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Age-related changes in oocyte yield and embryonic development in light horse mares

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INTRODUCTION

Reproductive aging significantly influences ovarian function and oocyte quality across species, including horses. Understanding age-related changes in oocyte yield and embryonic development is crucial for improving equine assisted reproductive techniques (ART) and addressing clinical and economic challenges, particularly in older mares.

OBJECTIVES

To assess the association of mare age with:

1. Oocyte retrieval
2. Oocyte maturation
3. Cleavage rates
4. Blastocyst production

METHODS

Study Design: Retrospective analysis of 119 light horse mares categorized into three age groups:

- Young (n = 26; 5.9 ± 0.5 years)
- Mature (n = 60; 14.5 ± 0.3 years)
- Senior (n = 33; 21.9 ± 0.4 years).

- Ovum pickup (OPU) was performed via transvaginal ultrasound-guided follicular aspiration during April–May 2024, coinciding with peak follicular activity in the northern hemisphere.
- Oocytes: 2,151 oocytes underwent proprietary ICSI protocols.
    - Only metaphase II (MII) oocytes were injected. Cleavage and blastocyst stages were assessed.
- Statistical Analysis: Mixed-effects modeling in PROC MIXED (SAS v9.4) with age group as a fixed effect and mare as a random effect. Statistical significance was set at $P < 0.05$, with trends noted at $P < 0.1$

RESULTS

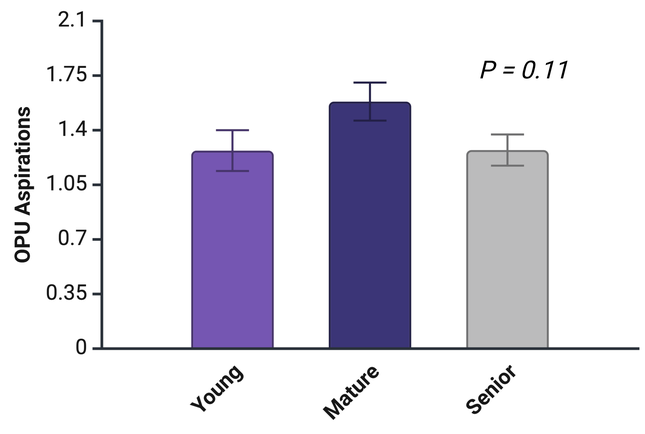

Figure 1. Number of ovum pick-up (OPU) aspirations for young, mature, and senior mares. No significant differences were observed among age groups (P = 0.11).

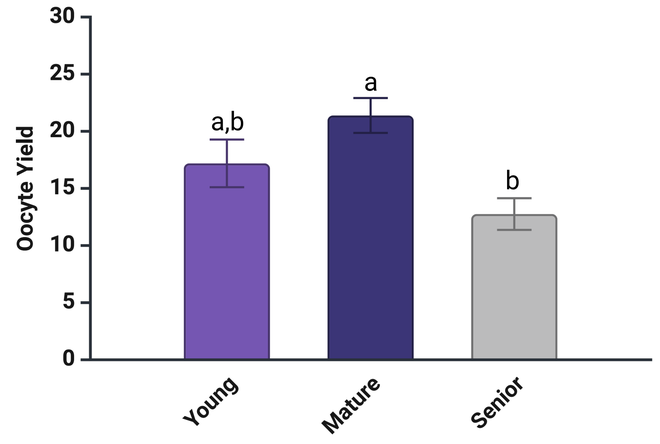

Figure 2. Oocyte yield in young, mature, and senior mares. Mature mares yielded significantly more oocytes than senior mares (P = 0.0012), with no significant difference between young and mature mares (P = 0.99) or young and senior mares (P = 0.96).

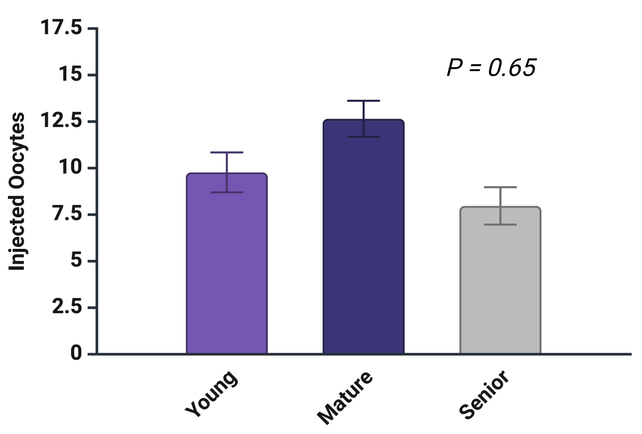

Figure 3. Number of injected oocytes in young, mature, and senior mares. No significant differences were observed in the proportion of injected oocytes among the age groups (P = 0.65).

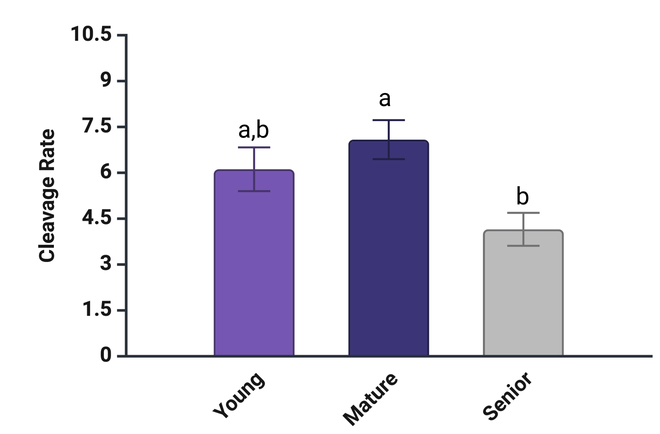

Figure 4. Cleavage rate in young, mature, and senior mares. Mature mares had a significantly higher cleavage rate compared to senior mares (P = 0.0048), with no significant difference between mature and young mares (P = 0.59) or senior and young mares (P = 0.18).

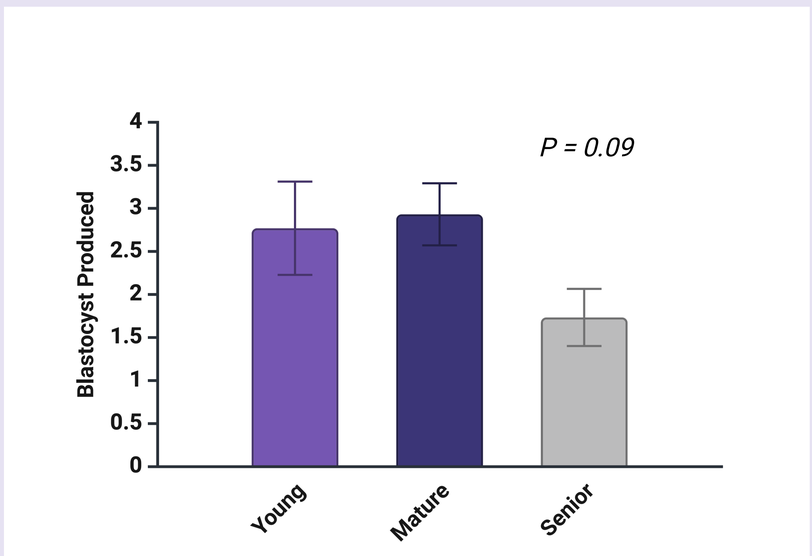

Figure 5. Blastocyst production in young, mature, and senior mares. Mature mares produced more blastocysts than senior mares, with a near-significant difference (P = 0.09), but no significant difference between mature and young mares (P = 0.96) or senior and young mares (P = 0.13).

CONCLUSION

- Reproductive age impacts specific parameters, with mature mares demonstrating superior oocyte yield and cleavage rates compared to senior mares
- Trends in blastocyst production highlight the potential clinical and economic implications of age in assisted reproduction, particularly for senior mares
- Further investigation is needed to account for semen quality variability and its effect on outcomes

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