CLAIMS:

1. A microfluidic device for analyzing extracellular vesicle glycans, the microfluidic device comprising:

an inlet portion configured to receive a fluid sample;

a mixing portion fluidically coupled to the inlet portion and configured to facilitate mixing between the fluid sample and magnetic nanoparticles functionalized to bind with extracellular vesicles and aggregate to vesicle glycans in the fluid sample;

a magnetic separation portion fluidically coupled to the mixing portion and configured to separate clusters of magnetic nanoparticles from the fluid sample; and

a magnetic sensor configured to measure magnetic properties of the fluid sample after it has passed through the magnetic separation portion.

2. A microfluidic device according to claim 1, wherein the magnetic sensor is a giant magnetoresistance sensor.

3. A microfluidic device according to claim 1 or claim 2, wherein the mixing portion comprises an array of micropillars.

4. A microfluidic device according to any one of claims 1 to 3, wherein the magnetic separation portion comprises a serpentine channel overlaid with a magnetic separation strip.

5. A microfluidic device according to any one of claims 1 to 4, comprising the magnetic nanoparticles functionalized to bind to extracellular vesicle in the fluid sample provided in the inlet portion.

6. A microfluidic device according to claim 5, further comprising a lectin selected to bind with target extracellular vesicle glycans in the fluid sample.

7. A system for analyzing extracellular vesicle glycans in a fluid sample, the system comprising a plurality of microfluidic devices according to any one of claims 1 to 6, wherein different lectins are provided in respective inlet portions of the plurality

of microfluidic devices to bind with different respective target extracellular vesicle glycans in the fluid sample.

8. A method of analyzing extracellular vesicle glycans in a fluid sample portion, the method comprising:

mixing the fluid sample with magnetic nanoparticles functionalized to bind with extracellular vesicles in the fluid sample and a lectin selected to bind with target extracellular vesicle glycans in the fluid sample portion;

magnetically separating nanoparticle clusters formed by multivalent binding of the lectins and target extracellular vesicle glycans;

measuring a magnetic property of the remaining fluid sample portion; and

determining a characteristic of the extracellular vesicle glycans in the fluid sample from the magnetic property of the remaining fluid sample portion.

9. A method of analyzing extracellular vesicle glycans in a fluid sample, the method comprising, for respective fluid sample portions of the fluid sample, carrying out the method according to claim 8 to determine a characteristic of each of a plurality of respective target extracellular vesicle glycans in the fluid sample from the respective magnetic properties of the respective remaining fluid sample portions.

10. A method according to claim 9, wherein determining a characteristic of each of the respective target extracellular vesicle glycans in the fluid sample from the respective magnetic properties of the respective remaining fluid sample portions comprises identifying at least one conserved glycan signature.

11. A method according to claim 10, wherein the conserved glycan signature is measured with lectin RCA120 and / or WGA.

12. A method differentiating patient prognosis, comprising analyzing extracellular vesicle glycans in a fluid sample corresponding to the patient according to claim 9.

13. A method according to claim 12, wherein the respective target extracellular vesicles and associated glycans are selected for differentiation of patient prognosis in colorectal and gastric cancer.

14. A method according to claim 12 or claim 13, wherein the magnetic nanoparticles are functionalized with antibody CD24 for binding with cancer extracellular vesicles.

15. A method according to any of the claims 12 to 14, wherein a prognostic glycan signature is measured with lectins selected from Jacalin, ConA, RCA120, PHA-E, STA, LEL, WGA and DSL.