CLAIMS

1. A method for the *in vitro* diagnosis of lung cancer in a subject, comprising the steps of:
a) contacting a biological sample from said subject with at least one progastrin-binding antibody, or an antigen-binding fragment thereof,
b) detecting the binding of said progastrin-binding antibody, or an antigen-binding fragment thereof to progastrin in said sample, and
detecting in said sample the presence of at least one lung cancer biomarker,

wherein the binding of said progastrin-binding antibody, or an antigen-binding fragment thereof to progastrin and the detection of said lung cancer biomarker in said sample indicate the presence of lung cancer in said subject, wherein said biological sample is a sample of blood, serum, or plasma; and

wherein said progastrin-binding antibody is a monoclonal antibody chosen from the group consisting of:

- A monoclonal antibody comprising a heavy chain comprising CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°4, 5 and 6, respectively, and a light chain comprising CDR-L1, CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N°7, 8 and 9, respectively,

- A monoclonal antibody comprising a heavy chain comprising CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°10, 11 and 12, respectively, and a light chain comprising CDR-L1, CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N°13, 14 and 15, respectively,

- A monoclonal antibody comprising a heavy chain comprising CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°16, 17 and 18, respectively, and a light chain comprising CDR-L1, CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N°19, 20 and 21, respectively,

- A monoclonal antibody comprising a heavy chain comprising CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°22, 23 and 24, respectively, and a light chain comprising CDR-L1, CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N°25, 26 and 27, respectively,

- A monoclonal antibody comprising a heavy chain comprising CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°28, 29 and 30, respectively, and a light chain comprising CDR-L1, CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N°31, 32 and 33, respectively,

- A monoclonal antibody comprising a heavy chain comprising CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°34, 35 and 36, respectively, and a light chain comprising CDR-L1, CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N°37, 38 and 39, respectively, and
- A monoclonal antibody produced by the hybridoma deposited at the CNCM, Institut Pasteur, 25-28 rue du Docteur Roux, 75724 Paris CEDEX 15, France, on 27 December 2016, under reference I-5158;

and wherein said antigen binding fragment thereof comprises the 6 CDRs of the antibody it derives from.

2. The method of claim 1, wherein said lung cancer biomarker is selected from the list consisting of: carcinoembryonic antigen (CEA), neuron-specific enolase (NSE), cytokeratin 19 (CYFRA-21-1), alpha-fetoprotein, carbohydrate antigen-125 (CA-125), carbohydrate antigen-19.9 (CA-19.9), and ferritin.

3. The method of any one of claim 1 or 2, wherein step b) further comprises determining the concentration of progastrin.

4. The method of claim 3, comprising the further steps of:

c) determining a reference concentration of progastrin in a reference sample, and
d) comparing the concentration of progastrin in said biological sample with said reference concentration of progastrin.

5. The method of any of claims 1 to 4, wherein said antibody, or antigen-binding fragment thereof, is selected among N-terminal anti-progastrin monoclonal antibodies and C-terminal anti-progastrin monoclonal antibodies.

6. The method of any of claims 1 to 5, wherein said antibody is selected from the group consisting of:

- A monoclonal antibody comprising a heavy chain of amino acid sequence SEQ ID N°41 and a light chain of amino acid sequence SEQ ID N°42;
- A monoclonal antibody comprising a heavy chain of amino acid sequence SEQ ID N°43 and a light chain of amino acid sequence SEQ ID N°44;

- A monoclonal antibody comprising a heavy chain of amino acid sequence SEQ ID N°45 and a light chain of amino acid sequence SEQ ID N°46;
- A monoclonal antibody comprising a heavy chain of amino acid sequence SEQ ID N°47 and a light chain of amino acid sequence SEQ ID N°48;
- A monoclonal antibody comprising a heavy chain of amino acid sequence SEQ ID N°49 and a light chain of amino acid sequence SEQ ID N°50; and
- A monoclonal antibody comprising a heavy chain of amino acid sequence SEQ ID N°51 and a light chain of amino acid sequence SEQ ID N°52.

7. The method of any one of claim 1 to 6, wherein the determination of step b) includes:

(i) contacting said sample with a first progastrin-binding antibody, or fragment thereof which binds to a first part of progastrin, and

(ii) contacting said sample with a second progastrin-binding antibody, or fragment thereof which binds to a second part of progastrin.

8. The method of claim 7, wherein the first progastrin-binding antibody, or fragment thereof binds an epitope within the C-terminus of progastrin.

9. The method of any one of claims 6 or 8, wherein said first progastrin-binding antibody is a monoclonal antibody produced by the hybridoma deposited at the CNCM, Institut Pasteur, 25-28 rue du Docteur Roux, 75724 Paris CEDEX 15, France, on 27 December 2016, under reference 1-5158.

10. The method of any one of claims 7 to 9, wherein the second progastrin- binding antibody, or fragment thereof, binds an epitope within the N-terminus of progastrin.

11. The method of any one of claims 7 to 10, wherein said second progastrin- binding antibody is a polyclonal antibody binding an epitope within the N- terminus of progastrin or a monoclonal antibody comprising a heavy chain comprising the following three CDRs, CDR-H1 , CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N° 16, 17 and 18, respectively, and a light chain comprising the following three CDRs, CDR-L1 , CDR-L2 and CDR-L3 of amino acid sequences SEQ ID N° 19, 20 and 21 , respectively.

12. The method of any one of claims 1 to 11, wherein the binding to progastrin is determined in step b) with an ELISA.

13. Use of a progastrin-binding antibody, or an antigen-binding fragment thereof, as in any one of claims 9 to 12 for the *in vitro* diagnosis of lung cancer.