These methods are therefore not conducive to direct RNA collection from a sample (e.g., a biological sample) without significant sample processing.

[0006] Accordingly, compositions and methods that enable dry-state RNA extraction and stabilization from a biological sample under ambient conditions within a single process-step are needed. Moreover, the ability to store a dried biological sample for a substantial period at ambient temperature and recover intact RNA thereafter for further analysis is highly desirable.

BRIEF DESCRIPTION

[0007] ~~One embodiment of~~In an aspect, there is provided a solid matrix comprisinges at least one protein denaturant, and at least one acid or acid-titrated buffer reagent impregnated therein in a dry state; wherein the matrix is configured to provide an acidic pH upon hydration, extract nucleic acids from a sample and preserve the nucleic acids in a substantially dry state at ambient temperature.

[0008] ~~In another embodiment,~~ In another aspect, there is provided an RNA extraction matrix comprisinges a protein denaturant comprising a chaotropic agent, a detergent or combination thereof; and an acid or acid-titrated buffer reagent impregnated therein in a dry state, wherein the matrix is a porous non-dissolvable dry material configured to provide a pH between 2 and 7 upon hydration for extracting RNA and stabilizing the extracted RNA with an RNA Integrity Number (RIN) of at least 4.

[0009] In ~~one embodiment,~~In another aspect, there is provided an RNA extraction matrix comprisinges a protein denaturant comprising a chaotropic agent, a detergent or combination thereof; an acid or acid-titrated buffer reagent; and an RNase inhibitor comprising a triphosphate salt

or pyrophosphate salt, impregnated therein in a dry state, wherein the matrix comprises a porous non-dissolvable dry material configured to provide a pH between 2 and 7 upon hydration and stabilize RNA with an RNA Integrity Number (RIN) of at least 4.

[0010] ~~One example of~~In another aspect, there is provided a method for extracting and storing nucleic acids from a sample comprisinges the steps of providing the sample to a dry solid matrix comprising a protein denaturant and an acid or acid titrated buffer reagent; generating an acidic pH upon hydration for extraction of nucleic acids from the sample; drying the matrix comprising the extracted nucleic acids; and storing the extracted nucleic acids on the matrix in a substantially dry state at ambient temperature.

DRAWINGS

[0011] These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

[0012] FIG. 1 is a P^{31} NMR profile showing the oxidation of Tris(2-carboxyethyl) phosphine (TCEP) and preparation of TCEP Oxide (TCEP-O).

[0013] FIG. 2 shows a bar graph derived from a 5,5'-Dithiobis-(2-Nitrobenzoic Acid) (DTNB) colorimetric assay for TCEP and TCEP-O reducing activity on cellulose samples.

[0014] FIG. 3 shows RNA Integrity Numbers (RIN) for dried blood spots collected on chemically-treated cellulose paper containing TCEP or TCEP-O.