MAYO CLINIC LABORATORIES

Test Definition: INHAB

Inhibin A and B, Tumor Marker, Serum

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

Test Id	Reporting Name	Available Separately	Always Performed
INHA	Inhibin A, Tumor Marker, S	Yes	Yes
INHB	Inhibin B, S	Yes	Yes

Method Name

INHA: Immunoenzymatic Assay
INHB: Enzyme-Linked Immunosorbent Assay (ELISA)

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Supplies: Sarstedt Aliquot Tube 5 mL (T914)
Collection Container/Tube:
Preferred: Serum gel
Acceptable: Red top
Submission Container/Tube: Plastic vial
Specimen Volume: 1.1 mL
Collection Instructions: Centrifuge and aliquot serum into a plastic vial.

Forms

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

Specimen Minimum Volume

0.9 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Ambient	7 days	
	Frozen	90 days	

Clinical & Interpretive

Clinical Information

Inhibins are heterodimeric protein hormones secreted by granulosa cells of the ovary and Sertoli cells of the testis. They selectively suppress secretion of pituitary follicle stimulating hormone (FSH) and 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 female individuals, 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 mid-follicular 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 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 these 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 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 studies for inhibin A and B as ovarian cancer markers 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 the following: day 3 FSH, day 3 inhibin B, and anti-mullerian 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 male patients, inhibin B levels are higher in those 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: <5.0 pg/mL

Females
<11 years: <5.0 pg/mL
11-17 years: <98 pg/mL
Premenopausal: <98 pg/mL
Postmenopausal: <5.0 pg/mL

INHIBIN B
Males
<15 days: 68-373 pg/mL
15-180 days: 42-516 pg/mL
6 months-7 years: 24-300 pg/mL
8-30 years: 47-383 pg/mL
31-72 years: <358 pg/mL
>72 years: Not established

Females
< or =12 years: <183 pg/mL
13-41 years regular Cycle (Follicular Phase): <224 pg/mL
42-51 years regular Cycle (Follicular Phase): <108 pg/mL
13-51 years regular Cycle (Luteal Phase): <80 pg/mL
>51 years (Postmenopausal): <12 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.

In rare cases, some individuals can develop antibodies to mouse or other animal antibodies (often referred to as human anti-mouse antibodies [HAMA] or heterophile antibodies), which may cause interference in some immunoassays. Caution should be used in interpretation of results and the laboratory should be alerted if the result does not correlate with the clinical presentation.

Clinical Reference

1. Mom CH, Engelen MJA, Willemse PHB, et al. Granulosa cell tumors of the ovary: the clinical value of serum inhibin A and B levels in a large single center cohort. Gynecol Oncol. 2007;105(2):365-372
2. Robertson DM, Pruysers E, Jobling T. Inhibin as a diagnostic marker for ovarian cancer. Cancer Lett. 2007;249(1):14-17
3. Jamieson S, Fuller PJ: Management of granulosa cell tumour of the ovary. Curr Opin Oncol. 2008;20(5):560-564
4. Sturgeon C. Tumor markers. In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and

Molecular Diagnostics. 6th ed. Elsevier; 2018:436-478
5. Yarbrough ML, Stout M, Gronowski AM. Pregnancy and its disorders. In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:1655-1696
6. Makanji Y, Zhu J, Mishra R, et al. Inhibin at 90: from discovery to clinical application, a historical review. Endocr Rev. 2014;35(5):747-794. doi:10.1210/er.2014-1003
7. Walentowicz P, Krintus M, Sadlecki P, et al. Serum inhibin A and inhibin B levels in epithelial ovarian cancer patients. PLoS One. 2014;9(3):e90575. doi:10.1371/journal.pone.0090575

Performance

Method Description

Inhibin A

The assay is performed using a Beckman Coulter Unicel DXI 800. 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. The light production is directly proportional to the concentration of inhibin A in the sample.(Package insert: Access Inhibin A. Beckman Coulter Inc; 10/2023)

Inhibin B

The ultra-sensitive inhibin B enzyme-linked immunosorbent assay is a quantitative three-step sandwich type immunoassay. Sample is incubated in wells that have been coated with inhibin B antibody. After incubation and washing, the wells are incubated with biotinylated inhibin B antibody. After a second incubation and washing step, the wells are incubated with streptavidin horseradish peroxidase conjugate. After the third incubation and washing step, the wells are incubated with substrate solution. After incubation, an acidic stopping solution is added. Antibody-analyte complex is detected by dual wavelength absorbance measurement at 450 nm as the primary test filter and 620 nm as the reference filter. The absorbance measured is directly proportional to the concentration of inhibin B in the samples and calibrators.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday, Wednesday, Friday

Report Available

2 to 4 days

Specimen Retention Time

3 months

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Superior Drive

Fees & 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 account representative. 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. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

83520-Inhibin B
86336-Inhibin A

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
INHAB	Inhibin A and B, Tumor Marker, S	87426-3

Result ID	Test Result Name	Result LOINC® Value
INHA	Inhibin A, Tumor Marker, S	23883-2
88722	Inhibin B, S	56940-0