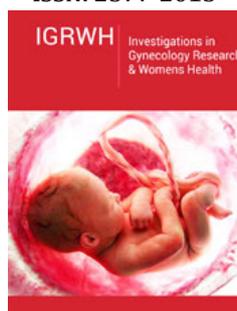


# Genetic Characteristics of Oocytes and Somatic Cells of Ovarian Follicles in Humans

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ISSN: 2577-2015



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**Submission:**  December 09, 2019

**Published:**  May 21, 2020

Volume 3 - Issue 4

**How to cite this article:** Bezerra FTG, Silva JVR. Genetic Characteristics of Oocytes and Somatic Cells of Ovarian Follicles in Humans. Invest Gynecol Res Women's Health. 3(4). IGRWH.000567. 2020. DOI: [10.31031/IGRWH.2020.03.000567](https://doi.org/10.31031/IGRWH.2020.03.000567)

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## Mini Review

Since most of the RNAs/proteins that support the initial phases of embryogenesis are accumulated during oocyte growth [1], knowledge about the effects of oocyte quality on embryo development plays a crucial role in the development of adequate assisted reproduction techniques. In this sense, understanding the requirements of oocytes recovered from different sized follicles is very important to optimize IVM and IVF of oocytes, which can have an excellent impact on the number of embryos produced in vitro. It will also allow analysis of the developmental potential of oocytes at different stages of development, the pattern of gene expression, the epigenetic modifications and the cytogenetic disorders in various domestic species, including humans [2].

### Influence of oocyte and follicle sizes on oocyte maturation

In human oocytes, gain of meiosis ability starts at the antral follicle stage, while its size reaches up to 100-120 $\mu$ m. Theoretically, antral follicles with diameter of 2.0-5.0mm contain oocytes with nuclear and cytoplasmic competence [3]. However, the minimum size of follicles required for developmental competence in humans is estimated to be 5.0-7.0mm in diameter [4]. It is possible that the selection of the dominant follicle induces changes in the remaining follicles that are detrimental for subsequent oocyte fertilization and embryonic development. Fadini et al. [5] reported that follicles of up to 12mm in size at the time of oocyte retrieval have not compromised their outcome. Taken together, the above information proposes that the molecular events that are triggered according to follicular and oocyte development influence oocyte maturation.

### Gene expression in oocytes from follicles of different sizes

It is well known that while the oocyte progresses in growth and development, it acquires maternal stores (mRNAs and proteins) which are essential to support the development of the embryo during the early cleavage stages [6]. Under *in-vitro* conditions, the dynamic micro RNA (miRNA) profile changes are partly attributed to the *in-vitro* maturation environment or ingredients used, while under *in-vivo* conditions, the miRNA profile is affected by physiological conditions, like the age. In humans, treatment of metaphase I (MI) human oocytes with insulin-like growth factor 1 activates the expression of miR-133a, miR-205-5p and 145 miRNAs and suppresses 200 others, including miR-152 and miR-142-5p [7]. In the same context, [8] demonstrated that YTHDF2 post-transcriptionally regulates transcript dosage during oocyte maturation and act as determinant of mammalian egg quality. Several studies have correlated the oocyte ATP content and its developmental competence, both in humans [9].

### Characteristics of somatic cells of follicles at different sizes

Within an antral follicle, the oocyte is surrounded by several layers of cumulus and mural granulosa cells. It is known that the characteristics of these cells vary according to the size of the follicle and this can directly affect the ability of the enclosed oocyte to undergo maturation. A study with humans [10] showed that the morphology of CCs collected from follicles smaller than 12.0mm is different from those retrieved from mature follicles of standard IVF. Immature oocytes rescued from smaller antral follicles are usually embedded in more compact cumulus

cells [10]. The number of dispersed CCs increases with duration of human chorionic gonadotrophin (HCG) priming and growing of follicular size in IVM program [11]. The patterns of CCs are divided into three groups: dispersed, compacted and sparse. Dispersed CCs have an expanded CC and multiple layers of corona cells. A GV oocyte that is completely masked with many layers of corona cells is considered as compacted CCs, while very few coronal cells exist in sparse CCs [3]. Comparison of different patterns of COCs reveals a significant increase in COCs with dispersed cumulus cells during oocyte maturation and blastocyst formation [3].

## References

1. Biase FH, Cao X, Zhong S (2014) Cell fate inclination within 2-cell and 4-cell mouse embryos revealed by single-cell RNA sequencing. *Genome Res* 24(11): 1787-1796.
2. Sirard MA, Richard F, Blondin P, Robert C (2006) Contribution of the oocyte to embryo quality. *Theriogenology* 65(1): 126-136.
3. Son WY, Chung JT, Dahan M (2011) Comparison of fertilization and embryonic development in sibling *in vivo* matured oocytes retrieved from different sizes follicles from *in vitro* maturation cycles. *J Assist Reprod Genet* 28(6): 539-544.
4. Trounson A, Anderiesz C, Jones G (2001) Maturation of human oocytes *in vitro* and their developmental competence. *Reproduction* 121(1): 51-75.
5. Fadini R, Canto MB, Mignini RM, Brambillasca F, Comi R, et al. (2009) Effect of different gonadotrophin priming on IVM of oocytes from women with normal ovaries: a prospective randomized study. *Reprod Biomed Online* 19(3): 343-351.
6. Li L, Zheng P, Dean J (2010) Maternal control of early mouse development. *Development* 137(6): 859-870.
7. Xiao G, Xia C, Yang J, Liu J, Du H, et al. (2014) MiR-133b regulates the expression of the Actin protein TAGLN<sub>2</sub> during oocyte growth and maturation: a potential target for infertility therapy. *PLoS ONE* 9(6): e100751.
8. Ivanova I, Much C, Giacomo M, Azzi C, Morgan M, et al. (2017) The RNA m<sup>6</sup>A reader YTHDF<sub>2</sub> is essential for the post-transcriptional regulation of the maternal transcriptome and oocyte competence. *Mol Cell* 67(6): 1059-1067.
9. Blerkom J, Davis P, Lee J (1995) ATP content of human oocytes and developmental potential and outcome after *in vitro* fertilization and embryo transfer. *Hum Reprod* 10(2): 415-424.
10. Yang Y, Kanno C, Sakaguchi K, Yanagawa Y, Katagiri S, et al. (2017) Extension of the culture period for the *in vitro* growth of bovine oocytes in the presence of bone morphogenetic protein-4 increases oocyte diameter but impairs subsequent developmental competence. *Anim Sci J* 88(11): 1686-1691.
11. Pincus G, Enzmann EV (1935) The comparative behavior of mammalian eggs *in vivo* and *in vitro*: I. the activation of ovarian eggs. *J Exp Med* 62(5): 665-675.

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