What is claimed is:

CLAIMS

1. A method for producing ribonucleic acid (RNA) comprising:

(a) incubating (i) cellular RNA, wherein the cellular RNA comprises ribosomal RNA, messenger RNA, and/or transfer RNA, and (ii) a ribonuclease to produce 5' nucleoside monophosphates (NMPs);

(b) eliminating the ribonuclease; and

(c) incubating the 5' NMPs with polyphosphate kinase (PPK), polyphosphate, deoxyribonucleic acid (DNA) template encoding a RNA of interest, and RNA polymerase to produce the RNA of interest.

2. The method of claim 1, wherein the ribonuclease is Nuclease P1 or RNase R.

3. The method of claim 1, wherein the 5' NMPs include 5' AMP, 5' GMP, 5' CMP, and/or 5' UMP.

4. The method of claim 1, wherein the ribonuclease is eliminated via temperature, pH, salt, detergent, alcohol, chemical inhibitors, separation, precipitation, filtration, capture, and/or chromatography.

5. The method of claim 1, wherein the PPK is a PPK1 family enzyme or a PPK2 family enzyme.

6. The method of claim 1, wherein the PPK is a Class III PPK2 enzyme from *Deinococcus geothermalis* (SEQ ID NO: 1).

7. The method of claim 1, wherein the polyphosphate is selected from the group consisting of tetrapolyphosphates, pentapolyphosphates, and hexametaphosphates.

8. The method of claim 1, wherein step (c) comprises an enzyme preparation or cell lysate obtained from cells that produce the PPK, the deoxyribonucleic acid (DNA) template, and/or the RNA polymerase.

9. The method of claim 8, wherein activity of native enzymes in the cell lysate or enzyme preparation has been eliminated via genetic modification, enzyme secretion from a cell, protease targeting, temperature, pH, salt, detergent, alcohol, chemical inhibitors, separation, precipitation, filtration, capture, and/or chromatography.

10. The method of claim 9, wherein the native enzymes are selected from the group consisting of phosphatases, nucleases, proteases, deaminases, oxidoreductases, and hydrolases.

11. A method for producing ribonucleic acid (RNA) comprising:

(a) incubating (i) cellular RNA and (ii) a ribonuclease to produce 5' nucleoside monophosphates (NMPs);

(b) eliminating the ribonuclease; and

(c) incubating the 5' NMPs with at least one NMP kinase, at least one NDP kinase, at least one polyphosphate kinase (PPK), polyphosphate, deoxyribonucleic acid (DNA) template encoding a RNA of interest, and RNA polymerase to produce the RNA of interest.

12. The method of claim 11, wherein the cellular RNA comprises ribosomal RNA, messenger RNA, and/or transfer RNA.

13. The method of claim 11, wherein the ribonuclease is Nuclease P1 or RNase R.

14. The method of claim 11, wherein the 5' NMPs include 5' AMP, 5' GMP, 5' CMP, and/or 5' UMP.

15. The method of claim 11, wherein the ribonuclease is eliminated via temperature, pH, salt, detergent, alcohol, chemical inhibitors, separation, precipitation, filtration, capture, and/or chromatography.

16. The method of claim 11, wherein the at least one NMP kinase is an AMP kinase, a CMP kinase, a UMP kinase, or a GMP kinase.

17. The method of claim 16, wherein the at least one NMP kinase is AMP kinase from *Thermus thermophilus* (SEQ ID NO: 12), CMP kinase from *Thermus thermophilus* (SEQ ID

NO: 13), UMP kinase from *Pyrococcus furiosus* (SEQ ID NO: 14), and/or GMP kinase from *Thermotoga maritima* (SEQ ID NO: 15).

18. The method of claim 11, wherein the at least one NDP kinase is from Aquifex aeolicus (SEQ ID NO: 16).

19. The method of claim 11, wherein the at least one PPK is a PPK1 family enzyme or a PPK2 family enzyme.

20. The method of claim 19, wherein the at least one PPK is a Class III PPK2 enzyme from *Deinococcus geothermalis* (SEQ ID NO: 1).

21. The method of claim 11, wherein the polyphosphate is selected from the group consisting of tetrapolyphosphates, pentapolyphosphates, and hexametaphosphates.

22. The method of claim 11, wherein step (c) comprises an enzyme preparation or cell lysate obtained from cells that produce the PPK, the NMP kinase, the NDP kinase, the deoxyribonucleic acid (DNA) template, and/or the RNA polymerase.

23. The method of claim 11, wherein activity of native enzymes in the cell lysate or enzyme preparation has been eliminated via genetic modification, enzyme secretion from a cell, protease targeting, temperature, pH, salt, detergent, alcohol, chemical inhibitors, separation, precipitation, filtration, capture, and/or chromatography.

24. The method of claim 23, wherein the native enzymes are selected from the group consisting of phosphatases, nucleases, proteases, deaminases, oxidoreductases, and hydrolases.

25. A method for producing ribonucleic acid (RNA) comprising:

(a) incubating (i) cellular RNA and (ii) Nuclease P1 to produce 5' nucleoside monophosphates (NMPs);

(b) eliminating the Nuclease P1; and

(c) incubating the 5' NMPs with at least one NMP kinase, at least one NDP kinase, a Class III PPK2 enzyme from *Deinococcus geothermalis* (SEQ ID NO: 1), polyphosphate,

deoxyribonucleic acid (DNA) template encoding a RNA of interest, and RNA polymerase to produce the RNA of interest.

26. The method of claim 25, wherein the at least one NMP kinase is AMP kinase from *Thermus thermophilus* (SEQ ID NO: 12), CMP kinase from *Thermus thermophilus* (SEQ ID NO: 13), UMP kinase from *Pyrococcus furiosus* (SEQ ID NO: 14), and/or GMP kinase from *Thermotoga maritima* (SEQ ID NO: 15).

27. The method of claim 25, wherein the at least one NDP kinase is from *Aquifex aeolicus* (SEQ ID NO: 16).

28. A method for producing ribonucleic acid (RNA) comprising:

(a) incubating (i) cellular RNA and (ii) a ribonuclease to produce 5' nucleoside monophosphates (NMPs);

(b) eliminating the ribonuclease, wherein the ribonuclease is eliminated via temperature, pH, salt, detergent, alcohol, chemical inhibitors, separation, precipitation, filtration, capture, and/or chromatography; and

(c) incubating the 5' NMPs with polyphosphate kinase (PPK), polyphosphate, deoxyribonucleic acid (DNA) template encoding a RNA of interest, and RNA polymerase to produce the RNA of interest.

29. The method of claim 28, wherein the ribonuclease is Nuclease P1 or RNase R.

30. The method of claim 28, wherein the PPK is a PPK1 family enzyme or a PPK2 family enzyme.