As shown in Pasechnikov et al (2014) and Kim et al, current screening methodologies usually use either invasive (biopsy or endoscopy) or imaging-based methods (which often exposes to the patients to radioactivity and/or is costly).

- Pasechnikov V, Chukov S, Fedorov E, Kikuste I, Leja M. *Gastric cancer: prevention, screening and early diagnosis*. *World J Gastroenterol*. 2014;20(38):13842–13862. doi:10.3748/wjg.v20.i38.13842

- Kim GH, Liang PS, Bang SJ, Hwang JH. *Screening and surveillance for gastric cancer in the United States: Is it needed? Gastrointest Endosc*. 2016 Jul;84(1):18-28. doi: 10.1016/j.gie.2016.02.028. Epub 2016 Mar 3.

The currently available non-invasive tests like pepsinogen, *H. pylori* serology, etc do not provide the requisite specificity and sensitivity.

We therefore provide for a non-invasive methodology that is an improvement over those currently available, and which would be useful for diagnosing gastric cancer in the population at large.

In one aspect, the present disclosure refers to a method of diagnosing a gastric cancer, in which the method comprises detecting, in a sample obtained from or of an individual, the expression level of an miRNA, wherein the miRNA is selected from the group consisting of: hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b and hsa-miR-17-5p; in which an altered expression level of the miRNA as compared to the expression level of the miRNA in a sample from or of an individual known not to be suffering from gastric cancer indicates that the individual is suffering, or is likely to be suffering, from gastric cancer; and in which the miRNA is detected in an extracellular vesicle (EV) and:

(a) hsa-miR-484 comprises a polynucleotide sequence having miRBase Accession Number MIMAT0002174 and in which the altered expression level comprises an increased expression level of hsa-miR-484;

(b) hsa-miR-320d comprises a polynucleotide sequence having miRBase Accession Number MIMAT0006764

and in which the altered expression level comprises an increased expression level of hsa-miR-320d

(c) (h) hsa-miR-423-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0004748 and in which the altered expression level comprises an increased expression level of hsa-miR-423-5p;

(d) hsa-miR-186-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0000456 and in which the altered expression level comprises an increased expression level of hsa-miR-186-5p;

(e) hsa-miR-142-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0000433 and in which the altered expression level comprises a decreased expression level of hsa-miR-142-5p;

(f) hsa-miR-320a comprises a polynucleotide sequence having miRBase Accession Number MI0000542 and in which the altered expression level comprises an increased expression level of hsa-miR-320a;

(g) hsa-miR-320b comprises a polynucleotide sequence having miRBase Accession Number MIMAT0005792 and in which the altered expression level comprises an increased expression level of hsa-miR-320b; or

(h) hsa-miR-17-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0000070 and in which the altered expression level comprises a decreased expression level of hsa-miR-17-5p.

In another aspect, the present disclosure refers to a combination of two or more nucleic acid sequences capable of binding the miRNA as specified herein or probes capable of binding specifically thereto, wherein the miRNA is present in an extracellular vesicle (EV).

Accordingly, disclosed herein is a method of diagnosing a gastric cancer. The method may include detecting the expression level of an miRNA in a sample from or of an individual.

The miRNA may be selected from the group consisting of: hsa-miR-484, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320d, hsa-miR-320a, hsa-miR-320b and hsa-miR-17-5p. The method may be such that an altered expression level of the miRNA as compared to the

expression level of the miRNA in a sample from or of an individual known not to be suffering from gastric cancer indicates that the individual is suffering, or is likely to be suffering, from gastric cancer.

The expression level of the miRNA may be detected in an extracellular vesicle (EV) in a sample from or of the individual.

MIMAT0000433), hsa-miR-320d (miRBase Accession Number MIMAT0006764), hsa-miR-320a (miRBase Accession Number MI0000542), hsa-miR-320b (miRBase Accession Number MIMAT0005792), hsa-miR-17-5p (miRBase Accession Number MIMAT0000070) and hsa-miR-423-5p (miRBase Accession Number MIMAT0004748).

In one aspect, the present disclosure refers to an miRNA selected from the group consisting of hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b and hsa-miR-17-5p for use in a method of detecting or determining the severity of gastric cancer, in which the method comprises detecting the expression level of an miRNA in an extracellular vesicle (EV), in a sample obtained from an individual.

In one example, the present disclosure refers to a pharmaceutical composition comprising two or more miRNAs selected from the group consisting of: hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b, hsa-miR-17-5p, and hsa-miR-423-5p, or a variant, homologue, derivative or fragment thereof such as a sequence having at least 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% sequence identity thereto together with a pharmaceutically acceptable excipient, carrier or diluent.

In yet another aspect, the present disclosure refers to a diagnostic kit for detecting gastric cancer, the kit comprising (a) sequences capable of binding to two or more miRNAs in an extracellular vesicle (EV), wherein the two or more miRNAs are selected from the group consisting of: hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b, hsa-miR-17-5p and hsa-miR-423-5p, and (b) means for isolating extracellular vesicles.

Further described herein is a method of treatment of a gastric cancer in an individual, the method comprising performing a method as set out above and, where the individual is determined to be suffering from, or likely to suffer from, gastric cancer, administering to the individual a treatment for gastric cancer.

Described herein is a method of treating gastric cancer in an individual, the method comprising: (a) receiving results of an assay that measures

CLAIMS

1. A method of diagnosing a gastric cancer, in which the method comprises detecting, in a sample obtained from or of an individual, the expression level of an miRNA, wherein the miRNA is selected from the group consisting of: hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b and hsa-miR-17-5p; in which an altered expression level of the miRNA as compared to the expression level of the miRNA in a sample from or of an individual known not to be suffering from gastric cancer indicates that the individual is suffering, or is likely to be suffering, from gastric cancer; and in which the miRNA is detected in an extracellular vesicle (EV) and:

(a) hsa-miR-484 comprises a polynucleotide sequence having miRBase Accession Number MIMAT0002174 and in which the altered expression level comprises an increased expression level of hsa-miR-484;

(b) hsa-miR-320d comprises a polynucleotide sequence having miRBase Accession Number MIMAT0006764 and in which the altered expression level comprises an increased expression level of hsa-miR-320d;

(c) hsa-miR-423-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0004748 and in which the altered expression level comprises an increased expression level of hsa-miR-423-5p;

(d) hsa-miR-186-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0000456 and in which the altered expression level comprises an increased expression level of hsa-miR-186-5p;

(e) hsa-miR-142-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0000433 and in which the altered expression level comprises a decreased expression level of hsa-miR-142-5p;

(f) hsa-miR-320a comprises a polynucleotide sequence having miRBase Accession Number MI0000542 and in which the altered expression level comprises an increased expression level of hsa-miR-320a;

(g) hsa-miR-320b comprises a polynucleotide sequence having miRBase Accession Number MIMAT0005792 and in which the altered expression level comprises an increased expression level of hsa-miR-320b; or

(h) hsa-miR-17-5p comprises a polynucleotide sequence having miRBase Accession Number MIMAT0000070 and in which the altered expression level comprises a decreased expression level of hsa-miR-17-5p.

2. The method according to claim 1, in which the method comprises detecting the expression level in a sample of two or more such miRNAs, for example, three miRNAs, four miRNAs, five miRNAs, six miRNAs or seven miRNAs in the group.

3. The method according to any preceding claim, in which:

(a) an expression level of hsa-miR-484 of 0.39 or more;

(b) an expression level of hsa-miR-186-5p of 0.15 or more;

(c) an expression level of hsa-miR-142-5p of -0.35 or less;

(d) an expression level of hsa-miR-320d of 0.48 or more;

(e) an expression level of hsa-miR-320a of 0.49 or more;

(f) an expression level of hsa-miR-320b of 0.4 or more;

(g) an expression level of hsa-miR-17-5p of -0.37 or less;

(h) an expression level of hsa-miR-423-5p of 0.54 or more;

each measured as $\log_2$(expression level of individual/ expression level of control), in which control designates the expression level of that miRNA in a sample, such as in an extracellular vesicle (EV) in or of the sample, from or of an individual known not to be suffering from gastric cancer, is indicative of gastric cancer.

4. The method according to any preceding claim, in which the sample comprises a bodily fluid sample such as a nasopharyngeal secretion, urine, serum, lymph, saliva, anal and vaginal secretions, perspiration or semen.

5. The method according to any preceding claim, in which extracellular vesicles (EV) are isolated from the sample using polymer based precipitation.

6. The method according to any preceding claim, in which the detection comprises polymerase chain reaction, such as real-time polymerase chain reaction (RT-PCR), multiplex polymerase chain reaction (multiplex PCR), Northern Blot, RNAse protection, microarray hybridisation or RNA sequencing.

7. A combination of two or more nucleic acid sequences capable of binding the miRNA as specified in any of the preceding claims, or probes capable of binding specifically thereto, wherein the miRNA is present in an extracellular vesicle (EV).

8. The combination according to claim 7, comprising probes capable of binding specifically thereto to each of the nucleic acids capable of binding the hsa-miR-484 (miRBase Accession Number MIMAT0002174), hsa-miR-186-5p (miRbase Accession Number MIMAT0000456), hsa-miR-142-5p (miRBase Accession Number MIMAT0000433), hsa-miR-320d (miRBase Accession Number MIMAT0006764), hsa-miR-320a (miRBase Accession Number MI0000542), hsa-miR-320b (miRBase Accession Number MIMAT0005792), hsa-miR-17-5p (miRBase Accession Number MIMAT0000070) and hsa-miR-423-5p (miRBase Accession Number MIMAT0004748).

9. The combination according to claims 7 and 8, wherein the combination of two or more nucleic acid sequences is immobilised on a substrate, in the form of a microarray, or as a polymerase chain reaction (PCR) kit.

10. An miRNA selected from the group consisting of hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b and hsa-miR-17-5p for use in a method of detecting or determining the severity of gastric cancer, in which the method comprises detecting the expression level of an miRNA in an extracellular vesicle (EV), in a sample obtained from an individual.

11. A diagnostic kit for detecting gastric cancer, the kit comprising (a) sequences capable of binding to two or more miRNAs in an extracellular vesicle (EV), wherein the two or more miRNAs are selected from the group consisting of hsa-miR-484, hsa-miR-320d, hsa-miR-423-5p, hsa-miR-186-5p, hsa-miR-142-5p, hsa-miR-320a, hsa-miR-320b, hsa-miR-17-5p and hsa-miR-423-5p, and (b) means for isolating extracellular vesicles.

12. The diagnostic kit according to claim 11, wherein the sequences under (a) are for use in a microarray or RNA sequencing.

13. The diagnostic kit according to claim 11, wherein the sequences under (a) are comprised in a polymerase chain reaction (PCR) kit.

14. The diagnostic kit according to claim 13, wherein the polymerase chain reaction (PCR) kit is a multiplex polymerase chain reaction (PCR) kit.