Anti-Mullerian Hormone

Anti-mullerian hormone (AMH) is exclusively produced by gonadal tissue, namely the testicular Sertoli cells and the ovarian granulosa cells. In males, the major function of AMH is to induce regression of the Mullerian structures (Fallopian tubes, uterus and upper third of vagina) in utero. Circulating AMH levels rise rapidly during the first year of male life, are highest during late infancy and gradually decline until puberty. In females, AMH is mainly produced by primordial follicles and small antral follicles up to the 4-6mm stage. AMH has an inhibitory effect on primordial follicle recruitment and on the responsiveness of the growing follicles to FSH.

Expected concentrations

In females AMH levels are almost undetectable at birth, with an increase in the first 2-4 years of life; then AMH levels are stable until the age of approximately 30 years after which there is a gradual decline reflecting follicular depletion.

AMH is measured in Endolab using the Gen II AMH ELISA kit from Beckman Coulter Ltd. Prior to 08-11-2010 the Immunotech ELISA kit was used.

Applications

The measurement of serum AMH has been used in a variety of clinical settings, most of which are currently investigational and not a component of routine clinical care. The most well established indications for AMH measurement are the following:

1. Evaluation of intersex disorders - the persistent Mullerian duct syndrome is a rare form of male pseudohermaphroditism characterised by the persistence of Mullerian structures in otherwise normal males. Broadly, this genetically transmitted disorder may be due to either a mutation in the gene encoding AMH (type 1) or an inactivating mutation in the AMH receptor (type 2). The measurement of AMH predicts the nature of the underlying genetic defect and may allow targeted mutational analysis of the gene for AMH or the receptor. Moreover, AMH measurement can be used to determine testicular status in prepubertal children with impalpable gonads, thus allowing differentiation of anorchidism from bilateral undescended testes in boys with cryptorchidism.

2. Marker of granulosa cell tumours - AMH levels are increased in more than 75% of women with granulosa cell tumours (GCTs) and seem to be a superior tumour marker compared to alpha-inhibin and oestradiol in the follow up of GCTs.

AMH measurement has also been used, mostly on a research basis, in the following settings:

1. Marker of ovarian reserve in assisted reproduction technology (ART) - as AMH is produced by the growing antral follicles (4-6mm) up to the stage of selection of a dominant follicle, it may serve as a marker of ovarian reserve for women undergoing IVF. Studies have suggested that day 3 AMH levels in an IVF cycle predict the number
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of oocytes retrievable as well as clinical pregnancy outcome. Other studies suggest that IVF patients who develop ovarian hyperstimulation syndrome have 6-fold higher basal AMH levels than controls. However, the precise role that AMH measurement in the IVF setting awaits further detailed investigation.

2. **Polycystic ovary syndrome** - serum AMH levels are markedly elevated in patients with polycystic ovary syndrome (PCOS), a reflection of the multiple small antral follicles in this disorder, prompting the suggestion that measurement of AMH may be useful as a surrogate for ovarian ultrasound in the appropriate clinical context. Other work has suggested that treatment of patients with PCOS with metformin decreases AMH and that daughters of women with PCOS have raised AMH when compared with controls. Precise cutoff values to allow routine clinical use will require further studies.

3. **Marker of ovarian reserve in ageing women** - AMH levels are undetectable after the menopause or oophorectomy. AMH levels on day 3 of the menstrual cycle show a progressive decrease with age which precedes the follicular phase rise in FSH, decline in inhibin-B and number of antral follicles, suggesting that AMH is the best marker of ovarian ageing and the menopausal transition.

**References:**

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