Claims

1. An *in vitro* and/or *ex vivo* method for diagnosing lung cancer in a mammalian subject, the method comprising the steps of:

a) determining, on the basis of a blood or serum sample taken from the subject, parameters related to the reactivity of antibodies specifically binding to different peptides comprising a stretch of the amino acid sequence of human BARD1 and/or of an isoform thereof

b) diagnosing, on the basis of the parameters obtained in the previous step, whether said subject suffers or not from lung cancer;

wherein a combination of different peptides is selected from a group of forty-one peptides, wherein each peptide of said group of forty-one peptides comprises and/or consists essentially of, respectively, one of the forty-one amino acid sequences of the group consisting of SEQ ID NO: 1 to 41.

2. A method for assessing a probability and/or a risk that a subject suffers from lung cancer, the method comprising the steps of:

a) determining, on the basis of a blood or serum sample taken from the subject, parameters related to the reactivity of antibodies specifically binding to different peptides comprising a stretch of the amino acid sequence of human BARD1 and/or of an isoform thereof;

b) assessing, from the parameters measured in step a) the probability that said subject suffers from lung cancer;

wherein a combination of different peptides is selected from a group of forty-one peptides, wherein each peptide of said group of forty-one peptides comprises and/or consists essentially of, respectively, one of the forty-one amino acid sequences of the group consisting of SEQ ID NO: 1 to 41.

3. Use of a combination of different peptides comprising a stretch of the amino acid sequence of human BARD1 and/or of an isoform thereof in an *in vitro* and/or *ex vivo* method for lung cancer screening, monitoring, diagnosis, prognosis, prediction, recurrence, and/or in methods for enhancing the clinical efficiency of lung cancer screening, monitoring, diagnosis, prognosis, prediction and recurrence;

wherein a combination of different peptides is selected from a group of forty-one peptides, wherein each peptide of said group of forty-one peptides comprises and/or consists essentially of, respectively, one of the forty-one amino acid sequences of the group consisting of SEQ ID

NO: 1 to 41.

4. The method of any one of the preceding claim, wherein a parameter related to the reactivity of antibodies is determined separately for each peptide, so as to obtain a plurality of said parameters in which each individual parameter is related to the reactivity of antibodies binding to one specific peptide of said different peptides.

5. The method of any one of the preceding claims, wherein step b) comprises the step of calculating a test value for the subject on the basis of said parameters and from a statistically determined coefficient specific to each peptide.

6. The method of claim 5, further comprising the step of diagnosing, by comparing said test value with a threshold value, whether said subject suffers or not from lung cancer.

7. The method of any one of the preceding claims, wherein said peptides have, independently, a length of 4 to 300, preferably 8 to 250 amino acids.

8. The method of any one of the preceding claims, wherein said different peptides consist of 5 to 35, preferably 11 to 30, and most preferably 17 to 28 different peptides.

9. The method of any one of the preceding claims, wherein said different peptides comprise several groups of peptides, a group A of peptides, a group B of peptides, a group C of peptides, a group D of peptides and a group E of peptides, wherein said group A comprises one or more peptides comprising or consisting of amino acid sequences selected from the group consisting of: SEQ ID NO: 1; SEQ ID NO: 2; SEQ ID NO: 3; SEQ ID NO: 4; SEQ ID NO: 5; SEQ ID NO: 6 ; SEQ ID NO: 7; and SEQ ID NO: 8; SEQ ID NO: 9; and SEQ ID NO: 10, said group B comprises one or more peptides comprising amino acid sequences selected from the group consisting of: SEQ ID NO: 11; SEQ ID NO: 12; SEQ ID NO: 13; SEQ ID NO: 14 and SEQ ID NO: 15 ; SEQ ID NO: 16 ; and SEQ ID NO: 17, said group C comprises one or more peptides comprising amino acid sequences selected from the group consisting of: SEQ ID NO: 18; SEQ ID NO: 19; SEQ ID NO: 20; SEQ ID NO: 21; SEQ ID NO: 22 and SEQ ID NO: 23; SEQ ID NO: 24; and SEQ ID NO: 25, said group D comprises one or more peptides comprising amino acid sequences selected from the group consisting of: SEQ ID NO: 26; SEQ ID NO: 27; SEQ ID NO: 28; SEQ ID NO: 29 and SEQ ID NO: 30; SEQ ID NO: 31; SEQ ID NO: 32; SEQ ID NO: 33 and SEQ ID NO: 34, said group E comprises one or more peptides comprising amino acid

sequences selected from the group consisting of: SEQ ID NO: 35; SEQ ID NO: 36; SEQ ID NO: 37; SEQ ID NO: 38; SEQ ID NO: 39; SEQ ID NO: 40 and SEQ ID NO: 41, said combination of peptides comprises one or more peptides selected from said group A and one or more peptides selected from said any one of said groups B, C, D, and/or E.

10. The method of claim 9, wherein said different peptides comprise five or more peptides selected from said group A; two or more peptides selected from group B, and two or more peptides selected from group C.

11. The method of any one of claims 1 to 8, wherein said different peptides comprises at least 10 different peptides, wherein each of said 10 peptides, respectively, comprises or consists essentially of one amino acid sequence selected from the group consisting of: SEQ ID NO: 1 to 10.

12. The method of any one of claims 1 to 8, wherein said different peptides comprise peptides comprising amino acid sequences of selected from the group consisting of: SEQ ID NO: 1-4; 11-13; 18-20.

13. An *in vitro* and/or *ex vivo* method for diagnosing lung cancer in a female human subject, the method comprising the steps of:

- determining, on the basis of a blood or serum sample taken from the female subject, parameters related to the reactivity of antibodies specifically binding to at least 19 different peptides, wherein said peptides are peptides comprising the amino acid sequences SEQ ID NO: 1 to SEQ ID NO: 6; SEQ ID NO: 11 to SEQ ID NO: 14; SEQ ID NO: 18 to SEQ ID NO: 21; SEQ ID NO: 26 to SEQ ID NO: 30, respectively;
- diagnosing, on the basis of the parameters obtained in the previous step, whether said female subject suffers or not from lung cancer.

14. An *in vitro* and/or *ex vivo* method for diagnosing lung cancer in a male human subject, the method comprising the steps of:

- determining, on the basis of a blood or serum sample taken from the female subject, parameters related to the reactivity of antibodies specifically binding to at least 22 different peptides, wherein said peptides are peptides comprising the amino acid sequences SEQ ID NO: 1 to SEQ ID NO: 5; SEQ ID NO: 7; SEQ ID NO: 8; SEQ ID NO: 11 to SEQ ID NO: 13; SEQ ID NO: 15; SEQ ID NO: 18 to SEQ ID NO: 20; SEQ ID NO: 22; SEQ ID NO: 23; SEQ ID NO:

26; SEQ ID NO: 27; and SEQ ID NO: 31 to SEQ ID NO: 34, respectively;

- diagnosing, on the basis of the parameters obtained in the previous step, whether said male subject suffers or not from lung cancer.

15. A diagnostic test kit for diagnosis of lung cancer, wherein said diagnostic test kit comprises a combination of at least 11 different peptides, each peptide comprising a stretch of the amino acid sequence of human BARD1 and/or of an isoform thereof; and wherein each peptide comprises and/or consists essentially of, respectively, one of the forty-one amino acid sequences of the group consisting of SEQ ID NO: 1 to 41.