Oocyte secretory factors receptor modulation in a granulosa cell line. An approach to oocyte quality assessment

The oocyte quality is a key factor in female fertility as it will dictate the success of assisted reproductive techniques (ART). The understanding of the nature of the molecular and cellular mechanisms involved in the oocyte quality has been a subject of intense study in the field of medicine and a major challenge for reproductive biology. In consideration of current low rate of successful ART, it is expected that the improvement of regulatory factors and mechanisms of oocyte quality can be used to effectively enhance its success rates and contribute for the development of new options in the infertility treatment.

Some works demonstrated that the follicular micro-environment is essential for the oocyte development. The oocyte is dependent on the adjacent somatic cells due to the intimate relationship they establish. In fact, its growth and development associate with the multiplication and differentiation of granulosa cells (GCs), before reaching the stage of pre-antral follicle. Upon antrum formation, which approximately corresponds to the end of oocyte growth phase, the GCs differentiate into two anatomically and functionally distinct types: the mural GCs, that line the wall of the follicle and have principally a steroidogenic role, and cumulus cells (CCs), which form an intimate association with the oocyte. The CCs are disposed in several layers around the oocyte, but the closest cells possess highly specialized zona pellucida penetrating, cytoplasmic projections, whose tips establish contacts with the oocyte membrane through gap junctions; this complex structure called is the cumulus-oocyte complex (COC).

The molecular and cellular mechanisms involved in the different phases of ovarian follicle growth and development, probably consequence of the interactions between oocyte and cumulus cells, are not yet completely understood. However some data demonstrated that the oocyte development is sustained by the surrounding GCs, and the oocyte that, in turn, exerts several stimuli that favor GCs differentiation.

The maintenance of primary granulosa cells in culture has not allowed great progress in the study of this biological process. In contrast, the use of an immortalized granulosa cell line may be an advantage for the study of this complex process of human ovarian follicle development. Among the different granulosa cells lines established so far in several species, the GC1a type, a human granulosa cells line, was recently immortalized. Due to their close morphology, comparable to cumulus cells, this cell line

is likely to provide relevant information that help to understand the biological aspects underlying human ovarian follicle development. In this work we aim to characterize this dynamic process between GCs and oocyte, in order to develop clinical biomarkers of oocyte development and quality.

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