

a given reagent supply of the control platform may provide for an increased number of tests by the control platform.

[0052] Embodiments of the present invention may thus provide for detection of one or more of a range of nucleic acid target sequences, for example for a variety of infectious diseases. Embodiments of the invention may provide for a bio-contained determination of the presence of an infectious disease using a single relatively low-cost instrument. The system is preferably portable and/or located at a point of care, such that test results can be obtained more rapidly on site, while nevertheless using a sensitive and accurate amplification test.

[0053] Aspiration and fluid flow paths within the microfluidic cartridge are preferably effected by at least one valve of the microfluidic cartridge, the at least one valve being controllable by the control platform.

[0054] The sample carrier is preferably adapted to be sealed after the sample is placed in the sample carrier, until becoming docked with the microfluidic cartridge. For example, the sample may be obtained by a sample swab, with the sample swab being sealed within the sample carrier by closing a one way threaded closure of the sample carrier. The sample swab may be attached to the closure to ensure placement of the sample at a desired location within the sample carrier.

[0055] The sample may be mucus obtained by a nasal or throat swab. The sample may additionally or alternatively comprise a biological sample derived from an agricultural source, a bacterial source, a viral source, a human source or an animal source. The sample may additionally or alternatively comprise waste water, drinking water, agricultural products, processed foodstuff, air, blood, stool, sputum, buccal material, serum, urine, saliva, teardrop, a biopsy sample, an histological tissue sample, a tissue culture product, an agricultural product, or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

[0056] Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

[0057] FIG. 1 is a perspective view of a sample collection device in accordance with an embodiment of the invention.

[0058] FIG. 2 is a perspective view of the sample collection device of FIG. 1 fitted to a closed sample tube to form a sample carrier in accordance with an embodiment of the invention.

[0059] FIG. 3 is a perspective magnified view of the outlet end of the sample carrier of FIG. 2.

[0060] FIG. 4 is a perspective view of a disposable single-use microfluidics microfluidic cartridge in accordance with an embodiment of the present invention, to which the sample carrier of FIG. 2 has been docked.

[0061] FIG. 5 is a plan view of a control platform instrument or reader in accordance with an embodiment of the present invention into which the microfluidics microfluidic cartridge of FIG. 4 has been loaded.

[0062] FIG. 6 is a plan view of the microfluidics microfluidic cartridge of FIG. 4.

[0063] FIG. 7 is a plan view of the microfluidics microfluidic cartridge of FIG. 4 illustrating sample lysis.

[0064] FIG. 8 is a plan view of the microfluidics microfluidic cartridge of FIG. 4 illustrating RNA extraction.

[0065] FIG. 9 is a plan view of the microfluidics microfluidic cartridge of FIG. 4 illustrating disposal of waste.

[0066] FIG. 10 is a plan view of the microfluidics microfluidic cartridge of FIG. 4 illustrating RNA elution.

[0067] FIG. 11 is a plan view of the microfluidics microfluidic cartridge of FIG. 4 illustrating the addition of master mix, stirring, amplification, and detection of the target nucleic acid sequence.

[0068] FIG. 12 is a magnified cross section of the microfluidics microfluidic cartridge of FIG. 4 when loaded into the control platform of FIG. 5, illustrating turbidimetric detection.

[0069] FIG. 13 is a magnified cross section of the microfluidics microfluidic cartridge of FIG. 4 when loaded into a different embodiment of the control platform, illustrating fluorescence detection.

[0070] FIG. 14 is a magnified cross section of a microfluidics microfluidic cartridge in accordance with another embodiment of the invention, illustrating an alternative method of heating the amplification and detection chamber.

[0071] FIG. 15 is a block diagram of a diagnostic system in accordance with an embodiment of the present invention.

[0072] FIG. 16 is a plan view of the instrument of FIG. 5 after the test has been completed.

DETAILED DESCRIPTION OF THE INVENTION

[0073] The term “oligonucleotide” as used herein refers to a polymer composed of a multiplicity of nucleotide residues (deoxyribonucleotides or ribonucleotides, or related structural variants or synthetic analogues thereof) linked via phosphodiester bonds (or related structural variants or synthetic analogues thereof). Thus, while the term “oligonucleotide” can refer to a nucleotide polymer in which the nucleotide residues and linkages between them are naturally occurring, it will be understood that the term also includes within its scope various analogues including, but not restricted to, single-stranded synthetic primers, peptide nucleic acids (PNAs), phosphoramidates, phosphorothioates, methyl phosphonates, 2-O-methyl ribonucleic acids, and the like. The exact size of the molecule can vary depending on the particular application. An oligonucleotide is typically rather short in length, generally from about 10 to 30 nucleotide residues, but the term can refer to molecules of any length, although the term “polynucleotide” or “nucleic acid” is typically used for large oligonucleotides.

[0074] By “primer” is meant an oligonucleotide which, when paired with a nucleotide strand, is capable of initiating the synthesis of a primer extension product in the presence of a suitable polymerase. The primer is preferably single-stranded for maximum efficiency in amplification but can alternatively be double-stranded. A primer must be sufficiently long to prime the synthesis of extension products in the presence of the polymerase. The length of the primer depends on many factors, including application, temperature to be employed, template reaction conditions, other reagents, and source of primers. For example, depending on the complexity of the target sequence, the oligonucleotide primer typically contains 10 to 35 or more nucleotide residues, although it can contain fewer nucleotide residues. Primers can be large polynucleotides, such as from about 200 nucleotide residues to several kilobases or more. Primers can be selected to be “substantially complementary” to the sequence on the template to which it is designed to hybridise and serve as a site for the initiation of synthesis. By “substantially complementary”, it is meant that the primer is sufficiently complementary to hybridise with a target polynucleotide. Preferably, the primer contains no mismatches with the template to which it is designed to hybridise but this is not