

## OBJECTIVES



- 1) Bibliographic review and **synthesis** of the main aspects related to **cryptorchidism** in horses.
- 2) Summary of the **main diagnostic techniques** and analysis of new **techniques based on the activity of the anti-Müllerian hormone** as a biomarker for the diagnosis of cryptorchidism in equines.
- 3) **Comparison** based on concrete studies among the **main diagnostic techniques**.

## INTRODUCTION



### Types of retention

- Inguinal permanent
- Abdominal
- Unilateral/Bilateral

### Incidence

- Prevalence in foals 2-8%
- Unilateral cryptorchids > bilateral cryptorchids

## CRYPTORCHIDISM

### Causes and genetics



Multifactorial

- Failure in **TESTICULAR DESCENT**

Regulated by different genes

Over-representation in some breeds

### Consequences

- Ethology: nervousness, aggressiveness, stallion like behaviour
- Reproductive: infertility

## DIAGNOSTIC METHODS

### HISTORY, PALPATION & ULTRASONOGRAPHY

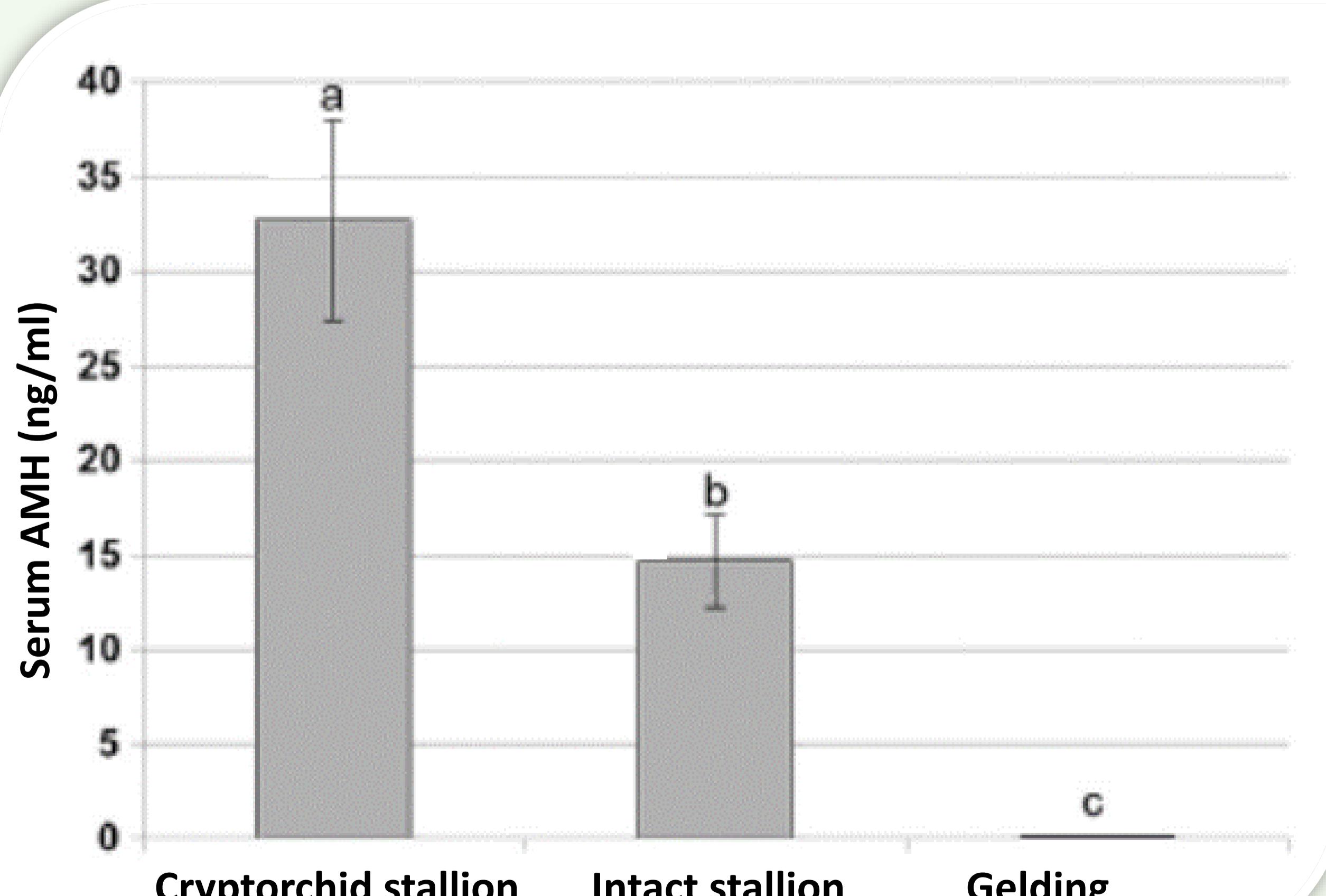


- **Rig** → entire male horse with stallion like behavior and no signs of external testicles. // **False rig** → gelding male horse with stallion like behavior and no signs of external testicles.
- At **1 to 2 years of age**, a stallion should receive an **examination** of inguinal and scrotal areas. If the testes are not present, rectal examination should be performed.
- **Ultrasonography** (transrectal or transcutaneous): **cryptorchid testis** → smaller, higher degree of echogenicity and difficult to see the central vein.

### ANTI-MÜLLERIAN HORMONE CONCENTRATIONS



- Functions of AMH: **sexual differentiation** during foetal life and **inhibition of Leydig cells** (quiescent state of testis) in foals.
- AMH secreted only by Sertoli cells → **specific marker of testicular tissue**.
- Cryptorchid stallion > intact stallion > gelding.

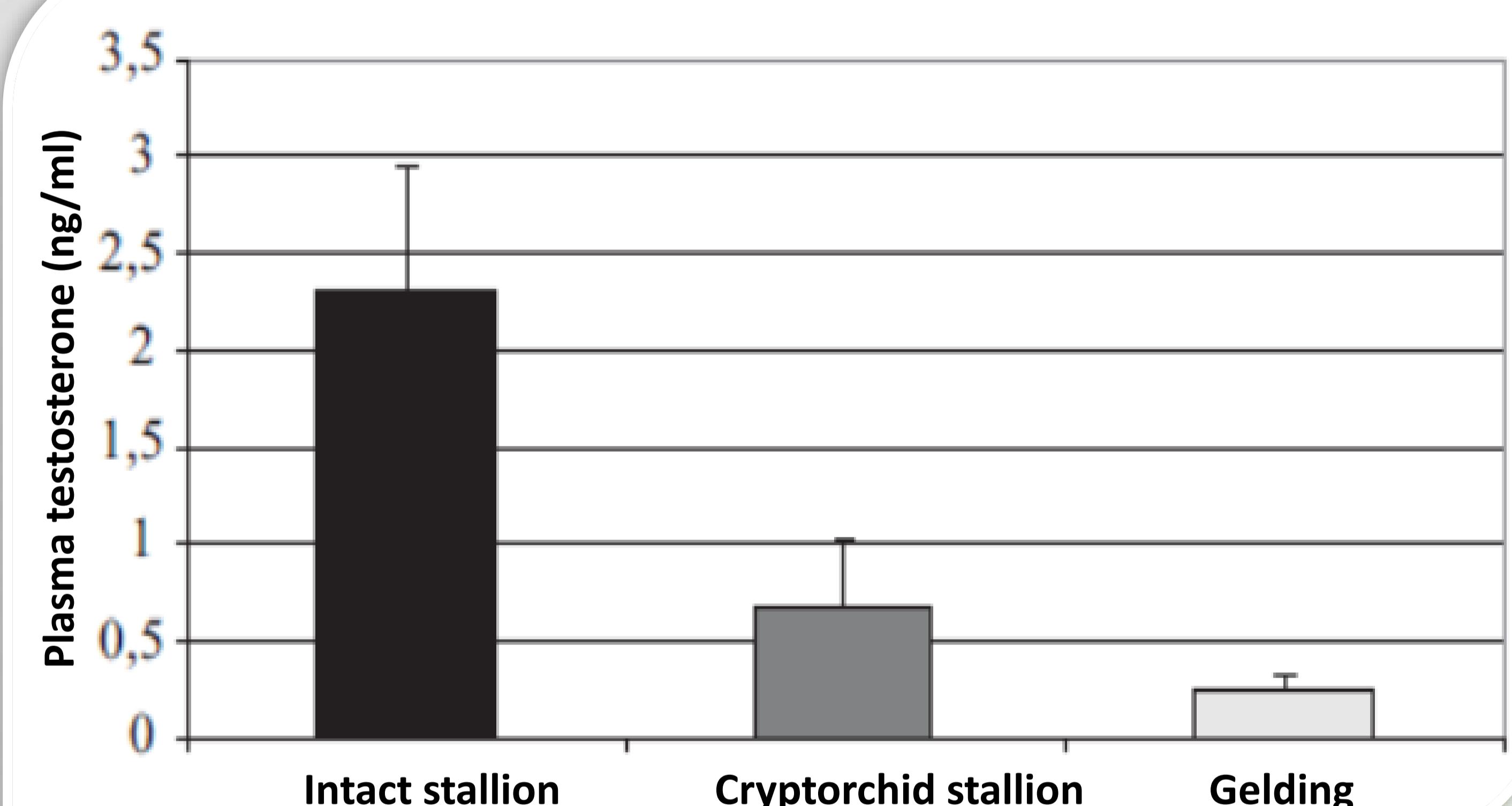


Mean serum AMH concentration in cryptorchid stallions (n=41), intact stallions (n=15), and geldings (n=41). Claes, Barry A. Ball, et al. 2013.

### BASAL TESTOSTERONE CONCENTRATIONS

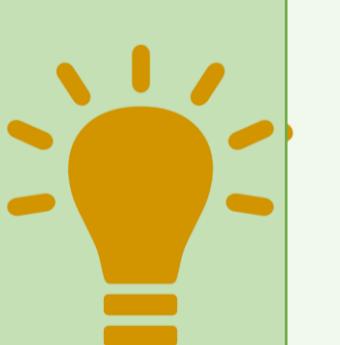


- Sources of **variability**: season, age and secretion of testosterone by adrenal glands.
- Cox et al. 1986, (n=1720) → 14% not clear
  - hCG stimulating test → 6,7% result
- Intact stallion > cryptorchid stallion > gelding.



Basal plasma level of testosterone in cryptorchid stallions (n=32), intact stallions (n=15), and geldings (n=15). Raš et al. 2010.

## CONCLUSIONS



- **Cryptorchidism** is a relatively **frequent** condition in **equines** with a **multifactorial origin** and a **genetic basis**.
- The **diagnosis** can be very **simple** or very **complex** and may require the **combination of diagnostic techniques**.
- The use of **basal testosterone** concentrations for the cryptorchidism diagnosis generates **inconclusive results** and may require the use of additional techniques.
- The **anti-Müllerian hormone** is a good **biomarker** for the presence of **testicular tissue** and may be useful in the endocrine diagnosis of cryptorchidism in equines.
- In veterinary medicine, **more research is needed** into the diagnosis of cryptorchidism by the anti-Müllerian hormone.

## REFERENCES

- Almeida J, Conley AJ, Mathewson L, Ball BA. 2012. Expression of anti-Müllerian hormone, cyclin-dependent kinase inhibitor (CDKN1B), androgen receptor, and connexin 43 in equine testes. *Claes A, Ball BA, Almeida J, Conley AJ, Gaskins AJ. 2013. Serum anti-Müllerian hormone concentrations in stallions: Developmental changes, seasonal variation, and differences between intact stallions, cryptorchid stallions, and geldings.*
- Clae A, Ball BA, Corbin CJ, Conley AJ. 2013. Age and season affect serum testosterone concentrations in cryptorchid stallions.
- Clae A, Ball BA, Corbin CJ, Conley AJ. 2014. Anti-Müllerian hormone as a diagnostic marker for equine cryptorchidism in three cases with equivocal testosterone concentrations.
- Davis J, Ball BA, Farley JA, Ball BA. 2006. Feline cryptorchidism. Medicine and surgery.
- Derek C, K. Nicola H, John E. M. 2004. Equine neonatology. Medicine and surgery.
- Derek JF. 2008. Pathologic conditions of the stallion reproductive tract.
- Gaskins S, Arnold C, Wade C, Leib T, Dietl O, Chowdhury BP, Verner DD, Radtke T. 2016. ARRIC genes as candidate loci for equine cryptorchidism.
- Malinoff MA, Gao JF, Shiba S, Ueda MA, Ball BA, Dominguez A, Mahmud MA. 2015. Cryptorchidism in Mammals: A Review.
- Mc Kinney AG, Voss JL. 2005. Equine reproduction.
- Net S, Parada LF. 2000. Hormones in male sexual development.
- Ras A, Rapaport A, Ras-Noyrotka M, Janowska E. 2010. Clinical, hormonal and ultrasonographic approaches to diagnosing cryptorchidism in horses.
- Santos JC, Peleteiro M, Ferreira M. 2006. Clinical use of transabdominal ultrasonography to determine the location of cryptorchid testes in the horse.
- Schambach MA, Farley JA, Marcos M, Lavery S. 2006. Use of transabdominal ultrasound to determine the location of cryptorchid testes in the horse.
- Silberzahn P, Rashed F, Zwain J, Leymarie P. 1984. Androstenedione and testosterone biosynthesis by the adrenal cortex of the horse.

