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 ~~said~~ 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~~s~~ 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 ~~at least one, preferentially at least two, preferentially three, of~~ CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°4, 5 and 6, respectively, and a light chain comprising ~~at least one, preferentially at least two, preferentially three, of~~ 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 ~~at least one, preferentially at least two, preferentially three, of~~ CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°10, 11 and 12, respectively, and a light chain comprising ~~at least one, preferentially at least two, preferentially three, of~~ 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 ~~at least one, preferentially at least two, preferentially three, of~~ CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°16, 17 and 18, respectively, and a light chain comprising ~~at least one, preferentially at least two, preferentially three, of~~ 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 ~~at least one, preferentially at least two, preferentially three, of~~ CDR-H1, CDR-H2 and CDR-

H3 of amino acid sequences SEQ ID N°22, 23 and 24, respectively, and a light chain comprising ~~at least one, preferentially at least two, preferentially three, of~~ 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 ~~at least one, preferentially at least two, preferentially three, of~~ CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°28, 29 and 30, respectively, and a light chain comprising ~~at least one, preferentially at least two, preferentially three, of~~ 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 ~~at least one, preferentially at least two, preferentially three, of~~ CDR-H1, CDR-H2 and CDR-H3 of amino acid sequences SEQ ID N°34, 35 and 36, respectively, and a light chain comprising ~~at least one, preferentially at least two, preferentially three, of~~ 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 CDR~~S~~s ~~S~~ 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. ~~2.~~ The method of any one of claim 1 or 2, wherein step b) further comprises determining the concentration of progastrin ~~and wherein a concentration of progastrin at least 10 pM in said biological sample is indicative of the presence of lung cancer in said subject~~.

~~3~~4. The method of claim ~~2~~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~~,~~

~~e) determining, from the comparison of step d), the presence of lung cancer~~.

~~4~~5. The method of any of claims 1 to ~~4~~3, 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~~5. The method of any of claims 1 to ~~4~~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.

~~6~~7. The method of any one of claim 1 to ~~6~~5, wherein the determination of step ~~a~~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~~7. The method of claim ~~6~~7, wherein the first progastrin-binding antibody, or fragment thereof binds an epitope within the C-terminus of progastrin.

98. The method of any one of claims 6 or 78, wherein said first progastrin-binding antibody, or fragment thereof, 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.

109. The method of any one of claims 67 to 89, wherein the second progastrin- binding antibody, or fragment thereof, binds an epitope within the N-terminus of progastrin.

1011. The method of any one of claims 67 to 910, wherein said second progastrin- binding antibody, or fragment thereof, 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.

1112. The method of any one of claims 1 to 1011, wherein the level of binding to progastrin is determined in step ab) with an ELISA.

12. The method of any one of claims 1 to 5, wherein said biological sample is contacted with a first antibody, or fragment thereof, which binds to a first part of progastrin, and with a second antibody, or fragment thereof, which binds to a second part of progastrin.

13. The method of any one of claims 1 to 7, wherein said biological sample is plasma, and wherein a concentration of progastrin of at least 10 pM is indicative of the presence of lung cancer in said subject.

1413. Use of a progastrin-binding antibody, or an antigen-binding fragment thereof, as in any one of claims 9 to 13 12 for the *in vitro* diagnosis of lung cancer.