

CLAIMS

1. A method of stabilizing nucleic acid contained in a biological sample at ambient temperature comprising the steps of:
 - a) obtaining a biological sample;
 - b) contacting the biological sample with an aqueous composition comprising a chelating agent, wherein the chelating agent is present at a concentration of at least about 150 mM, and wherein the composition has a pH of at least 9.5, to form a mixture;
 - c) homogenizing the mixture of (b) to form a homogeneous mixture; and
 - d) storing the homogeneous mixture at ambient temperature.
2. The method of claim 1, wherein the nucleic acid is deoxyribonucleic acid (DNA).
3. The method of claim 1 or 2, wherein the biological sample is selected from a fecal sample, a soil sample, a sewage sample, a wastewater sample, or a water sample.
4. The method of any one of claims 1-3, wherein the biological sample is a fecal sample obtained from a mammal.
5. The method of claim 4, wherein the mammal is a human.
6. The method of any one of claims 1-5, wherein the chelating agent is selected from 1,2-cyclohexanediamine tetraacetic acid (CDTA), diethylenetriamine pentaacetic acid (DTPA), tetraazacyclododecanetetraacetic acid (DOTA), tetraazacyclotetradecanetetraacetic acid (TETA), desferioximine, or chelator analogs thereof.
7. The method of claim 6, wherein the chelating agent is CDTA.
8. The method of any one of claims 1-7, wherein the concentration of the chelating agent is from about 150 mM to about 500 mM, or from about 250 mM to about 350 mM.
9. The method of claim 8, wherein the concentration of the chelating agent is about 300 mM.

10. The method of any one of claims 1-9, wherein the composition has a pH of from 9.5 to 11.5, or from 10.5 to 11.5.
11. The method of claim 10, wherein the composition has a pH of 11.
12. The method of any one of claims 1-11, wherein the composition further comprises at least one buffering agent capable of buffering in the pH range 9.5 to 11.5.
13. The method of claim 12, wherein the buffering agent is beta-alanine.
14. The method of any one of claims 1-13, wherein the composition further comprises a water-soluble organic solvent, such as a C₁-C₆ alkanol.
15. The method of claim 14, wherein the water-soluble organic solvent is ethanol.
16. The method of claim 15, wherein the ethanol is present in the composition at a concentration of less than about 30% by volume.
17. The method of claim 16, wherein the ethanol is present in the composition at a concentration of less than about 24% by volume.
18. The method of any one of claims 1-17, wherein the composition further comprises a detergent, such as sodium dodecylsulfate.
19. The method of any one of claims 1-18, wherein the composition further comprises an antifoaming agent, such as Antifoam A.
20. The method of any one of claims 1-19, wherein the mixture is homogenized using a homogenization means.
21. The method of claim 20, wherein the homogenization means is at least one mixing ball.
22. The method of claim 21, wherein the method comprises forming the mixture of the biological sample and the composition in a sample container containing the at least one mixing ball, sealing the sample container, and homogenizing the mixture by shaking the mixture in the presence of the at least one mixing ball.
23. The method of claim 22, wherein the shaking is done by hand.
24. The method of any one of claims 21-23, wherein the at least one mixing ball is a stainless steel mixing ball or a tungsten carbide mixing ball.

25. The method of claim 24, wherein the at least one mixing ball is a stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³.
26. The method of claim 25, wherein the stainless steel mixing ball has a diameter of about 7.1 – 8.7 mm and the sample container is a round-bottom tube having an internal diameter of about 12.9 mm.
27. The method of any one of claims 5-26, wherein the nucleic acid is human DNA.
28. The method of claim 27, wherein the method renders the human DNA stable for:
- at least 7 days, at least 14 days, at least 30 days, or at least 60 days at room temperature;
- at least 7 days, or at least 14 days at a temperature of from about 37°C to about 50°C; and/or
- at least 30 days at -20°C.
29. The method of any one of claims 3-26, wherein the nucleic acid is microbial DNA and the method stabilizes a microbiome profile of the biological sample.
30. The method of claim 29, wherein the method renders the microbiome profile of the biological sample stable for
- at least 7 days, at least 14 days, at least 30 days, or at least 60 days at room temperature;
- at least 7 days, or at least 14 days at a temperature of from about 37°C to about 50°C; and/or
- at least 30 days at -20°C.
31. An aqueous composition for stabilizing nucleic acid contained in a biological sample at ambient temperature, comprising a chelating agent wherein the chelating agent is present at a concentration of at least about 150 mM, wherein the composition has a pH of at least 9.5.
32. The composition of claim 31, wherein the nucleic acid is deoxyribonucleic acid (DNA).

33. The composition of claim 31 or 32, wherein the biological sample is selected from a fecal sample, a soil sample, a sewage sample, a wastewater sample, or a water sample.
34. The composition of any one of claims 31-33, wherein the biological sample is a fecal sample obtained from a mammal.
35. The composition of claim 34, wherein the mammal is a human.
36. The composition of any one of claims 31-35, wherein the chelating agent is selected from CDTA, DTPA, DOTA, TETA, desferioximine, or chelator analogs thereof.
37. The composition of claim 36, wherein the chelating agent is CDTA.
38. The composition of any one of claims 31-37, wherein the concentration of the chelating agent is from about 150 mM to about 500 mM, or from about 250 mM to about 350 mM.
39. The composition of claim 38, wherein the concentration of the chelating agent is about 300 mM.
40. The composition of any one of claims 31-39, wherein the composition has a pH of from 9.5 to 11.5, or from 10.5 to 11.5.
41. The composition of claim 40, wherein the composition has a pH of 11.
42. The composition of any one of claims 31-41, wherein the composition further comprises at least one buffering agent capable of buffering in the pH range 9.5 to 11.5.
43. The composition of claim 42, wherein the buffering agent is beta-alanine.
44. The composition of any one of claims 31-43, wherein the composition further comprises a water-soluble organic solvent, such as a C₁-C₆ alkanol.
45. The composition of claim 44, wherein the water-soluble organic solvent is ethanol.
46. The composition of claim 45, wherein the ethanol is present in the composition at a concentration of less than about 30% by volume.
47. The composition of claim 46, wherein the ethanol is present in the composition at a concentration of less than about 24% by volume.

48. The composition of any one of claims 31-47, wherein the composition further comprises a detergent, such as sodium dodecylsulfate.
49. The composition of any one of claims 31-48, wherein the composition further comprises an antifoaming agent, such as Antifoam A.
50. The composition of any one of claims 35-49, wherein the nucleic acid is human DNA.
51. The composition of any one of claims 33-49, wherein the nucleic acid is microbial DNA and the composition is for stabilizing a microbiome profile of the biological sample.
52. A kit for stabilizing nucleic acid contained in a biological sample at ambient temperature, the kit comprising:
- a) a sample container having a resealable closure;
 - b) an aqueous composition comprising a chelating agent wherein the chelating agent is present at a concentration of at least about 150 mM, wherein the composition has a pH of at least 9.5, wherein said composition is optionally contained within the sample container;
 - c) a homogenization means, optionally contained within the sample container;
 - d) a means to transfer the biological sample, or a portion thereof, into the sample container; and
 - d) instructions for use.
53. The kit of claim 52, wherein the nucleic acid is deoxyribonucleic acid (DNA).
54. The kit of claim 52 or 53, wherein the biological sample is selected from a fecal sample, a soil sample, a sewage sample, a wastewater sample, or a water sample.
55. The kit of any one of claims 52-54, wherein the biological sample is a fecal sample obtained from a mammal.
56. The kit of claim 55, wherein the mammal is a human.
57. The kit of any one of claims 52-56, wherein the chelating agent is selected from CDTA, DTPA, DOTA, TETA, desferioximine, or chelator analogs thereof.
58. The kit of claim 57, wherein the chelating agent is CDTA.

59. The kit of any one of claims 52-58, wherein the concentration of the chelating agent is from about 150 mM to about 500 mM, or from about 250 mM to about 350 mM.
60. The kit of claim 59, wherein the concentration of the chelating agent is about 300 mM.
61. The kit of any one of claims 52-60, wherein the composition has a pH of from 9.5 to 11.5, or from 10.5 to 11.5.
62. The kit of claim 61, wherein the composition has a pH of 11.
63. The kit of any one of claims 52-62, wherein the composition further comprises at least one buffering agent capable of buffering in the pH range 9.5 to 11.5.
64. The kit of claim 63, wherein the buffering agent is beta-alanine.
65. The kit of any one of claims 52-64, wherein the composition further comprises a water-soluble organic solvent, such as a C₁-C₆ alkanol.
66. The kit of claim 65, wherein the water-soluble organic solvent is ethanol.
67. The kit of claim 66, wherein the ethanol is present in the composition at a concentration of less than about 30% by volume.
68. The kit of claim 67, wherein the ethanol is present in the composition at a concentration of less than about 24% by volume.
69. The kit of any one of claims 52-68, wherein the composition further comprises a detergent, such as sodium dodecylsulfate.
70. The kit of any one of claims 52-69, wherein the composition further comprises an antifoaming agent, such as Antifoam A.
71. The kit of any one of claims 56-70, wherein the nucleic acid is human DNA.
72. The kit of any one of claims 54-70, wherein the nucleic acid is microbial DNA and the kit is for stabilizing a microbiome profile of the biological sample.
73. The kit of any one of claims 52-72, wherein the homogenization means is at least one mixing ball.

74. The kit of claim 73, wherein the at least one mixing ball is a stainless steel mixing ball or a tungsten carbide mixing ball.

75. The kit of claim 74, wherein the at least one mixing ball is a stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³.

76. The kit of claim 75, wherein the stainless steel mixing ball has a diameter of about 7.1 – 8.7 mm and the sample container is a round-bottom tube having an internal diameter of about 12.9 mm.

77. The method of claim 1, wherein the nucleic acid is DNA, the biological sample is a fecal sample obtained from a mammal, the composition has a pH of from 10.5 to 11.5, and the composition comprises, consists essentially of, or consists of:

CDTA in an amount of from about 250 mM to about 350 mM;

β-alanine in an amount of from about 30 mM to about 70 mM;

ethanol in an amount of from about 21.5% to about 23.5% by volume;

sodium dodecyl sulfate in an amount of from about 0 to about 1% (w/v); and

Antifoam A in an amount of from about 0 to about 0.2% (v/v).

78. The method of claim 77, wherein the composition has a pH of 11, and comprises, consists essentially of, or consists of.

CDTA in an amount of about 300 mM;

β-alanine in an amount of about 50 mM;

ethanol in an amount of about 23.5% by volume;

sodium dodecyl sulfate in an amount of about 0.5% (w/v); and

Antifoam A in an amount of about 0.1% (v/v).

79. The method of claim 77 or 78, wherein the method comprises forming the mixture of the fecal sample and the composition in a round-bottom tube having an internal diameter of about 12.9 mm and containing at least one stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³, sealing the round-bottom tube,

and homogenizing the mixture by shaking the mixture by hand in the presence of the at least one stainless steel mixing ball.

80. The method of claim 79, wherein the nucleic acid is microbial DNA and the method stabilizes a microbiome profile of the fecal sample, wherein the microbiome profile of the fecal sample is rendered stable for:

at least 7 days, at least 14 days, at least 30 days, or at least 60 days at room temperature;

at least 7 days, or at least 14 days at a temperature of from about 37°C to about 50°C; and/or

at least 30 days at -20°C.

81. The composition of claim 31, wherein the nucleic acid is DNA, the biological sample is a fecal sample obtained from a mammal, the composition has a pH of from 10.5 to 11.5, and the composition comprises, consists essentially of, or consists of:

CDTA in an amount of from about 250 mM to about 350 mM;

β-alanine in an amount of from about 30 mM to about 70 mM;

ethanol in an amount of from about 21.5% to about 23.5% by volume;

sodium dodecyl sulfate in an amount of from about 0 to about 1% (w/v); and

Antifoam A in an amount of from about 0 to about 0.2% (v/v).

82. The composition of claim 81, wherein the composition has a pH of 11, and comprises, consists essentially of, or consists of:

CDTA in an amount of about 300 mM;

β-alanine in an amount of about 50 mM;

ethanol in an amount of about 23.5% by volume;

sodium dodecyl sulfate in an amount of about 0.5% (w/v); and

Antifoam A in an amount of about 0.1% (v/v).

83. The composition of claim 81 or 82, wherein the composition is for stabilizing a microbiome profile of the fecal sample.

84. The kit of claim 52, wherein the nucleic acid is DNA, the biological sample is a fecal sample obtained from a mammal, the composition has a pH of from 10.5 to 11.5, and the composition comprises, consists essentially of, or consists of:

CDTA in an amount of from about 250 mM to about 350 mM;

β -alanine in an amount of from about 30 mM to about 70 mM;

ethanol in an amount of from about 21.5% to about 23.5% by volume;

sodium dodecyl sulfate in an amount of from about 0 to about 1% (w/v); and

Antifoam A in an amount of from about 0 to about 0.2% (v/v).

85. The kit of claim 84, wherein the composition has a pH of 11, and comprises, consists essentially of, or consists of:

CDTA in an amount of about 300 mM;

β -alanine in an amount of about 50 mM;

ethanol in an amount of about 23.5% by volume;

sodium dodecyl sulfate in an amount of about 0.5% (w/v); and

Antifoam A in an amount of about 0.1% (v/v).

86. The kit of claim 85, wherein the nucleic acid is microbial DNA and the kit is for stabilizing a microbiome profile of the biological sample.

87. The kit of claim 86, wherein the homogenization means is at least one stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³, and the sample container is a round-bottom tube having an internal diameter of about 12.9 mm.

CLAIMS

1. A method of stabilizing nucleic acid contained in a biological sample at ambient temperature comprising the steps of:

a) contacting a biological sample, such as a fecal sample, a soil sample, a sewage sample, a wastewater sample, or a water sample, with an aqueous composition comprising a chelating agent, wherein the chelating agent is present at a concentration of at least about 150 mM, and wherein the composition has a pH of at least 9.5, to form a mixture;

b) homogenizing the mixture of (a) to form a homogeneous mixture; and

c) storing the homogeneous mixture at ambient temperature.

2. The method of claim 1, wherein the chelating agent is selected from 1,2-cyclohexanediamine tetraacetic acid (CDTA), diethylenetriamine pentaacetic acid (DTPA), tetraazacyclododecanetetraacetic acid (DOTA), tetraazacyclotetradecanetetraacetic acid (TETA), desferioximine, or chelator analogs thereof.

3. The method of claim 1 or 2, wherein the nucleic acid is deoxyribonucleic acid (DNA).

4. The method of any one of claims 1-3, wherein the biological sample is a fecal sample obtained from a vertebrate, preferably a mammal, such as a human.

5. The method of any one of claims 1-4, wherein:

(a) the chelating agent is CDTA;

(b) the concentration of the chelating agent is from about 150 mM to about 500 mM, or from about 250 mM to about 350 mM, or about 300 mM;

(c) the composition has a pH of from 9.5 to 11.5, or from 10.5 to 11.5, or 11;

(d) the composition further comprises at least one buffering agent, such as beta-alanine, capable of buffering in the pH range 9.5 to 11.5;

(e) the composition further comprises a water-soluble organic solvent, such as a C₁-C₆ alkanol; preferably, wherein the water-soluble organic solvent is ethanol; wherein the ethanol is optionally present in the composition at a concentration of less than about 30% by volume, or less than about 24% by volume;

(f) the composition further comprises a detergent, such as sodium dodecylsulfate; and/or

(g) the composition further comprises an antifoaming agent, such as Antifoam A.

6. The method of any one of claims 1-5, wherein the mixture is homogenized using a homogenization means, such as at least one mixing ball; wherein when the homogenization means is at least one mixing ball, the method comprises forming the mixture of the biological sample and the composition in a sample container containing the at least one mixing ball, sealing the sample container, and homogenizing the mixture by shaking the mixture in the presence of the at least one mixing ball, wherein the shaking is optionally done by hand; optionally, wherein

(a) the at least one mixing ball is a stainless steel mixing ball or a tungsten carbide mixing ball;

(b) the at least one mixing ball is a stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³; or

(c) the at least one mixing ball is a stainless steel mixing ball having a diameter of about 7.1 - 8.7 mm and a density of at least about 7.6 g/cm³ and the sample container is a round-bottom tube having an internal diameter of about 12.9 mm.

7. The method of any one of claims 1-6, wherein

(a) the biological sample is a fecal sample obtained from a human, and the nucleic acid is human DNA; optionally, wherein the method renders the human DNA stable for:

at least 7 days, at least 14 days, at least 30 days, or at least 60 days at room temperature;

at least 7 days, or at least 14 days at a temperature of from about 37°C to about 50°C; and/or

at least 30 days at -20°C; or

(b) the nucleic acid is microbial DNA and the method stabilizes a microbiome profile of the biological sample; optionally, wherein the method renders the microbiome profile of the biological sample stable for

at least 7 days, at least 14 days, at least 30 days, or at least 60 days at room temperature;

at least 7 days, or at least 14 days at a temperature of from about 37°C to about 50°C; and/or

at least 30 days at -20°C.

8. An aqueous composition for stabilizing nucleic acid contained in a biological sample, such as a fecal sample, a soil sample, a sewage sample, a wastewater sample, or a water sample, at ambient temperature, comprising a chelating agent wherein the chelating agent is present at a concentration of at least about 150 mM, and wherein the composition has a pH of at least 9.5.

9. The composition of claim 8, wherein the chelating agent is selected from CDTA, DTPA, DOTA, TETA, desferioximine, or chelator analogs thereof.

10. The composition of claim 8 or 9, wherein the nucleic acid is deoxyribonucleic acid (DNA).

11. The composition of any one of claims 8-10, wherein the biological sample is a fecal sample obtained from a vertebrate, preferably a mammal, such as a human.

12. The composition of any one of claims 8-11, wherein:

(a) the chelating agent is CDTA;

(b) the concentration of the chelating agent is from about 150 mM to about 500 mM, or from about 250 mM to about 350 mM, or about 300 mM;

(c) the composition has a pH of from 9.5 to 11.5, or from 10.5 to 11.5, or 11;

(d) the composition further comprises at least one buffering agent, such as beta-alanine, capable of buffering in the pH range 9.5 to 11.5;

(e) the composition further comprises a water-soluble organic solvent, such as a C₁-C₆ alkanol; preferably, wherein the water-soluble organic solvent is ethanol; wherein the ethanol is optionally present in the composition at a concentration of less than about 30% by volume, or less than about 24% by volume;

(f) the composition further comprises a detergent, such as sodium dodecylsulfate; and/or

(g) the composition further comprises an antifoaming agent, such as Antifoam A.

13. The composition of any one of claims 8-12, wherein the biological sample is a fecal sample obtained from a human, and the nucleic acid is human DNA; or the nucleic acid is microbial DNA and the composition is for stabilizing a microbiome profile of the biological sample.

14. A kit for stabilizing nucleic acid contained in a biological sample, such as a fecal sample, a soil sample, a sewage sample, a wastewater sample, or a water sample, at ambient temperature, the kit comprising:

a) a sample container having a resealable closure;

b) an aqueous composition comprising a chelating agent wherein the chelating agent is present at a concentration of at least about 150 mM, wherein the composition has a pH of at least 9.5, wherein said composition is optionally contained within the sample container;

c) a homogenization means, optionally contained within the sample container;

d) a means to transfer the biological sample, or a portion thereof, into the sample container;
and

e) instructions for use.

15. The kit of claim 14, wherein the chelating agent is selected from CDTA, DTPA, DOTA, TETA, desferioximine, or chelator analogs thereof.

16. The kit of claim 14 or 15, wherein the nucleic acid is deoxyribonucleic acid (DNA).

17. The kit of any one of claims 14-16, wherein the biological sample is a fecal sample obtained from a vertebrate, preferably a mammal, such as a human.

18. The kit of any one of claims 14-17, wherein:

(a) the chelating agent is CDTA;

(b) the concentration of the chelating agent is from about 150 mM to about 500 mM, or from about 250 mM to about 350 mM, or about 300 mM;

(c) the composition has a pH of from 9.5 to 11.5, or from 10.5 to 11.5, or 11;

(d) the composition further comprises at least one buffering agent, such as beta-alanine, capable of buffering in the pH range 9.5 to 11.5;

(e) the composition further comprises a water-soluble organic solvent, such as a C₁-C₆ alkanol; preferably, wherein the water-soluble organic solvent is ethanol; wherein the ethanol is optionally present in the composition at a concentration of less than about 30% by volume, or less than about 24% by volume;

(f) the composition further comprises a detergent, such as sodium dodecylsulfate; and/or

(g) the composition further comprises an antifoaming agent, such as Antifoam A.

19. The kit of any one of claims 14-18, wherein the biological sample is a fecal sample obtained from a human, and the nucleic acid is human DNA; or the nucleic acid is microbial DNA and the kit is for stabilizing a microbiome profile of the biological sample.

20. The kit of any one of claims 14-19, wherein the homogenization means is at least one mixing ball; optionally,

(a) wherein the at least one mixing ball is a stainless steel mixing ball or a tungsten carbide mixing ball;

(b) wherein the at least one mixing ball is a stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³; or

(c) wherein the at least one mixing ball is a stainless steel mixing ball having a diameter of about 7.1 - 8.7 mm and a density of at least about 7.6 g/cm³ and the sample container is a round-bottom tube having an internal diameter of about 12.9 mm.

21. The method of claim 1, wherein the nucleic acid is DNA, the biological sample is a fecal sample obtained from a mammal, the composition has a pH of from 10.5 to 11.5, and the composition comprises, consists essentially of, or consists of:

CDTA in an amount of from about 250 mM to about 350 mM, or about 300mM;

β -alanine in an amount of from about 30 mM to about 70 mM, or about 50 mM;

ethanol in an amount of from about 21.5% to about 23.5% by volume, or about 23.5% by volume;

sodium dodecyl sulfate in an amount of from about 0 to about 1% (w/v), or about 0.5% (w/v); and

Antifoam A in an amount of from about 0 to about 0.2% (v/v), or about 0.1% (v/v); optionally, wherein the method comprises forming the mixture of the fecal sample and the composition in a round-bottom tube having an internal diameter of about 12.9 mm and containing at least one stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³, sealing the round-bottom tube, and homogenizing the mixture by shaking the mixture by hand in the presence of the at least one stainless steel mixing ball.

22. The method of claim 21, wherein the nucleic acid is microbial DNA and the method stabilizes a microbiome profile of the fecal sample, wherein the microbiome profile of the fecal sample is rendered stable for:

at least 7 days, at least 14 days, at least 30 days, or at least 60 days at room temperature;

at least 7 days, or at least 14 days at a temperature of from about 37°C to about 50°C; and/or

at least 30 days at -20°C.

23. The composition of claim 8, wherein the nucleic acid is DNA, the biological sample is a fecal sample obtained from a mammal, the composition has a pH of from 10.5 to 11.5, and the composition comprises, consists essentially of, or consists of:

CDTA in an amount of from about 250 mM to about 350 mM, or about 300mM;

β -alanine in an amount of from about 30 mM to about 70 mM, or about 50 mM;

ethanol in an amount of from about 21.5% to about 23.5% by volume, or about 23.5% by volume;

sodium dodecyl sulfate in an amount of from about 0 to about 1% (w/v), or about 0.5% (w/v); and

Antifoam A in an amount of from about 0 to about 0.2% (v/v), or about 0.1% (v/v).

24. The composition of claim 23, wherein the composition is for stabilizing a microbiome profile of the fecal sample.

25. The kit of claim 14, wherein the nucleic acid is DNA, the biological sample is a fecal sample obtained from a mammal, the composition has a pH of from 10.5 to 11.5, and the composition comprises, consists essentially of, or consists of:

CDTA in an amount of from about 250 mM to about 350 mM, or about 300mM;

β -alanine in an amount of from about 30 mM to about 70 mM, or about 50 mM;

ethanol in an amount of from about 21.5% to about 23.5% by volume, or about 23.5% by volume;

sodium dodecyl sulfate in an amount of from about 0 to about 1% (w/v), or about 0.5% (w/v); and

Antifoam A in an amount of from about 0 to about 0.2% (v/v), or about 0.1% (v/v).

26. The kit of claim 25, wherein the nucleic acid is microbial DNA and the kit is for stabilizing a microbiome profile of the biological sample; optionally, wherein the homogenization means is at least one stainless steel mixing ball having a diameter of about 5.6-11.1 mm and a density of at least about 7.6 g/cm³, and the sample container is a round-bottom tube having an internal diameter of about 12.9 mm.

27. The method of claim 1, the composition of claim 8, or the kit of claim 14, wherein the nucleic acid is ribonucleic acid (RNA).

28. The use of an aqueous composition according to any one of claims 8-13 and 23-24, for stabilizing nucleic acid contained in a biological sample at ambient temperature.