Anti-Müllerian Hormone:

An Eggciting Introduction

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Overview

• What is AMH?
• Application/Uses
• How it's measured and compares with other labs
• Case studies
• Limitations
What is AMH?

• A glycoprotein part of the transforming growth factor family.
• In males: Produced by immature sertoli cells. Important in sex differentiation.
• In females: Produced by granulosa cells of primary and secondary follicles.

Two Main Functions in Females:
• Regulates the number of primordial follicles that begin maturation.
• Prevents the recruitment of non-dominant follicles during FSH-mediated selection.
Folliculogenesis

Application

• Important marker in the assessment of ovarian reserve in women undergoing fertility counselling.
• AMH reflect the number of small follicles entering the growth phase of their life cycles which is suggestive of the number of primordial follicles that still remain in the ovary.

AMH levels can:
• Predict the response to ovarian stimulation in fertility treatment
• Predict the age of menopause
• Help in the diagnosis of Polycystic ovarian syndrome (PCOS) and ovarian failure
Other tests in assessing ovarian reserve include:
• FSH
• Oestradiol
• Progesterone (6-8 days before menstruation)
• FSH and oestradiol must be measured during the early follicular phase because they are part of the pituitary-ovarian feedback system.
• Less sensitive in early stages of reduced ovarian reserve.
• AMH not part of the pituitary-ovarian feedback system therefore it can be measured at any time.

https://mindthegraph.com/profile/mindthegraph2/menstrual-cycle#/
Other Uses

Evaluation of intersex disorders:
• Persistent Mullerian Duct Syndrome: Affects males that have normal male reproductive organs and genitalia as well as a uterus and fallopian tubes.
• AMH levels can help achieve targeted mutation analysis of the gene for AMH.

AMH can also help in distinguishing between:
• Cryptorchidism: One or both testes fail to descend from the abdomen.
  And
• Anorchism: Genetic male born without testes.

As a tumour marker:
• Aids in diagnosis and management of granulosa cell tumours.
Roche AMH Immunoassay

- 18 min assay
- Sandwich electrochemiluminescence
- Serum or lithium heparin plasma
- Sample stability: 3 days at RT, 5 days at 2-8°C or 6 months at -20°C
- Measuring range: 0.07-164 pmol/L
Measurement

- 70 Samples collected and analysed
- Results compared to CHL’s method (Beckman-Coulter)
Measurement

Anti-Müllerian Hormone: WSCL vs CHL Comparison

\[ y = 1.075x - 0.0026 \]
\[ R^2 = 0.9877 \]

-\( R^2 \) value: 0.9877
### Reference Intervals

#### Females:
**Expected ranges: (25 – 75th percentiles)**

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>AMH (pmol/L)</th>
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<tbody>
<tr>
<td>18-25</td>
<td>18-45</td>
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<tr>
<td>26-30</td>
<td>8-30</td>
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<td>31-35</td>
<td>8-30</td>
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<td>36-40</td>
<td>5-25</td>
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<td>41-45</td>
<td>1-8</td>
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- If AMH >30 pmol/L consider Polycystic Ovary Syndrome (PCOS) or if markedly elevated, granulosa cell tumour of the ovary. If on ART, elevated AMH indicates risk of possible ovarian hyperstimulation. Fertility assessment should consider the full clinical context.
Limitations

AMH stability during a menstrual cycle
• Some reports suggest AMH is highest during the follicular phase and lowest in the luteal phase.
• A study done at the University of Messina proved that there are fluctuations in AMH levels, however the differences were not clinically significant.

A. La Marca, G. Stabile, A.Carducci Artenisio, A. Volpe, Serum anti-Mullerian hormone throughout the human menstrual cycle.
Limitations

Contraceptive Use
• A study found that there was a 30% decrease in AMH in cases of prolonged contraceptive use.
• Temporary suppression.
• 2 months after contraceptives stopped, AMH levels increased.
• Possible need for timing of AMH levels in this case.

Serum AMH at baseline and after 5 weeks and 9 weeks of administration of contraceptives.

Antonio La Marca, Valentina Grisendi, and Georg Griesinger, “How Much Does AMH Really Vary in Normal Women?”
Example 1
A 35 year-old woman with an AMH level of 20 pmol/L. This means she has an average number of eggs left in her ovaries. Average means she is likely to go through menopause at around 51-52 and she is likely to have children until she is 41. She is also likely to get an average number of eggs in an IVF cycle.

Example 2
A 35 year-old woman with an AMH level of 10 pmol/L. Her level sits on the 25th centile and so she is likely to go through menopause at around 49. She is also probably going to produce fewer eggs if she did an IVF cycle and so she would need a higher dose of ovarian stimulation drugs.

A 29 year-old woman who was seen at a reproductive medicine clinic with a 2 year history of secondary subfertility.

• No significant medical history.
• FSH, oestradiol, progesterone and AMH levels were done.
• Ultrasound done to identify any abnormalities.
• AMH: 99.54 pmol/L.
• Suspicious area on left ovary seen on ultrasound and MRI.
• Other tumour markers like CA-125, HCG and AFP were all normal.
• Laparotomy confirmed presence of 10 cm mass on left ovary.
• Histology examination confirmed GCT.
• One month after surgery AMH levels dropped to 39.09 pmol/L.
• Six months after surgery she was able to conceive through IVF.
AMH is a useful marker of ovarian reserve where it can:
- Predict response to IVF
- Provide a time frame for women to have children

Stability of AMH has the advantage over traditional assessments of FSH, oestradiol and progesterone measurements.

Minor limitations: contraceptive use easily overcome with correct information and timing.

Roche assay has shorter test time but same accuracy as other methods.


• A. La Marca, G. Stabile, A. Carducci Artenisio, A. Volpe, Serum anti-Mullerian hormone throughout the human menstrual cycle, Human Reproduction, Volume 21, Issue 12, Dec 2006, Pages 3103–3107


References


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TO MY PRESENTATION