

WHAT IS CLAIMED IS:

1. A portable diagnostic apparatus for detecting at least one analyte from a sample, the portable diagnostic apparatus comprising:

a cartridge receiving unit configured to receive a microfluidic cartridge therein and aligning at least part of a diagnostic portion of the microfluidic cartridge with an optical unit of said portable diagnostic apparatus;

a cartridge driver unit comprises

a) a microvalve controller configured to control at least some of a plurality of the microvalves of a microfluidic cartridge received by the portable diagnostic apparatus, and

b) a micropump controller configured to actuate at least some of a plurality of the micropumps of the microfluidic cartridge received by the portable diagnostic apparatus,

wherein the micropump controller and the microvalve controller are configured to cooperatively actuate the flow of fluids from one or more of the plurality of the reservoirs to the to the diagnostic portion in a predetermined sequence.

2. The portable diagnostic apparatus of claim 1, wherein the microvalve controller comprises at least one heating element configured to apply heat energy to a heat-deformable surface of at least one microvalve of the plurality of microvalves for opening thereof.

3. The portable diagnostic apparatus of claim 2, wherein the at least one heating element is juxtapose to at least one microvalve of the microfluidic cartridge when the cartridge is placed into the cartridge receiving unit.

4. The portable diagnostic apparatus of claim 3, wherein the heating element is an infra-red emitter.

5. The portable diagnostic apparatus of claim 1, wherein the micropump controller comprises at least one electrical connector for electrical connection with the at least one micropump of the microfluidic cartridge, wherein said at least one electrical connector is configured to provide electrical current to the at least one micropump, and preferably the at least one electrical connector is configured so as to be mounted juxtapose the location(s) of the at least

one micropump of a microfluidic cartridge received in the cartridge receiving unit of the portable diagnostic apparatus.

6. The portable diagnostic apparatus of claim 1, wherein the optical unit comprises an illumination component and a sensor component, wherein
 - a. the illumination component is configured to deliver light to a diagnostic portion of the microfluidic cartridge, and
 - b. the sensor component is configured to detect at least one signal generated from the diagnostic portion caused by the presence of an analyte when a microfluidic cartridge is inserted and operated at a predetermined condition.
7. The portable diagnostic apparatus of claim 6, wherein the illumination component comprises a light source having a wavelength in the range of 600nm to 650nm and the at least one data signal is a fluorescent signal.
8. The portable diagnostic apparatus of claim 1, further comprising a control unit configured to perform one or more of the following:
 - a. provide a predetermined control sequence to the cartridge driver unit for directing at least one fluid movement within the microfluidic cartridge;
 - b. provide a predetermined condition to the optical unit for performing a quantitative and/or qualitative analysis of the analyte;
 - c. store a data signal obtained from the optical unit; and
 - d. control and monitor an operation of the apparatus.
9. The portable diagnostic apparatus of claim 1, further comprises a housing for anchoring the cartridge receiving unit, the cartridge driver unit and the optical unit therein, the cartridge receiving unit further comprises a rail component and a tray, wherein the rail component comprises a pair of slidable rails, the tray is configured to receive the microfluidic cartridge and is anchored on the pair of rails,
wherein the rails may slide the tray in and out of the housing such that the microfluidic cartridge may be inserted into the housing.

10. The portable diagnostic apparatus of claim 8 further comprising an identification unit to read the identity of the microfluidic cartridge and transmit a corresponding identity signal to the control unit.
11. The portable diagnostic apparatus of claim 10, further comprising a switch to trigger the identification unit to read the identity of the microfluidic cartridge when the microfluidic cartridge is positioned in a designated area.
12. The portable diagnostic apparatus of claim 8, further comprising a user interface unit configured to display the quantitative and/or qualitative analysis of the analyte, wherein the user interface unit is connected to the control unit.
13. The portable diagnostic apparatus of claim 1, wherein the cartridge receiving unit comprises a rail component and a tray, wherein
- the rail component comprises a cavity for slidably receiving the tray,
 - the tray comprises a cartridge chamber for receiving the microfluidic cartridge such that the microfluidic cartridge is positioned at the designated area.
14. The portable diagnostic apparatus of claim 1, further comprising a removable device, wherein the removable device comprises
- a. an environmental measuring module for acquiring environmental data, preferably selected from positioning data, humidity, temperature, and time, wherein environmental data comprises at least one environmental parameter at the location;
 - b. a data storage module for storing raw data, wherein the raw data comprises one or more of environmental data and diagnostic data; and
 - c. a transmitter for transmitting the raw data to a remote server;
15. A method of detecting at least one analyte from a sample using the portable diagnostic apparatus of claim 1,
- wherein the method comprises the steps of:
- a) loading the sample into the microfluidic cartridge;
 - b) directing the sample and at least one reagent from the microfluidic portion to the diagnostic portion within the microfluidic cartridge in a predetermined sequence by opening at least one microvalve and actuating at least one micropump in the microfluidic cartridge;

- c) providing a predetermined condition to the diagnostic portion of the microfluidic cartridge to generate at least one signal;
 - d) detecting the at least one data signal and collecting diagnostic data using an optical sensor; and
 - e) analyzing the diagnostic data to determine the presence of the analyte quantitatively and/or qualitatively;
- optionally, the method further comprising the steps of:
- a) reading the identity of the microfluidic cartridge;
 - b) providing a predetermined sequence to the cartridge driver unit and a predetermined condition to the optical unit based on the identity of the microfluidic cartridge.

16. A system for managing a network of portable diagnostic apparatus, comprising
- at least one portable diagnostic apparatus of claim 14,
 - at least one user terminal, and
 - a server comprising
- a data module for collecting and storing raw data, wherein the raw data comprises one or more of the following:
- (a) diagnostic data obtained at a location using a portable diagnostic apparatus, wherein the diagnostic data comprises at least one biochemical or pathological measurement of a subject,
 - (b) environmental data obtained at the location using an environmental measuring module, wherein the environmental data comprises at least one environmental parameter,
 - (c) apparatus data obtained from the portable diagnostic apparatus, and
 - (d) a data module for analyzing the raw data
- wherein the server is configured for communication with the user terminal and to the portable diagnostic apparatus.

17. The system of claim 16, wherein the data module is configured to perform one or more of the following steps:
- 1. collecting raw data;
 - 2. analysing the raw data to provide results; and
 - 3. transmitting results to the user terminal;
- and provides one or more of the following results:

1. disease prevalence at different locations displayed on a map;
2. disease prevalence over a period of time;
3. severity of a disease in a particular location; and
4. correlation between environmental conditions and apparatus status.

18. A method of using the system of claim 17, comprising the following steps:
 obtaining raw data at the location and storing it on a data storage module;
 transmitting the raw data from the data storage module to a server;
 collecting and storing, in the server, a plurality of raw data from a plurality of portable diagnostic apparatuses to form a databank;
 analyzing the databank to provide results;
 wherein the raw data comprises one or more of the following:
 diagnostic data obtained at a location using a portable diagnostic apparatus, wherein the diagnostic data comprises at least one biochemical or pathological measurement of a subject;
 environmental data obtained at the location using an environmental measuring module, wherein the environmental data comprises at least one environmental parameter;
 apparatus data obtained from the portable diagnostic apparatus.

19. The method of claim 18, wherein the raw data is diagnostic data obtained at a location using a portable diagnostic apparatus, wherein the diagnostic data comprises at least one biochemical or pathological measurement of a subject and location data; and the results provide disease prevalence information.

20. The method of claim 18, wherein the raw data is one or more of temperature, humidity, time, positioning data, and apparatus data; and the results provide information associated with performance of the portable diagnostic apparatus.