

CLAIMS

WHAT IS CLAIMED IS:

1. A method of screening for presence of a tumor in a subject, the method comprising:
 - a) determining an amount of cell-free nucleic acid from a virus in a biological sample from the subject;
 - b) determining a threshold of cell-free nucleic acid based on an attribute selected from the group consisting of: age of the subject, smoking status of the subject, and ambient temperature; and
 - c) comparing the amount of cell-free nucleic acid from the virus to the threshold, thereby screening the subject for the tumor.
2. The method of claim 1, wherein the threshold is determined based on the smoking status of the subject.
3. The method of claim 2, wherein if the smoking status of the subject is smoker, the threshold is set higher than if the smoking status of the subject is not a smoker.
4. The method of claim 1, wherein the threshold is determined based on the age of the subject.
5. The method of claim 4, wherein the threshold comprises a positive correlation with subject age.
6. The method of claim 1, wherein the threshold is determined based on the ambient temperature.
7. The method of claim 6, wherein the threshold is negatively correlated with ambient temperature.
8. The method of claim 6, wherein the ambient temperature is a temperature measured at a location within 50 km of a location at which the sample was acquired from the subject.
9. The method of claim 6, wherein the ambient temperature is a mean ambient temperature on a day the sample was acquired from the subject.
10. The method of claim 1, wherein the threshold is determined based on the age of the subject and the smoking status of the subject.
11. The method of claim 1, wherein the threshold is determined based on the age of the subject and the ambient temperature.
12. The method of claim 1, wherein the threshold is determined based on the smoking status of the subject and the ambient temperature.
13. The method of claim 1, wherein the threshold is determined based on the age of the subject, the smoking status of the subject, and the ambient temperature.

14. The method of claim 1, wherein the threshold is not determined based on whether the subject has diabetes, consumes alcohol, exercises, has hypertension, has hyperlipidemia, or has ischemic heart disease.
15. The method of claim 1, wherein comparing the amount of cell-free nucleic acid from the virus to the threshold based on the attribute reduces a false positive rate of the screen relative to comparing the amount of cell-free nucleic acid to a threshold not based on the attribute.
16. The method of claim 1, wherein the amount comprises a number of copies of cell-free nucleic acid from the virus per milliliter (copies/mL).
17. The method of claim 1, further comprising performing a second screen for presence of the tumor if the amount of cell-free nucleic acid from the virus in the biological sample is above the threshold.
18. The method of claim 17, wherein the second screen comprises determining a size of cell-free nucleic acid from the virus in a second biological sample.
19. The method of claim 18, wherein the second biological sample is identical to the biological sample.
20. The method of claim 18, wherein the second biological sample is different from the biological sample.
21. The method of claim 18, wherein the second screen comprises determining an amount of cell-free nucleic acid from the second biological sample from the subject that is from the virus and has a size within a given range.
22. The method of claim 21, wherein determining the amount of the cell-free nucleic acid that is from the virus and has a size within a given range comprises massively parallel sequencing of the cell-free nucleic acid in the second biological sample to generate sequence reads.
23. The method of claim 1, wherein the biological sample comprises plasma or serum.
24. The method of claim 1, wherein determining the amount comprises amplification of the cell-free nucleic acid.
25. The method of claim 24, wherein the amplification comprises polymerase chain reaction (PCR).
26. The method of claim 25, wherein the PCR comprises quantitative PCR (qPCR).
27. The method of any one of the above claims, wherein the tumor is nasopharyngeal cancer.
28. The method of any one of the above claims, wherein the virus is an Epstein-Barr Virus (EBV).

29. The method of claim 1, further comprising treating the subject for the tumor when the screen indicates the tumor is present in the subject.
30. A computer product comprising a computer readable medium storing a plurality of instructions for controlling a computer system to perform operations of any one of the methods of claims 1-28.
31. A system comprising the computer product of claim 30 and one or more processors for executing instructions stored on the computer readable medium.