

In the Spotlight

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The Growing Importance of Noncoding RNAs in Early Life

It was not that long ago that researchers strongly believed that the answers to all questions related to genetics lied on the protein-coding genes present in an individual's genome. Therefore, it was with the stunning discovery, after the completion of the human genome project, that most DNA is not translated into proteins that more attention started to be devoted to non-coding genome sequences that were previously considered to be merely noise.

Since then, a large number of publications have come out to evidence the importance of small and long noncoding RNAs (lncRNAs) in all venues of life and disease, as key regulators of molecular mechanisms controlling important biological processes.

Reproductive Sciences has recently published several manuscripts that highlight the importance of noncoding RNAs,^{1,2} but in the current issue, in particular, 2 articles reinforce the significance of these sequences by evidencing their major role in 2 early life events that had not previously been established to be regulated by noncoding RNAs.

Knowing that microRNAs (miRNAs, the short, single-stranded, and noncoding messenger RNAs [mRNAs] that regulate gene expression by binding to the 3' untranslated region of a target mRNA) have been implicated in the pathogenesis of gestational diabetes mellitus, preeclampsia, and intrauterine growth restriction, Jiang et al³ sought to determine whether these regulatory RNAs also played a role in macrosomia (defined as an infant's birth weight of more than 4000 g, which is associated with pregnancy and labor problems, as well as obesity in the offspring's childhood and beyond). Their findings show that 1 miRNA is significantly upregulated and 10 others are significantly decreased in the prenatal serum of mothers who had an infant with macrosomia. In particular, the expression levels of miR-21 were found to be significantly lower in macrosomia as early as the third trimester of pregnancy, as compared to the controls. Since this miRNA shows a good predictive value for macrosomia, the authors suggest that it could be used as a candidate biomarker for this condition. The availability of a

biomarker that can predict early in pregnancy the risk of macrosomia with a minimal invasive test would greatly help in diminishing pregnancy complications along with child and adulthood obesity.

Xu et al⁴ focused their research on the prevalently transcribed lncRNAs (>200 bp) that have later gained prominence due to the findings that showed their involvement in many important biological processes, such as imprinting, cell differentiation, and immune response among others. Xu and colleagues were interested in understanding whether lncRNAs played a role in the 2-way signaling system involving the oocyte and the surrounding cumulus cell during oocyte development and ovulation. Furthermore, they sought to determine whether the lncRNAs profile expression would correlate with embryo development in in vitro fertilization (ivf) cycles. The authors were able to establish the expression profile of lncRNAs in cumulus cells from mature oocytes that resulted in high-quality embryos and from oocyte that resulted in poor embryo quality assessed on day 3 of development using microarray technology. The profile analysis shows that expression of lncRNAs differs significantly between the 2 groups of oocytes and associated cumulus cells, suggesting that these RNAs contribute to the process of oocyte and early embryo development. The authors propose that further studying the differences between the lncRNA expression profiles may lead to new methods of embryo selection in ivf cycles that would ultimately lead to improved success rates with decreased numbers of multiple pregnancies.

References

1. Chuang TD, Ho M, Khorram O. The regulatory function of miR-200c on inflammatory and cell-cycle associated genes in SK-LMS-1, a leiomyosarcoma cell line. *Reprod Sci.* 2015;22:563-571.
2. Agrawal S, Parveen F. Recurrent miscarriage and micro-RNA among North Indian Women. *Reprod Sci.* 2015;22:410-415.
3. Jiang H, Wen Y, Hu L, et al. Serum MicroRNAs as diagnostic biomarkers for macrosomia. *Reprod Sci.* 2015;22:664-671.
4. Xu X, Li J, Cao Y-X, et al. Differential expression of long non-coding RNAs in human cumulus cells related to embryo developmental potential: a microarray analysis. *Reprod Sci.* 2015;22:672-678.