Overview

Useful For
Aiding in the diagnosis of granulosa cell tumors and mucinous epithelial ovarian tumors

Monitoring of patients with granulosa cell tumors and epithelial mucinous-type tumors of the ovary known to secrete inhibin A or overexpress inhibin B

Profile Information

<table>
<thead>
<tr>
<th>Test ID</th>
<th>Reporting Name</th>
<th>Available Separately</th>
<th>Always Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>INHA</td>
<td>Inhibin A, Tumor Marker, S</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>INHB</td>
<td>Inhibin B, S</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Method Name
INHA: Sequential 2-Step Immunoenzymatic Assay

INHB: Enzyme-Linked Immunosorbent Assay (ELISA)

NY State Available
Yes

Specimen

Specimen Type
Serum

Specimen Required

Container/Tube:

Preferred: Red top

Acceptable: Serum gel

Specimen Volume: 1 mL

Forms

If not ordering electronically, complete, print, and send an Oncology Test Request (T729) with the specimen.

Specimen Minimum Volume
0.6 mL

Reject Due To

<table>
<thead>
<tr>
<th>Reason</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross hemolysis</td>
<td>Reject</td>
</tr>
<tr>
<td>Gross lipemia</td>
<td>OK</td>
</tr>
</tbody>
</table>
Test Definition: INHAB
Inhibin A and B, Tumor Marker, S

Specimen Stability Information

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum</td>
<td>Refrigerated (preferred)</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frozen</td>
<td>90 days</td>
<td></td>
</tr>
</tbody>
</table>

Clinical and Interpretive

Clinical Information

Inhibins are heterodimeric protein hormones secreted by granulosa cells of the ovary in the female and Sertoli cells of the testis in the male. They selectively suppress the secretion of pituitary follicle stimulating hormone (FSH) and also have local paracrine actions in the gonads. The inhibins consist of a dimer of 2 homologous subunits, an alpha subunit and either a beta A or beta B subunit, to form inhibin A and inhibin B, respectively.

In females, inhibin A is primarily produced by the dominant follicle and corpus luteum: whereas inhibin B is predominantly produced by small developing follicles. Serum inhibin A and B levels fluctuate during the menstrual cycle. Inhibin A is low in the early follicular phase and rises at ovulation to maximum levels in the midluteal phase. In contrast, inhibin B levels increase early in the follicular phase to reach a peak coincident with the onset of the midfollicular phase decline in FSH levels. Inhibin B levels decrease in the late follicular phase. There is a short-lived peak of the hormone 2 days after the midcycle luteinizing hormone (LH) peak. Inhibin B levels remain low during the luteal phase of the cycle. The timing of the inhibin B rise suggests that it plays a role in regulation of folliculogenesis via a negative feedback on the production of FSH. At menopause, with the depletion of ovarian follicles, serum inhibin A and B decrease to very low or undetectable levels.

Ovarian cancer is classified into 3 types: epithelial (80%), germ cell tumors (10%-15%), and stromal sex-cord tumors (5%-10%). Epithelial ovarian tumors are further subdivided into: serous (70%), mucinous (10%-15%), and endometrioid (10%-15%) types. Granulosa cell tumors represent the majority of the stromal sex cord tumors.

Elevations of serum inhibin A and B are detected in some patients with granulosa cell tumors. Inhibin A elevations have been reported in approximately 70% of granulosa cell tumors. In these patients, inhibin A levels tend to show a 6-fold to 7-fold increase over the reference range value. Inhibin B elevations have been reported in 89% to 100% of patients with granulosa cell tumors. In those patients, inhibin B levels tend to be elevated about 60-fold over the reference range value. The frequency of elevated levels varies amongst studies, likely due to the different specificities of the antibodies used in the immunoassays. Inhibin A and B also appear to be a suitable serum markers for epithelial tumors of the mucinous type with about 20% of cases having elevated inhibin A levels and 55% to 60% of cases having elevated inhibin B levels. In contrast, inhibin is not a very good marker in nonmucinous epithelial tumors. At best, total inhibin is elevated in 15% to 35% of nonmucinous epithelial ovarian cancer cases.

Inhibin seems to be a complementary to cancer antigen 125 (CA 125) as an ovarian cancer marker. CA 125 is not as good of a tumor marker for mucinous and granulosa ovarian cell tumors. Inhibin shows a better performance in those 2 types of ovarian cancer.

The majority of the studies for inhibin A and B as an ovarian cancer marker have been limited to postmenopausal women where the levels for both proteins are normally very low. Inhibin levels vary in relation to the menstrual cycle and, therefore, are difficult to interpret in premenopausal women.

Inhibin B has also been used as a marker of ovarian reserve. Every female is born with a specific number of follicles
containing oocytes, a number that steadily and naturally declines with age. The number of follicles remaining in the ovary at any time is called the ovarian reserve. As ovarian reserve diminishes, it is increasingly more difficult for the hormones used for in vitro fertilization (IVF) to stimulate follicle development and, thus, the likelihood of successful oocyte retrieval, fertilization, and embryo transfer decreases, all leading to a lower chance of conceiving. As part of an infertility evaluation, attempts are made to estimate a woman's ovarian reserve. Tests to assess ovarian reserve include: day 3 FSH, day 3 inhibin B, and antimullerian hormone levels. The amount of inhibin B measured in serum during the early follicular phase of the menstrual cycle (day 3) directly reflects the number of follicles in the ovary. Therefore, the higher the inhibin B, the more ovarian follicles present. The level of inhibin B that predicts a poor response to IVF treatment has not been established with this assay.

In males, inhibin B levels are higher in men with apparently normal fertility than in those with infertility and abnormal spermatogenesis. Serum inhibin B, when used in combination with FSH, is a more sensitive marker of spermatogenesis than FSH alone. However, the optimal level of inhibin B to assess male infertility has not been established.

**Reference Values**

**INHIBIN A, TUMOR MARKER**

Males: <2.0 pg/mL

Females

<11 years: <4.7 pg/mL

11-17 years: <97.5 pg/mL

Premenopausal: <97.5 pg/mL

Postmenopausal: <2.1 pg/mL

**INHIBIN B**

Males

0-23 months: <430 pg/mL

2-4 years: <269 pg/mL

5-7 years: <184 pg/mL

8-10 years: <214 pg/mL

11-13 years: <276 pg/mL

14-17 years: <273 pg/mL

Adults: <399 pg/mL

Females

0-23 months: <111 pg/mL
2-4 years: <44 pg/mL
5-7 years: <27 pg/mL
8-10 years: <67 pg/mL
11-13 years: <120 pg/mL
14-17 years: <136 pg/mL

Premenopausal
Follicular: <139 pg/mL
Luteal: <92 pg/mL
Postmenopausal: <10 pg/mL

**Interpretation**

Inhibin A levels are elevated in approximately 70% of patients with granulosa cell tumors and in approximately 20% of patients with epithelial ovarian tumors.

Inhibin B levels are elevated in approximately 89% to 100% of patients with granulosa cell tumors and in approximately 55% to 60% of patients with epithelial ovarian tumors.

A normal inhibin A or B level does not rule out a mucinous or granulosa ovarian cell tumor.

For monitoring of patients with known ovarian cancer, inhibin A and B levels decrease shortly after surgery. Elevations of inhibin A or B after treatment are suggestive of residual, recurrent, or progressive disease. In patients with recurrent disease, inhibin A or B elevation seems to be present earlier than clinical symptoms. Patients in remission show normal levels of inhibin A and B.

For infertility evaluation, an inhibin B level in the postmenopausal range is suggestive of a diminished or depleted ovarian reserve.

**Cautions**

Inhibin values fluctuate during the menstrual cycle. Inhibin levels in premenopausal women should be interpreted with caution.

Do not interpret serum inhibin levels as absolute evidence of the presence or the absence of malignant disease. Use results in conjunction with information from the clinical evaluation of the patient and other diagnostic procedures.

Tumor markers are not specific for malignancy and values may vary by testing methodology. The same method should be used to serially monitor patients.

Some patients who have been exposed to animal antigens, either in the environment or as part of treatment or imaging procedures, may have circulating antianimal antibodies present. These antibodies may interfere with the assay reagents to produce unreliable results.

**Clinical Reference**

Test Definition: INHAB
Inhibin A and B, Tumor Marker, S


Performance

Method Description
The Access Inhibin A assay is a sequential 2-step immunoenzymatic ("sandwich") assay. Sample is added to a reaction vessel and incubated with paramagnetic particles coupled with anti-inhibin A monoclonal antibody. Excess sample and reagents are removed and anti-inhibin A monoclonal antibody-alkaline phosphatase conjugate is then added to a reaction mixture. After incubation, unbound materials are washed away. Antibody-analyte complex is detected by addition of the chemiluminescent substrate Lumi-Phos* 530. The light production is directly proportional to the concentration of inhibin A in the sample.(Package insert: Beckman Coulter Inc, July 2019)

Inhibin B Gen II ELISA is an enzymatically amplified 3-step "sandwich" assay. Sample is incubated in wells that have been coated with anti-activin B antibody. After incubation and washing, the wells are incubated with biotinylated anti-inhibin detection antibody. After a second incubation and washing step, the wells are incubated with streptavidin labeled with the enzyme horseradish peroxidase. Antibody-analyte complex is detected by dual wavelength absorbance measurement after addition of the tetramethylbenzidine substrate. The absorbance measured is directly proportional to the concentration of inhibin B in the samples.(Package insert: Inhibin B Gen II ELISA kit, Beckman Coulter, Inc. March 2018)

PDF Report
No

Day(s) and Time(s) Test Performed
Inhibin A: Monday through Friday; 5 a.m.-9 a.m.
Saturday; 6 a.m.-1 p.m.

Inhibin B: Monday, Wednesday, Friday; 10 a.m.

Analytic Time
Same day/1 day

Specimen Retention Time
Test Definition: INHAB
Inhibin A and B, Tumor Marker, S

INHA: 12 months; INHB: 3 months

Performing Laboratory Location
Rochester

Fees and Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their Regional Manager. For assistance, contact Customer Service.

Test Classification
This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the U.S. Food and Drug Administration.

CPT Code Information
83520-Inhibin B
86336-Inhibin A

LOINC® Information

<table>
<thead>
<tr>
<th>Test ID</th>
<th>Test Order Name</th>
<th>Order LOINC Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INHAB</td>
<td>Inhibin A and B, Tumor Marker, S</td>
<td>87426-3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Result ID</th>
<th>Test Result Name</th>
<th>Result LOINC Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INHA</td>
<td>Inhibin A, Tumor Marker, S</td>
<td>23883-2</td>
</tr>
<tr>
<td>88722</td>
<td>Inhibin B, S</td>
<td>56940-0</td>
</tr>
</tbody>
</table>