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האגודה הישראלית לחקר הפוריות (אילי"ה)
THE ISRAEL FERTILITY ASSOCIATION (IFA)
الجمعية الإسرائيلية لأبحاث الخصوبة

Epigenetic aging in oocytes

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Introduction

Aging oocytes significantly affect female fertility, particularly in advanced maternal age, leading to increased rates of aneuploidy and related syndromes such as Down syndrome. A key factor in this process is heterochromatin loss, which affects chromosomal stability during meiosis. This study investigates the link between heterochromatin loss and chromosomal instability, focusing on kinetochore function, sister chromatid cohesion and telomeric damage-induced foci (TIFs). Using Chaetocin as a model to induce heterochromatin loss, we analyze its effects on key chromosomal markers. Additionally, we evaluate the potential of Curcumin to restore heterochromatin levels, improve oocyte maturation, and enhance embryo viability. Understanding these mechanisms may contribute to strategies for reducing aneuploidy and enhancing in-vitro maturation (IVM) techniques .

Aims

- Investigating the mechanisms by which loss of heterochromatin in oocytes contributes to chromosomal instability and aneuploidy.
- Examining whether increasing heterochromatin levels can improve embryo development in IVF.

Methods & Results

Experiment 1

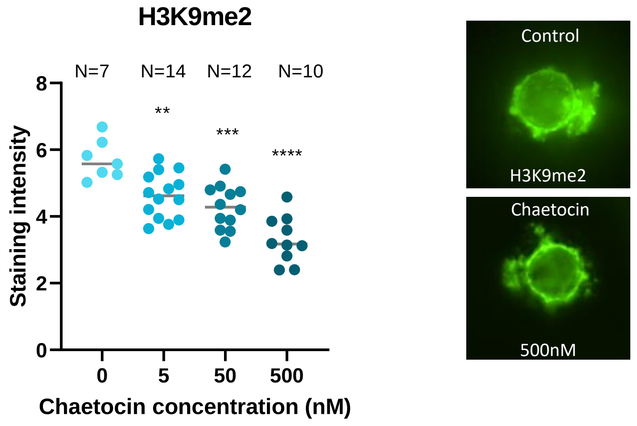

Figure 1. Chaetocin Treatment Reduces H3K9me2 Levels in a Dose-Dependent Manner. Chaetocin treatment leads to a dose-dependent decrease in H3K9me2 levels, reflecting the reduction in heterochromatin. Statistical significance is indicated (**p < 0.01, ***p < 0.001, ****p < 0.0001).

Experiment 2

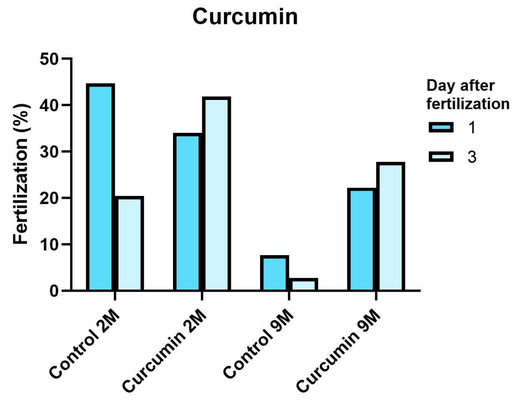

Figure 2. Fertilization Rates (%) in Young (2M) and Old (9M) Mice. Fertilization percentages on days 1 and 3 after fertilization under control and Curcumin treatments, comparing age groups.

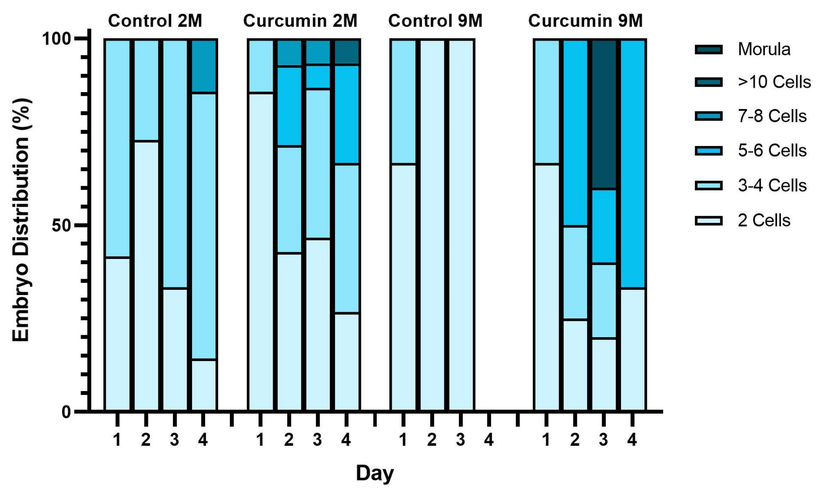

Figure 3. Embryo Development Distribution (%) in Young (2M) and Old (9M) Mice. The percentage distribution of embryos at various developmental stages over days 1–4 in young (2M) and old (9M) mice under control and Curcumin treatments.

Conclusions

Our research highlights the critical role of heterochromatin in maintaining chromosomal stability during meiosis. Understanding these epigenetic changes can provide valuable insights for improving fertility treatments and reducing aneuploidy risks in assisted reproductive technologies. These findings support the development of targeted interventions, such as curcumin supplementation, to enhance oocyte quality and embryo viability in aging individuals.

Future plans

- Kinetochore, cohesin and telomere components staining
- Retrotransposons levels
- Chromosome spreads
- Maturation+aneuploidity

References:
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