Identification of potential biomarkers in donor cows for in vitro embryo production by granulosa cell transcriptomics - DTU Orbit (12/12/2018)

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The Ovum Pick Up-In vitro Production (OPU-IVP) of embryos is an advanced reproductive technology used in cattle production but the complex biological mechanisms behind IVP outcomes are not fully understood. In this study we sequenced RNA of granulosa cells collected from Holstein cows at oocyte aspiration prior to IVP, to identify candidate genes and biological mechanisms for favourable IVP-related traits in donor cows where IVP was performed separately for each animal. We identified 56 genes significantly associated with IVP scores (BL rate, kinetic and morphology). Among these, BEX2, HEY2, RGN, TNFAIP6 and TXNDC11 were negatively associated while Mx1 and STC1 were positively associated with all IVP scores. Functional analysis highlighted a wide range of biological mechanisms including apoptosis, cell development and proliferation and four key upstream regulators (COX2, IL1, PRL, TRIM24) involved in these mechanisms. We found a range of evidence that good IVP outcome is positively correlated with early follicular atresia. Furthermore we showed that high genetic index bulls can be used in breeding without reducing the IVP performances. These findings can contribute to the development of biomarkers from follicular fluid content and to improving Genomic Selection (GS) methods that utilize functional information in cattle breeding, allowing a widespread large scale application of GS-IVP.

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