes.

47. The use of claim 1, wherein the aerosol is administered to the lung in less than about 3 minutes.

48. The use of claim 1, wherein the aerosol is administered to the lung in less than about 2 minutes.

49. The use of claim 1, further comprising co-administering an additional active agent selected from the group consisting of antibiotics, bronchodilators, anticholinergics, glucocorticoids, eicosanoid inhibitors, CFTR modulators, agents to restore airway surface liquid, anti-inflammatory agents, and combinations thereof.

50. The use of claim 49, wherein co-administering comprises inhaling the additional active agent.

51. The use of claim 49, wherein the antibiotic is selected from the group consisting of tobramycin, aztreonam, ciprofloxacin, azithromycin, tetracycline, quinupristin, linezolid, vancomycin, and chloramphenicol, colisitin and combinations thereof.

52. The use of claim 49, wherein the bronchodilator is selected from the group consisting of salbutamol, levosalbuterol, terbutaline, fenoterol, terbutlaine, pirbuterol, procaterol, bitolterol, rimiterol, carbuterol, tulobuterol, reproterol, salmeterol, formoterol, arformoterol, bambuterol, clenbuterol, indacterol, theophylline, roflumilast, cilomilast, and combinations thereof.

53. The use of claim 49, wherein the anticholinergic is selected from the group consisting of ipratropium, tiotropium, and combinations thereof.

54. The use of claim 49, wherein the glucocorticoid is selected from the group consisting of prednisone, fluticasone, budesonide, mometasone, ciclesonide, beclomethasone, and combinations thereof.

55. The use of claim 49, wherein the CFTR modulator VX-770, atluren, VX-809, and combinations thereof.

56. The use of claim 49, wherein the agents to restore airway surface liquid is selected from the group consisting of denufosol, mannitol, GS-9411, SPI-8811, and combinations thereof.

57. The use of claim 49, wherein the anti-inflammatory agent is selected from the group consisting of ibuprofen, sildenafil, simavastatin, and combinations thereof.

58. The use of claim 49, wherein the eicosanoid is selected from the group consisting of montelukast, pranlukast, zafirlukast, zileuton, ramatroban, seratrodast, and combinations thereof.

59. The use of claim 1 , comprising administering the aerosol once daily.

60. The use of claim 1 , comprising administering the aerosol twice daily.

61. Use of a solution comprising levofloxacin or ofloxacin and a divalent or trivalent cation for the preparation of an aerosol for treating a chronic lung infection.

62. The use of claim 61, wherein the solution consists essentially of levofloxacin or ofloxacin and the divalent or trivalent cation.

63. The use of claim 61, wherein the solution comprises no lactose.

64. The use of claim 61, wherein the human has a pulmonary disorder selected from the group consisting of cystic fibrosis, chronic obstructive pulmonary disease, chronic bronchitis, bronchiectasis, pneumonia, and asthma.

65. The use of claim 61, wherein the solution comprises a divalent or trivalent cation concentration from about 50 mM to about 400 mM, and a levofloxacin or ofloxacin concentration from between about 50 mg/ml to about 200 mg/ml.

66. The use of claim 61, wherein the solution comprises a divalent or trivalent cation concentration from about 100 mM to about 300 mM, and a levofloxacin or ofloxacin concentration from between about 75 mg/ml to about 150 mg/ml.

67. The use of claim 61, wherein the solution comprises a divalent or trivalent cation concentration from about 150 mM to about 250 mM, and a levofloxacin or ofloxacin concentration from between about 90 mg/ml to about 125 mg/ml.

68. The use of claim 61, wherein the solution comprises an osmolality from about 300 mOsmol/kg to about 600 mOsmol/kg, and a pH from about 5 to about 8.

69. The use of claim 61, wherein the solution comprises an osmolality from about 350 mOsmol/kg to about 425 mOsmol/kg, and a pH from about 5 to about 6.5.

70. The use of claim 61, wherein the solution comprises a pH from about 5.5 to about 6.5.

71. The use of claim 61, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

72. The use of claim 61, wherein the solution comprises magnesium chloride. The method of claim 1 , wherein the solution comprises a levofloxacin or ofloxacin concentration between about 90 mg/ml to about 110 mg/ml, a magnesium chloride concentration between about 175 mM to about 225 mM, a pH between about 5 to about 7; an osmolarity of between about 300 mOsmol/kg to about 500 mOsmol/kg, and lacks lactose.

73. The use of claim 61, further comprising co-administering an additional active agent selected from the group consisting of antibiotics, bronchodilators, anticholinergics, glucocorticoids, eicosanoid inhibitors, and combinations thereof.

74. The use of claim 73, wherein co-administering comprises inhaling the additional active agent.

75. The use of claim 73, wherein the antibiotic is selected from the group consisting of tobramycin, aztreonam, ciprofloxacin, azithromycin, tetracycline, quinupristin, linezolid, vancomycin, and chloramphenicol, colisitin and combinations thereof.

76. The use of claim 73, wherein the bronchodilator is selected from the group consisting of salbutamol, levosalbuterol, terbutaline, fenoterol, terbutlaine, pirbuterol, procaterol, bitolterol, rimiterol, carbuterol, tulobuterol, reproterol, salmeterol, formoterol, arformoterol, bambuterol, clenbuterol, indacterol, theophylline, roflumilast, cilomilast, and combinations thereof.

77. The use of claim 73, wherein the anticholinergic is selected from the group consisting of ipratropium, tiotropium, and combinations thereof.

78. The use of claim 73, wherein the glucocorticoid is selected from the group consisting of prednisone, fluticasone, budesonide, mometasone, ciclesonide, beclomethasone, and combinations thereof.

79. The use of claim 73, wherein the eicosanoid is selected from the group consisting of montelukast, pranlukast, zafirlukast, zileuton, ramatroban, seratrodast, and combinations thereof.

80. The use of claim 61, comprising administering the aerosol once daily.

81. The use of claim 61, comprising administering the aerosol twice daily.

82. A pharmaceutical composition, comprising an aqueous solution consisting essentially of from 80 mg/ml to 120 mg/ml levofloxacin or ofloxacin and from 160 mM

to 240 mM of a divalent or trivalent cation, wherein the solution has a pH from 5 to 7 and an osmolality from 300 mOsmol/kg to 500 mOsmol/kg.

83. The composition of claim 82, wherein the solution consists essentially of from 80 mg/ml to 120 mg/ml levofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation.

84. The composition of claim 82, wherein the solution consists essentially of from 90 mg/ml to 110 mg/ml levofloxacin and from 180 mM to 220 mM of a divalent or trivalent cation.

85. The composition of claim 82, wherein the solution has a pH from 6.0 to 6.5 and an osmolality from 350 mOsmol/kg to 400 mOsmol/kg.

86. The composition of claim 82, wherein the solution consists of 80 mg/ml to 120 mg/ml levofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation.

87. The composition of claim 82, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

CLAIMS

1. Use of an aerosol of a solution in the manufacture of a medicament for the treatment of a pulmonary infection in a human, wherein the solution comprises from 75 mg/ml to 150 mg/ml of levofloxacin or ofloxacin, from 100 mM to 300 mM of a divalent or trivalent cation, an osmolality from 300 mOsmol/kg to 500 mOsmol/kg, and a pH from 5 to 8, and wherein the aerosol provides a maximum lung sputum concentration (Cmax) of at least 1200 mg/L and a lung sputum area under the curve (AUC) of at least 1500 h•mg/L.

2. The use of claim 1, wherein the solution consists essentially of levofloxacin or ofloxacin and the divalent or trivalent cation.

3. The use of claim 1, wherein the solution comprises no lactose.

4. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 1700 mg/L.

5. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 2000 mg/L.

6. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 3000 mg/L.

7. The use of claim 1, comprising achieving a maximum lung sputum concentration (Cmax) of at least 4000 mg/L.

8. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 1700 h•mg/L.

9. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 2000 h•mg/L.

10. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 3000 h•mg/L.

11. The use of claim 1, comprising achieving a lung sputum area under the curve (AUC) of at least 4000 h•mg/L.

12. The use of claim 1, wherein the solution comprises a divalent or trivalent cation concentration from 150 mM to 250 mM, and a levofloxacin or ofloxacin concentration from between 90 mg/ml to 125 mg/ml.

13. The use of claim 1, wherein the solution comprises an osmolality from 350 mOsmol/kg to 425 mOsmol/kg, and a pH from 5 to 6.5.

14. The use of claim 1, wherein the solution comprises a pH from 5.5 to 6.5.

15. The use of claim 1, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

16. The use of claim 1, wherein the solution comprises magnesium chloride.

17. The use of claim 1, wherein the solution comprises a levofloxacin or ofloxacin concentration between 90 mg/ml to 110 mg/ml, a magnesium chloride concentration between 175 mM to 225 mM, a pH between about 5 to about 7; an osmolality of between 300 mOsmol/kg to 500 mOsmol/kg, and lacks lactose.

18. The use of claim 1, wherein the human has a pulmonary disorder selected from the group consisting of cystic fibrosis, chronic obstructive pulmonary disease, chronic bronchitis, bronchiectasis, and asthma.

19. The use of claim 1 , wherein the pulmonary infection comprises one or more bacteria selected from the group consisting of *Pseudomonas aeruginosa, Pseudomonas fluorescens, Pseudomonas acidovorans, Pseudomonas alcaligenes, Pseudomonas putida, Stenotrophomonas maltophilia, Aeromonas hydrophilia, Escherichia coli, Citrobacter freundii, Salmonella typhimurium, Salmonella typhi, Salmonella paratyphi, Salmonella enteritidis, Shigella dysenteriae, Shigella flexneri, Shigella sonnei, Enterobacter cloacae, Enterobacter aerogenes, Klebsiella pneumoniae, Klebsiella oxytoca, Serratia marcescens, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Providencia alcalifaciens, Providencia rettgeri, Providencia stuartii,*

Acinetobacter calcoaceticus, Acinetobacter haemolyticus, Yersinia enterocolitica, Yersinia pestis, Yersinia pseudotuberculosis, Yersinia intermedia, Bordetella pertussis, Bordetella parapertussis, Bordetella bronchiseptica, Haemophilus influenzae, Haemophilus parainfluenzae, Haemophilus haemolyticus, Haemophilus parahaemolyticus, Haemophilus ducreyi, Pasteurella multocida, Pasteurella haemolytica, Helicobacter pylori, Campylobacter fetus, Campylobacter jejuni, Campylobacter coli, Borrelia burgdorferi, Vibrio cholera, Vibrio parahaemolyticus, Legionella pneumophila, Listeria monocytogenes, Neisseria gonorrhoeae, Neisseria meningitidis, Burkholderia cepacia, Francisella tularensis, Kingella, and *Moraxella*.

20. The use of claim 1, wherein the lung infection is caused by a gram-negative anaerobic bacteria.

21. The use of claim 1 , wherein the lung infection is caused by one or more of the bacteria selected from the group consisting of *Bacteroides fragilis, Bacteroides distasonis, Bacteroides* 3452A homology group, *Bacteroides vulgatus, Bacteroides ovalus, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides eggerthii,* and *Bacteroides splanchnicus*.

22. The use of claim 1, wherein the lung infection is caused by a gram-positive bacteria.

23. The use of claim 1 , wherein the lung infection is caused by one or more of the bacteria selected from the group consisting of *Corynebacterium diphtheriae, Corynebacterium ulcerans, Streptococcus pneumoniae, Streptococcus agalactiae, Streptococcus pyogenes, Streptococcus milleri; Streptococcus (Group G); Streptococcus (Group C/F); Enterococcus faecalis, Enterococcus faecium, Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus saprophyticus, Staphylococcus intermedius, Staphylococcus hyicus subsp. hyicus, Staphylococcus haemolyticus, Staphylococcus hominis,* and *Staphylococcus saccharolyticus*.

24. The use of claim 1, wherein the lung infection is caused by a gram-positive anaerobic bacteria.

25. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of *Clostridium difficile, Clostridium perfringens, Clostridium*

tetini, and *Clostridium botulinum*.

26. The use of claim 1, wherein the lung infection is caused by an acid-fast bacteria.

27. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of *Mycobacterium tuberculosis, Mycobacterium avium, Mycobacterium intracellulare,* and *Mycobacterium leprae*.

28. The use of claim 1, wherein the lung infection is caused by an atypical bacteria.

29. The use of claim 1, wherein the lung infection is caused by one or more bacteria selected from the group consisting of *Chlamydia pneumoniae* and *Mycoplasma pneumoniae*.

30. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from 2 microns to 5 microns with a geometric standard deviation less than or equal to 2.5 microns.

31. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from 2.5 microns to 4.5 microns with a geometric standard deviation less than or equal to 1.8 microns.

32. The use of claim 1, wherein the aerosol comprises a mass median aerodynamic diameter from 2.8 microns to 4.3 microns with a geometric standard deviation less than or equal to 2 microns.

33. The use of claim 1, comprising producing the aerosol with a vibrating mesh nebulizer.

34. The use of claim 1, wherein a respirable drug dose (RDD) of at least 20 mg of levofloxacin or ofloxacin is administered to the lung.

35. The use of claim 1, wherein a respirable drug dose (RDD) of at least 100 mg of levofloxacin or ofloxacin is administered to the lung.

36. The use of claim 1, wherein a respirable drug dose (RDD) of at least 125 mg of levofloxacin or ofloxacin is administered to the lung.

37. The use of claim 1, wherein a respirable drug dose (RDD) of at least 150 mg of levofloxacin or ofloxacin is administered to the lung.

38. The use of claim 1, wherein a loaded dose of at least 100 mg is nebulized.

39. The use of claim 1, wherein a loaded dose of at least 200 mg is nebulized.

40. The use of claim 1, wherein a loaded dose of at least 300 mg is nebulized.

41. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 10 minutes.

42. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 5 minutes.

43. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 3 minutes.

44. The use of claim 1, wherein the aerosol is adapted to be administrable to the lung in less than about 2 minutes.

45. The use of claim 1, wherein an additional active agent selected from the group consisting of antibiotics, bronchodilators, anticholinergics, glucocorticoids, eicosanoids, CFTR modulators, anti-inflammatory agents, and combinations thereof is adapted to be co-administrable.

46. The use of claim 45, wherein the additional active agent is adapted to be co-administrable by inhalation.

47. The use of claim 45, wherein the antibiotic is selected from the group consisting of tobramycin, aztreonam, ciprofloxacin, azithromycin, tetracycline, quinupristin, linezolid, vancomycin, and chloramphenicol, colisitin and combinations thereof.

48. The use of claim 45, wherein the bronchodilator is selected from the group consisting of

salbutamol, levosalbuterol, terbutaline, fenoterol, terbutlaine, pirbuterol, procaterol, bitolterol, rimiterol, carbuterol, tulobuterol, reproterol, salmeterol, formoterol, arformoterol, bambuterol, clenbuterol, indacterol, theophylline, roflumilast, cilomilast, and combinations thereof.

49. The use of claim 45, wherein the anticholinergic is selected from the group consisting of ipratropium, tiotropium, and combinations thereof.

50. The use of claim 45, wherein the glucocorticoid is selected from the group consisting of prednisone, fluticasone, budesonide, mometasone, ciclesonide, beclomethasone, and combinations thereof.

51. The use of claim 45, wherein the CFTR modulator VX-770, atluren, VX-809, and combinations thereof.

52. The use of claim 1, wherein an additional agent selected from the group consisting of denufosol, mannitol, GS-9411, SPI-8811, and combinations thereof is adapted to be co-administrable.

53. The use of claim 45, wherein the anti-inflammatory agent is selected from the group consisting of ibuprofen, sildenafil, simavastatin, and combinations thereof.

54. The use of claim 45, wherein the eicosanoid is selected from the group consisting of montelukast, pranlukast, zafirlukast, zileuton, ramatroban, seratrodast, and combinations thereof.

55. The use of claim 1, wherein the aerosol is adapted to be administrable once daily.

56. The use of claim 1, wherein the aerosol is adapted to be administrable twice daily.

57. Use of an aerosol of a solution in the manufacture of a medicament for the treatment of a chronic lung infection in a human, wherein the solution comprises from 75 mg/ml to 150 mg/ml of levofloxacin or ofloxacin, from 100 mM to 300 mM of a divalent or trivalent cation, an osmolality from 300 mOsmol/kg to 500 mOsmol/kg, and a pH from about 5 to about 8.

58. The use of claim 57, wherein the solution consists essentially of levofloxacin or ofloxacin and the divalent or trivalent cation.

59. The use of claim 57, wherein the solution comprises no lactose.

60. The use of claim 57, wherein the human has a pulmonary disorder selected from the group consisting of cystic fibrosis, chronic obstructive pulmonary disease, chronic bronchitis, bronchiectasis, pneumonia, and asthma.

61. The use of claim 57, wherein the solution comprises a divalent or trivalent cation concentration from 175 mM to 225 mM, a levofloxacin or ofloxacin concentration from between 90 mg/ml to 110 mg/ml, a pH from 5 to 7, and an osmolality from 300 mOsmol/kg to 500 mOsmol/kg, and lacks lactose.

62. The use of claim 57, wherein the solution comprises a divalent or trivalent cation concentration from 150 mM to 250 mM, and a levofloxacin or ofloxacin concentration from between 90 mg/ml to 125 mg/ml.

63. The use of claim 57, wherein the solution comprises an osmolality from 350 mOsmol/kg to 425 mOsmol/kg, and a pH from 5 to 6.5.

64. The use of claim 57, wherein the solution comprises a pH from 5.5 to 6.5.

65. The use of claim 57, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.

66. The use of claim 57, wherein the solution comprises magnesium chloride.

67. The use of claim 57, further comprising co-administering an additional active agent selected from the group consisting of antibiotics, bronchodilators, anticholinergics, glucocorticoids, eicosanoids, and combinations thereof.

68. The use of claim 67, wherein co-administering comprises inhaling the additional active agent.

69. The use of claim 67, wherein the antibiotic is selected from the group consisting of tobramycin, aztreonam, ciprofloxacin, azithromycin, tetracycline, quinupristin, linezolid, vancomycin, and chloramphenicol, colisitin and combinations thereof.

70. The use of claim 67, wherein the bronchodilator is selected from the group consisting of salbutamol, levosalbuterol, terbutaline, fenoterol, terbutlaine, pirbuterol, procaterol, bitolterol, rimiterol, carbuterol, tulobuterol, reproterol, salmeterol, formoterol, arformoterol, bambuterol, clenbuterol, indacterol, theophylline, roflumilast, cilomilast, and combinations thereof.

71. The use of claim 67, wherein the anticholinergic is selected from the group consisting of ipratropium, tiotropium, and combinations thereof.

72. The use of claim 67, wherein the glucocorticoid is selected from the group consisting of prednisone, fluticasone, budesonide, mometasone, ciclesonide, beclomethasone, and combinations thereof.

73. The use of claim 67, wherein the eicosanoid is selected from the group consisting of montelukast, pranlukast, zafirlukast, zileuton, ramatroban, seratrodast, and combinations thereof.

74. The use of claim 57, comprising administering the aerosol once daily.

75. The use of claim 57, comprising administering the aerosol twice daily.

76. A pharmaceutical composition, comprising an aqueous solution consisting essentially of from 80 mg/ml to 120 mg/ml levofloxacin or ofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation, wherein the solution has a pH from 5 to 7 and an osmolality from 300 mOsmol/kg to 500 mOsmol/kg.

77. The composition of claim 76, wherein the solution consists essentially of from 80 mg/ml to 120 mg/ml levofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation.

78. The composition of claim 76, wherein the solution consists essentially of from 90 mg/ml

to 110 mg/ml levofloxacin and from 180 mM to 220 mM of a divalent or trivalent cation.

79. The composition of claim 76, wherein the solution has a pH from 6.0 to 6.5 and an osmolality from 350 mOsmol/kg to 400 mOsmol/kg.

80. The composition of claim 76, wherein the solution consists of 80 mg/ml to 120 mg/ml levofloxacin and from 160 mM to 240 mM of a divalent or trivalent cation.

81. The composition of claim 76, wherein the divalent or trivalent cation is selected from magnesium, calcium, zinc, copper, aluminum, and iron.