LISTING OF CLAIMS

1. A method of detecting a plurality of target molecules comprising:

extracting target molecules in a dried biological sample from a collection device;

diluting the extracted target molecules into a first dilution and a second dilution;

contacting the first dilution with a first capture reagent to form a first capture reagent affinity complex with its target molecule if the target molecule is present in the first dilution;

contacting the second dilution with a second capture reagent to form a second capture reagent affinity complex with its target molecule if the target molecule is present in the second dilution;

incubating the first and second dilution samples separately to allow capture reagent affinity complex formation; wherein each of the first capture reagent affinity complex and the second capture reagent affinity complex are immobilized on separate first solid supports;

releasing and capturing the first capture reagent affinity complex on a second solid support;

after releasing the first capture reagent affinity complex, releasing and capturing the second capture reagent affinity complex on the second solid support; and

detecting for the presence of or determining the level of the first capture reagent, second capture reagent of the first or second capture reagent affinity complexes, or the presence or amount of the first or second capture reagent affinity complexes.

2. The method of claim 1, wherein the target molecules are extracted from the collection device in a formulation for at least 5 minutes.

3. The method of claim 11 or claim 12, wherein the target molecules are extracted from the collection device in a formulation for at least 5 minutes, at least 10 minutes, at least 15 minutes, at least 20 minutes, at least 25 minutes, at least 30 minutes, at least 35 minutes, at least 40 minutes, at least 45 minutes, at least 50 minutes, at least 55 minutes, at least 60 minutes, at least 70 minutes, at least 80 minutes, at least 90 minutes, at least 100 minutes, at least 110 minutes, at least 120 minutes, at least 130 minutes, at least 140 minutes, at least 150 minutes, at least 160 minutes, at least 170 minutes, at least 180 minutes, at least 190 minutes, or at least 200 minutes.

4. The method of claim 12 or claim 13, wherein the formulation comprises a buffering agent, one or more salts, a chelating agent, a protease inhibitor, a non-ionic surfactant, and an oligonucleotide.

5. The method of claim 14, wherein the one or more salts are each independently selected from a sodium salt, a potassium salt and a magnesium salt, preferably wherein the sodium salt is NaCl, the potassium salt is KCl and the magnesium salt is $MgCl_2$ and wherein NaCl in the formulation is at a concentration of from about 10 mM to about 500 mM, or from about 50 mM to about 250 mM, or from about 100 mM to about 200 mM, or from about 75-125 mM, or about 100 mM, wherein the KCl in the formulation is at a concentration of from about 0.5 mM to about 30 mM, or from about 1 mM to about 20 mM, or from about 2 mM to about 15 mM, or from about 4 mM to about 10 mM, or about 5 mM, or wherein the $MgCl_2$ in the formulation is at a concentration of from about 0.5 mM to about 30 mM, or from about 1 mM to about 20 mM, or from about 2 mM to about 15 mM, or from about 4 mM to about 10 mM, or about 8 mM.

6. The method of any one of claims 1-5, wherein the oligonucleotide is a single stranded oligonucleotide, preferably wherein the oligonucleotide is from 20 to 100 nucleotides in length, or from 25 to 80 nucleotides in length, or from 25 to 70 nucleotides in length or from 25 to 50 nucleotides in length or about 30 nucleotides in length.

7. The method of any one of claims 1-6, wherein the oligonucleotide comprises one or more modified nucleotides,preferably wherein the oligonucleotide comprises one or more C-5 modified pyrimidines.

8. The method of any one of claims 1-7, wherein the oligonucleotide comprises the sequence $[(A\text{-}C\text{-}X\text{-}X)_7\text{-}A\text{-}C]$, wherein X is a BndU.

9. The method of any one of claims 1-8, wherein the biological sample has been dried for at least 4 hours at about room temperature or below room temperature,
preferably wherein the biological sample has been dried at about room temperature, 4^oC-8^oC, or -20^oC.

10. The method of any one of claims 1-9, wherein the biological sample has been dried for at least 6 hours, at least 8 hours, at least 10 hours, at least 12 hours, at least 14 hours, at least 16 hours, at least 18 hours, at least 20 hours, at least 22 hours, at least one day, at least two days, or at least three days.

11. The method of any one of claims 1-10, wherein the dried biological sample has been homogenized by the drying process, and/or, wherein the first and second capture reagent-target molecule affinity complexes are non-covalent complexes.

12. The method of any one of claims 1-11, further comprising contacting a third dilution sample with a third capture reagent, wherein a third capture reagent affinity complex is formed by the interaction of the third capture reagent with its target molecule if the target molecule is present in the third dilution sample; wherein the third dilution sample is incubated separately from the first and second dilution samples to allow capture reagent affinity complex formation of the third aptamer with its target molecule.

13. The method of 12, further comprising after releasing the second capture reagent affinity complex, releasing and capturing the third capture reagent affinity complex on the second solid support.

14. The method of claim 13, further comprising detecting for the presence of or determining the level of the third capture reagent of the third capture reagent affinity complex, or the presence or amount of the third capture reagent affinity complex.

15. The method of claim 14, wherein the third dilution is a different dilution from the first dilution and/or the second dilution of the same eluted target molecule sample.

16. The method of any one of claims 1-14, wherein the first capture reagent and the second capture reagent are, independently, selected from an aptamer or an antibody.

17. The method of any one of claims 14-16, wherein the third capture reagent is selected from an aptamer or an antibody.

18. The method of claim 17, wherein each of the first capture reagent, the second capture reagent, and the third capture reagent is an aptamer.

19. The method of any one of claims 1-18, wherein the detecting for the presence or the determining of the level of the dissociated first and second capture reagents is performed by PCR, mass spectrometry, nucleic acid sequencing, next-generation sequencing (NGS) or hybridization.

20. A method of preparing a biological sample for a multiplex assay comprising:

depositing the biological sample comprising a plurality of target molecules onto a collection device;

drying the biological sample on the collection device for a period of time to stabilize the dried sample prior to any temperature fluctuation;

wherein the biological sample is dried for at least 4 hours at about room temperature or below room temperature so that target molecules in the dried biological sample are detectable in the multiplex assay.

21. The method of claim 20, wherein the biological sample is dried at about room temperature, 4°C-8°C, or -20°C, and/or wherein the dried biological sample is stored at about room temperature or below room temperature prior to detection in the multiplex assay, preferably wherein the dried biological sample is stored at about 4°C-8°C, or -20°C, and wherein the biological sample is dried for at least 6 hours, at least 8 hours, at least 10 hours, at least 12 hours, at least 14 hours, at least 16 hours, at least 18 hours, at least 20 hours, at least 22 hours, one day, at least two days, or at least three days.

22. The method of any one of claims 20-21, wherein the dried biological sample is homogenized by the drying process and wherein the plurality of target molecules are extractable from the collection device after the biological sample is dried and detectable in the multiplex assay.

23. A method for preparing a liquid sample comprising:

drying the sample at a constant temperature of from -20°C to room temperature for at least four (4) hours to create a dried sample; and

reconstituting the dried sample with a formulation comprising a buffering agent, one or more salts, a chelating agent, a protease inhibitor, a non-ionic surfactant, and an oligonucleotide.

24. A method for detecting an analyte in a sample comprising:

drying the sample at a constant temperature of from about -20°C to room temperature for at least four (4) hours to create a dried sample;

reconstituting the dried sample with a formulation comprising a buffering agent, one or more salts, a chelating agent, a protease inhibitor, a non-ionic surfactant, and an oligonucleotide; and

detecting the analyte from the reconstituted sample.