Claims

We Claim:

1. An apparatus for rapidly detecting a target molecule, compound or substance via a molecular probe whereby said apparatus comprises the following:

a breath tube for the conveyance of condensate of EBC (exhaled breath condensate);

a collection receptacle;

said collection receptacle chamber being rounded and tapered as to induce a vortex flow within said collection receptacle;

said tapered chamber receiving exhaled breath condensate for channeling, through hydrophobic surfaces, gravity or a combination thereof, downward into a trough area;

a collection reservoir;

said collection reservoir residing at a point inferior to said collection receptacle and in a trough area;

said collection receptacle capable of accumulating condensate from EBC;

a condensate accelerator;

said condensate accelerator applied to or within said collection receptacle;

an exhaust portal; and

said exhaust portal residing at a point superior to said collection receptacle;

said exhaust portal providing for the exit and expulsion of expended EBC (eEBC);

a fluorescent light detector.

2. The apparatus of claim 1 wherein said collection receptacle has an inner surface that is hydrophobic as to facilitate condensate movement down said surface, as influenced by gravitational forces, to said collection reservoir.

3. The apparatus of claim 1 wherein said condensation accelerator is a device which is endogenous or exogenously adjacent to said collection receptacle.

4. The apparatus of claim 3 wherein said condensation accelerator is provided by pre-refrigeration /pre-freezing prior to administration of ECB.

5. The apparatus of claim 3 wherein said condensation accelerator may comprise one or more of the following:

ice;

thermoelectric (TE) cooling;

vapor compression cooling;

refrigerant gels;

cooling liquid;

“cold pack” cooling (i.e., those coolants using water and ammonium nitrate, calcium ammonium nitrate or urea causing an endothermic reaction) and/or phase change gels;

heat sinks;

heat conductors;

exothermic reactants;

endothermic reactants and/or a combination thereof.

6. The apparatus of claim 1 wherein said collection receptacle, collection reservoir or a combination thereof contains molecular beacons (MBs).

7. The apparatus of claim 6 wherein said molecular beacons contain a nucleotide sequence comprising a loop and two stems whereby said stems express two fluorescent dyes or a fluorescent dye and a quencher wherein said stems express reciprocal affinity, through corresponding base pairs in a closed conformation.

8. The apparatus of claim 7 wherein said molecular beacons' loop expresses a target-specific affinity for a corresponding nucleotide sequence on a target molecule, compound or substance and wherein said target, if present, binds to said MB.

9. The apparatus of claim 8 wherein said binding of said MB and said target causes a conformational change in said MB and subsequent hybridization, creating a MB-target duplex, whereby said fluorescent dye and said quencher are distanced from one another causing said fluorescent dye to fluoresce.

10. The apparatus of claim 9 wherein said fluorescence allows said detector to detect the presence, absence, quantity, or a combination thereof, of a target molecule, compound or substance as a result of MB-target binding, MB hybridization, MB conformational change, fluorescent dye and quencher created distance and a non-quenched, fluorescent dye which is made to fluoresce.

11. The apparatus of claim 10 whereby said MB-target fluorescence duplex is observable through a Multi-pixel Photon Counter (MPPC).

12. The apparatus of claim 11 whereby said MPPC detection is aided through the use of a non-energy dependent ellipsoid reflective mirror which acts to amplify, direct and focus fluorescent light to said MPPC to enhance sensitivity.

13. The apparatus of claim 12 whereby ellipsoid reflected light may be amplified through a non-energy consuming process facilitating light passage through an aperture, through a condenser lens and through an optical bandpass filter as to concentrate said reflected fluorescent light directly into said MPPC.

14. The apparatus of claim 13 wherein said mouthpiece may exhibit a one-way valve, said exhaust portal may exhibit a filter, or a combination thereof.

15. The apparatus of claim 13 wherein said mouthpiece may be disposable.

16. The apparatus of claim 10 wherein fluorescence or phosphorescence may be achieved through one of several means: chemiluminescence, a chemical reaction via the addition of the enzymes to a substrate containing reagent, electrochemiluminescence,

radioluminescence, electroluminescence, mechanoluminescence, piezoluminescence, sonoluminescence, thermoluminescence, singly, or by a combination thereof.

17. The apparatus of claim 1 wherein said apparatus also includes a spirometer, data tag, signal processor, battery, charger, and communication means for data transfer, monitoring, collection, presentation, storage and analysis.

18. The apparatus of claim 17 wherein said communication means of claim 17 is WiFi®, Bluetooth® or a combination thereof.

19. The apparatus of claim 1 wherein the detection is of a target molecule, compound or substance or several target molecules, compounds or substances may comprise one to a plurality of distinct frequencies or wavelengths for individualized identification in a mixed sample.