(b) combining the suspension with a lysis buffer to form a lysate;

(c) combining the lystate with a binding buffer to form a solution;

(d) combining the solution with at least one magnetic particle to form a combined solution comprising at least one modified magnetic particle, wherein the at least one modified magnetic particle is reversibly bound to the at least one nucleic acid;

(e) separating the at least one modified magnetic particle from the combined solution;

(f) washing the at least one modified magnetic particle with a first wash buffer and a second wash buffer; and

(g) combining the at least one modified magnetic particle with an elution buffer;

wherein:

the suspension buffer comprises at least one first ion chelating agent, present in a concentration ranging from 1 mM to 10 mM, and at least one first buffer compound (B1), present in a concentration ranging from 10 mM to 100 mM;

the lysis buffer comprises at least one detergent chaotropic agent, present in a concentration ranging from 1% to 10% by weight, wherein the at least one detergent chaotropic agent is chosen from sodium dodecyl sulfate (SDS), sodium dodecylbenzene sulfonate (SDBS), and combinations thereof, and at least one second buffer compound (B2), present in a concentration greater than or equal to 0.2 M;

the binding buffer comprises at least one first chaotropic agent, present in a concentration ranging from 4 M to 6 M, at least one optional first salt, present in a concentration ranging from 0.1 M to 2 M, at least one first alcohol, present in a concentration ranging from 1% to 5% by volume, and at least one third buffer compound (B3), present in a concentration ranging from 0.25% to 3% by weight;

the first wash buffer comprises at least one second chaotropic agent, present in a concentration ranging from 4 M to 6 M, at least one second ion chelating agent, present in an concentration ranging from 1 mM to 10 mM, at least one second alcohol, present in a concentration ranging from 30% to 50% by volume, and at least one fourth buffer compound (B4), present in a concentration ranging from 10 mM to 100 mM; and

the second wash buffer comprises at least one third alcohol and optionally at least one optional second salt.

[0007] According to various embodiments, the suspension buffer can comprise at least one ion chelating agent, present in a concentration ranging from about 1 mM to about 10 mM, and at least one buffer compound, present in a concentration ranging from about 10 mM to about 100 mM. The lysis buffer may comprise at least one

detergent chaotropic agent, present in a concentration ranging from about 1% to about 10% by weight, and at least one buffer compound, present in a concentration greater than or equal to about 0.2 M. In non-limiting embodiments, the binding buffer can comprise at least one chaotropic agent, present in a concentration ranging from about 4 M to about 6 M, optionally at least one salt, present in a concentration ranging from about 0.1 M to about 2 M, at least one alcohol, present in a concentration ranging from about 1% to about 5% by volume, and at least one buffer compound, present in a concentration ranging from about 0.25% to about 3% by weight. According to additional embodiments, the first wash buffer can comprise at least one chaotropic agent, present in a concentration ranging from about 4 M to about 6 M, at least one ion chelating agent, present in a concentration ranging from about 1 mM to about 10 mM, at least one buffer compound present in a concentration ranging from about 10 mM to about 100 mM, and at least one alcohol, present in a concentration ranging from about 30% to about 50% by volume. In further embodiments, the second wash buffer may comprise at least one alcohol and optionally at least one salt. Magnetic particles can be chosen, for example, from carboxyl coated magnetic particles, silica-based magnetic particles, and combinations thereof. Also disclosed herein are nucleic acid purification kits comprising these buffers and magnetic particles.

[0007a] In another aspect, there is provided a kit for nucleic acid purification, comprising:

(a) a suspension buffer comprising at least one first ion chelating agent, present in a concentration ranging from 1 mM to 10 mM, and at least one first buffer compound (B1), present in a concentration ranging from 10 mM to 100 mM;

(b) a lysis buffer comprising at least one detergent chaotropic agent, present in a concentration ranging from 1% to 10% by weight, and at least one second buffer compound (B2), present in a concentration greater than or equal to 0.2 M;

(c) a binding buffer comprising at least one first chaotropic agent, present in a concentration ranging from 4 M to 6 M, at least one optional first salt, present in a concentration ranging from 0.1 M to 2 M, at least one first alcohol, present in a concentration ranging from 1% to 5% by volume, and at least one third buffer compound (B3), present in a concentration ranging from 0.25% to 3% by weight;

(d) a first wash buffer comprising at least one second chaotropic agent, present in a concentration ranging from 4.5 M to 6 M, at least one second ion chelating agent, present in an concentration ranging from 1 mM to 10 mM, at least one second alcohol, present in a concentration ranging from 30% to 50% by volume, and at least one fourth buffer compound (B4), present in a concentration ranging from 10 mM to 100 mM;

(e) a second wash buffer comprising at least one third alcohol and at least one optional second salt; and

(f) at least one magnetic particle,

wherein the at least one detergent chaotropic agent is chosen from sodium dodecyl sulfate (SDS), sodium dodecylbenzene sulfonate (SDBS), and combinations thereof.

[0007b] In another aspect, there is provided a kit for nucleic acid purification, comprising:

(a) a suspension buffer comprising at least one first ion chelating agent chosen from EDTA, isomers thereof, and combinations thereof, present in a concentration ranging from 8 mM to 10 mM, and at least one first buffer compound (B1) chosen from Tris, Tris-HCl and combinations thereof, present in a concentration ranging from 10 mM to 40 mM;

(b) a lysis buffer comprising at least one detergent chaotropic agent chosen from SDS, SDBS, and combinations thereof, present in a concentration ranging from 1% to 3% by weight, and at least one second buffer compound (B2) chosen from akali hydroxides and combinations thereof, present in a concentration greater than or equal to 0.2 M;

(c) a binding buffer comprising at least one first chaotropic agent chosen from GuHCl, GuSCN, and combinations thereof, present in a concentration ranging from 4 M to 4.5 M, at least one first salt chosen from ammonium sulfate, ammonium acetate, sodium acetate, and combinations thereof, present in a concentration ranging from 0.3 M to 1.5 M, from 1% to 2% by volume of isopropanol, and at least one third buffer compound (B3) chosen from glacial acetic acid, hydrochloric acid, and combinations thereof, present in a concentration ranging from 1% to 3% by weight;

(d) a first wash buffer comprising at least one second chaotropic agent chosen from GuHCl, GuSCN, and combinations thereof, present in a concentration ranging from 4.5 M to 5 M, at least one second ion chelating agent chosen from EDTA, isomers thereof, and combinations thereof, present in an concentration ranging from 1 mM to 3 mM, from 30% to 40% by volume of isopropanol, and at least one fourth buffer compound (B4) chosen from Tris, Tris-HCl, and combinations thereof, present in a concentration ranging from 20 mM to 50 mM;

(e) a second wash buffer comprising at least 70% by volume of ethanol and at least one second salt chosen from ammonium sulfate, ammonium acetate, sodium acetate, and combinations thereof, present in a concentration ranging from 80 mM to 100 mM; and

(f) at least one silica-based magnetic particle.

[0008] Additional features and advantages of the disclosure will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the embodiments of the disclosure as described herein, including the detailed description which follows, the claims, and the appended drawings.

[0009] It is to be understood that both the foregoing general description and the following detailed description present various embodiments of the disclosure, and are intended to provide an overview or framework for understanding the nature and character of the claims. The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated into and constitute a part of this specification. The drawings illustrate various embodiments of the

WHAT IS CLAIMED IS:

1. A method for nucleic acid purification, comprising:

(a) combining a sample comprising at least one nucleic acid with a suspension buffer to form a suspension;

(b) combining the suspension with a lysis buffer to form a lysate;

(c) combining the lystate with a binding buffer to form a solution;

(d) combining the solution with at least one magnetic particle to form a combined solution comprising at least one modified magnetic particle, wherein the at least one modified magnetic particle is reversibly bound to the at least one nucleic acid;

(e) separating the at least one modified magnetic particle from the combined solution;

(f) washing the at least one modified magnetic particle with a first wash buffer and a second wash buffer; and

(g) combining the at least one modified magnetic particle with an elution buffer;

wherein:

the suspension buffer comprises at least one first ion chelating agent, present in a concentration ranging from 1 mM to 10 mM, and at least one first buffer compound (B1), present in a concentration ranging from 10 mM to 100 mM;

the lysis buffer comprises at least one detergent chaotropic agent, present in a concentration ranging from 1% to 10% by weight, wherein the at least one detergent chaotropic agent is chosen from sodium dodecyl sulfate (SDS), sodium dodecylbenzene sulfonate (SDBS), and combinations thereof, and at least one second buffer compound (B2), present in a concentration greater than or equal to 0.2 M;

the binding buffer comprises at least one first chaotropic agent, present in a concentration ranging from 4 M to 6 M, at least one optional first salt, present in a concentration ranging from 0.1 M to 2 M, at least one first alcohol, present in a concentration ranging from 1% to 5% by volume,

and at least one third buffer compound (B3), present in a concentration ranging from 0.25% to 3% by weight;

the first wash buffer comprises at least one second chaotropic agent, present in a concentration ranging from 4 M to 6 M, at least one second ion chelating agent, present in an concentration ranging from 1 mM to 10 mM, at least one second alcohol, present in a concentration ranging from 30% to 50% by volume, and at least one fourth buffer compound (B4), present in a concentration ranging from 10 mM to 100 mM; and

the second wash buffer comprises at least one third alcohol and at least one optional second salt.

2. The method of claim 1, wherein the sample comprising the at least one nucleic acid is at least one bacterial cell comprising plasmid DNA.

3. The method of either of the preceding claims, wherein the at least one first ion chelating agent is chosen from ethylenediamine tetraacetic acid (EDTA); ethylenediamine-N,N'-disuccinic acid (EDDS); cyclohexane-1,2-diaminetetraacetic acid (CDTA); iminodisuccinic acid (IDS); polyaspartic acid (PASA); methylglycinediacetic acid (MGDA); L-glutamic acid N,N-diacetic acid, tetrasodium salt (GLDA), and combinations thereof, and

wherein the at least one first buffer compound (B1) is chosen from Tris, Tris-HCl, 3-(N-morpholino)propanesulfonic acid (MOPS), 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES), 2-(N-morpholino)ethanesulfonic acid (MES), and combinations thereof.

4. The method of any one of the preceding claims,

wherein the at least one second buffer compound (B2) is chosen from sodium hydroxide (NaOH), lithium hydroxide (LiOH), potassium hydroxide (KOH), rubidium hydroxide (RbOH), cesium hydroxide (CsOH), and combinations thereof.

5. The method of any one of the preceding claims, wherein the at least one first chaotropic agent is chosen from guanidine hydrochloride (GuHCl), guanidium thiocyanate (GuSCN), urea, and combinations thereof,

wherein the at least one first salt is chosen from ammonium sulfate ($(NH_4)_2SO_4$), ammonium acetate (NH_4Ac), lithium acetate (LiAc), potassium acetate (KAc), sodium acetate (NaAc), sodium chloride (NaCl), and combinations thereof,

wherein the at least one first alcohol is chosen from isopropanol, ethanol, methanol, butanol, and combinations thereof, and

wherein the at least one third buffer compound (B3) is chosen from glacial acetic acid, hydrochloric acid, and combinations thereof.

6. The method of any one of the preceding claims, wherein the at least one second chaotropic agent is chosen from guanidine hydrochloride (GuHCl), guanidium thiocyanate (GuSCN), urea, and combinations thereof,

wherein the at least one second ion chelating agent is chosen from ethylenediamine tetraacetic acid (EDTA); ethylenediamine-N,N'-disuccinic acid (EDDS); cyclohexane-1,2-diaminetetraacetic acid (CDTA); iminodisuccinic acid (IDS); polyaspartic acid (PASA); methylglycinediacetic acid (MGDA); L-glutamic acid N,N-diacetic acid, tetrasodium salt (GLDA), and combinations thereof,

wherein the at least one second alcohol is chosen from isopropanol, ethanol, methanol, butanol, and combinations thereof, and

wherein the at least one fourth buffer compound (B4) is chosen from Tris, Tris-HCl, 3-(N-morpholino)propanesulfonic acid (MOPS), 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES), 2-(N-morpholino)ethanesulfonic acid (MES), and combinations thereof.

7. The method of any one of the preceding claims, wherein the at least one third alcohol is chosen from isopropanol, ethanol, methanol, butanol, and combinations thereof, and

wherein the at least one second salt is chosen from ammonium sulfate ($(NH_4)_2SO_4$), ammonium acetate (NH_4Ac), lithium acetate (LiAc), potassium acetate (KAc), sodium acetate (NaAc), sodium chloride (NaCl), and combinations thereof.

8. The method of any one of the preceding claims, wherein the at least one magnetic particle is chosen from carboxyl coated paramagnetic particles, silica-based paramagnetic particles, and combinations thereof.

9. The method of any one of the preceding claims, further comprising centrifuging the solution to remove at least one agglomerate or macromolecule prior to (d) combining the solution with the at least one magnetic particle.

10. The method of any one of the preceding claims, further comprising incubating the at least one modified magnetic buffer with the elution buffer for a time period sufficient to unbind the at least one nucleic acid from the at least one modified magnetic particle, and wherein the elution buffer is chosen from water and solutions comprising at least one buffer compound (B1, B2, B3, B4) and/or at least one ion chelating agent.

11. A kit for nucleic acid purification, comprising:

(a) a suspension buffer comprising at least one first ion chelating agent, present in a concentration ranging from 1 mM to 10 mM, and at least one first buffer compound (B1), present in a concentration ranging from 10 mM to 100 mM;

(b) a lysis buffer comprising at least one detergent chaotropic agent, present in a concentration ranging from 1% to 10% by weight, and at least one second buffer compound (B2), present in a concentration greater than or equal to 0.2 M;

(c) a binding buffer comprising at least one first chaotropic agent, present in a concentration ranging from 4 M to 6 M, at least one optional first salt, present in a concentration ranging from 0.1 M to 2 M, at least one first alcohol, present in a concentration ranging from 1% to 5% by volume, and at least one third buffer compound (B3), present in a concentration ranging from 0.25% to 3% by weight;

(d) a first wash buffer comprising at least one second chaotropic agent, present in a concentration ranging from 4.5 M to 6 M, at least one second ion chelating agent, present in an concentration ranging from 1 mM to 10 mM, at least one second alcohol, present in a concentration ranging from 30% to 50% by volume, and at least one fourth buffer compound (B4), present in a concentration ranging from 10 mM to 100 mM;

(e) a second wash buffer comprising at least one third alcohol and at least one optional second salt; and

(f) at least one magnetic particle,

wherein the at least one detergent chaotropic agent is chosen from sodium dodecyl sulfate (SDS), sodium dodecylbenzene sulfonate (SDBS), and combinations thereof.

12. The kit of claim 11, wherein the sample comprising the at least one nucleic acid is at least one bacterial cell comprising plasmid DNA.

13. The kit of either of claims 11 or 12, wherein the at least one first ion chelating agent is chosen from ethylenediamine tetraacetic acid (EDTA); ethylenediamine-N,N'-disuccinic acid (EDDS); cyclohexane-1,2-diaminetetraacetic acid (CDTA); iminodisuccinic acid (IDS); polyaspartic acid (PASA); methylglycinediacetic acid (MGDA); L-glutamic acid N,N-diacetic acid, tetrasodium salt (GLDA), and combinations thereof, and

wherein the at least one first buffer compound (B1) is chosen from Tris, Tris-HCl, 3-(N-morpholino)propanesulfonic acid (MOPS), 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES), 2-(N-morpholino)ethanesulfonic acid (MES), and combinations thereof.

14. The kit of any one of claims 11-13, wherein the at least one second buffer compound (B2) is chosen from sodium hydroxide (NaOH), lithium hydroxide (LiOH), potassium hydroxide (KOH), rubidium hydroxide (RbOH), cesium hydroxide (CsOH), and combinations thereof.

15. The kit of any one of claims 11-14, wherein the at least one first chaotropic agent is chosen from guanidine hydrochloride (GuHCl), guanidium thiocyanate (GuSCN), urea, and combinations thereof,

wherein the at least one first salt is chosen from ammonium sulfate ($(NH_4)_2SO_4$), ammonium acetate (NH_4Ac), lithium acetate (LiAc), potassium acetate (KAc), sodium acetate (NaAc), sodium chloride (NaCl), and combinations thereof,

wherein the at least one first alcohol is chosen from isopropanol, ethanol, methanol, butanol, and combinations thereof, and

wherein the at least one third buffer compound (B3) is chosen from glacial acetic acid, hydrochloric acid, and combinations thereof.

16. The kit of any one of claims 11-15, wherein the at least one second chaotropic agent is chosen from guanidine hydrochloride (GuHCl), guanidium thiocyanate (GuSCN), urea, and combinations thereof,

wherein the at least one second ion chelating agent is chosen from ethylenediamine tetraacetic acid (EDTA); ethylenediamine-N,N'-disuccinic acid (EDDS); cyclohexane-1,2-diaminetetraacetic acid (CDTA); iminodisuccinic acid (IDS); polyaspartic acid (PASA); methylglycinediacetic acid (MGDA); L-glutamic acid N,N-diacetic acid, tetrasodium salt (GLDA), and combinations thereof,

wherein the at least one second alcohol is chosen from isopropanol, ethanol, methanol, butanol, and combinations thereof, and

wherein the at least one fourth buffer compound (B4) is chosen from Tris, Tris-HCl, 3-(N-morpholino)propanesulfonic acid (MOPS), 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES), 2-(N-morpholino)ethanesulfonic acid (MES), and combinations thereof.

17. The kit of any one of claims 11-16, wherein the at least one third alcohol is chosen from isopropanol, ethanol, methanol, butanol, and combinations thereof, and

wherein the at least one second salt is chosen from ammonium sulfate ($(NH_4)_2SO_4$), ammonium acetate (NH_4Ac), lithium acetate (LiAc), potassium acetate (KAc), sodium acetate (NaAc), sodium chloride (NaCl), and combinations thereof.

18. The kit of any one of claims 11-17, wherein the at least one magnetic particle is chosen from carboxyl coated paramagnetic particles, silica-based paramagnetic particles, and combinations thereof.

19. The kit of any one of claims 11-18, further comprising (g) an elution buffer chosen from water and solutions comprising at least one buffer compound (B1, B2, B3, B4) and/or at least one ion chelating agent.

20. A kit for nucleic acid purification, comprising:

(a) a suspension buffer comprising at least one first ion chelating agent chosen from EDTA, isomers thereof, and combinations thereof, present in a concentration ranging from 8 mM to 10 mM, and at least one first buffer compound (B1) chosen from Tris, Tris-HCl and combinations thereof, present in a concentration ranging from 10 mM to 40 mM;

(b) a lysis buffer comprising at least one detergent chaotropic agent chosen from SDS, SDBS, and combinations thereof, present in a concentration ranging from 1% to 3% by weight, and at least one second buffer compound (B2) chosen from akali hydroxides and combinations thereof, present in a concentration greater than or equal to 0.2 M;

(c) a binding buffer comprising at least one first chaotropic agent chosen from GuHCl, GuSCN, and combinations thereof, present in a concentration ranging from 4 M to 4.5 M, at least one first salt chosen from ammonium sulfate, ammonium acetate, sodium acetate, and combinations thereof, present in a concentration ranging from 0.3 M to 1.5 M, from 1% to 2% by volume of isopropanol, and at least one third buffer compound (B3) chosen from glacial acetic acid, hydrochloric acid, and combinations thereof, present in a concentration ranging from 1% to 3% by weight;

(d) a first wash buffer comprising at least one second chaotropic agent chosen from GuHCl, GuSCN, and combinations thereof, present in a concentration ranging from 4.5 M to 5 M, at least one second ion chelating agent chosen from EDTA, isomers thereof, and combinations thereof, present in an concentration ranging from 1 mM to 3 mM, from 30% to 40% by volume of isopropanol, and at least one fourth buffer compound (B4) chosen from Tris, Tris-HCl, and combinations thereof, present in a concentration ranging from 20 mM to 50 mM;

(e) a second wash buffer comprising at least 70% by volume of ethanol and at least one second salt chosen from ammonium sulfate, ammonium acetate, sodium acetate, and combinations thereof, present in a concentration ranging from 80 mM to 100 mM; and

(f) at least one silica-based magnetic particle.