Abstract

To elucidate the reproductive role of oxytocin (OXT) in ovarian steroidogenesis and its functional interaction with bone morphogenetic proteins (BMPs), the effects of OXT on ovarian steroidogenesis were investigated by utilizing primary culture of rat granulosa cells and human granulosa KGN cells. Here we revealed that the OXT receptor was expressed in both rat and human granulosa cells and that OXT treatment significantly increased follicle-stimulating hormone (FSH)- and forskolin (FSK)-induced progesterone production, but not estradiol production, by rat and human granulosa cells, respectively. In accordance with the effects of OXT on progesterone production, OXT enhanced mRNA expression of *CYP11A1* and *HSD3B2* induced by FSK in human granulosa cells. Of note, OXT enhanced the phosphorylation of SMAD1/5/9 and the transcription of *ID1* induced by BMP-15, but not those induced by BMP-6, in human granulosa cells. It was also revealed that OXT treatment upregulated the expression of *BMPR2*, a crucial type-II receptor of BMP-15, and enhanced the BMP-15-induced expression of inhibitory *SMAD6* by human granulosa cells. Collectively, it was shown that OXT accelerates ovarian progesterone synthesis with upregulation of BMP-15 activity, leading to a fine-tuning of ovarian steroidogenesis (186 words).