The Positive Role of AMH Regulation in Oocyte Number and Embryonic Development in Aged Mice

Ji Young Hwang, Sook Young Yoon, Miseon Park Junghye Kim, Jin Hee Eum, Woo Sik Lee[1]

1. CHA fertility Center Gangnam, CHA University, Seoul, South Korea

Anti-Müllerian hormone (AMH) is known to play an important role in preserving the pool of primordial follicles by inhibiting awakening from dormancy to the growth phase. The number of follicle is decreasing with age, so maintaining the number of follicles is very important in reproductive function of aged mice. Regulation of AMH expression has a critical role in folliculogenesis and female reproductive function. We previously reported that PPARγ agonist can modulate the level of AMH along with the foxl2/sf-1/STAT3-related network, and showed that ovaries treated with PPARγ agonists have an increased proportion of primordial follicles in 2-day-old female ICR mice. Therefore, we studied the effects of PPARγ agonist on the folliculogenesis of aged mice and its impact on oocyte quality and developmental competency.

15-22-week-old (Young) mice and 56-62-week-old (Aged) C57BL/DBA F1 hybrid female mice were administered with a PPARγ agonist by intraperitoneal injection every 3 days for 21 days. To evaluate the developmental competence of these oocytes, three days after last PPARγ agonist IP injection, mice were induced superovulation. The retrieved oocytes were subjected to in vitro fertilization (IVF) with epididymal sperm obtained from 12-week-old fertile male mice and cultured to the blastocyst stage in KSOM.

In line with our previous studies, results in aged mouse groups showed that PPARγ agonist increased the number of primordial follicles. The proportion of ovulated oocyte that reached good-quality blastocysts was significantly higher in the PPARγ agonist-treated group compared to the control group. Also, the count of zona pellucida remnant (ZPR), an apoptotic marker associated with follicle atresia, exhibited a decrease in PPARγ agonist-treated group. In young mice, the number of good-quality oocytes was significantly increased compared to the control group. The number of primordial follicles and the rate of high-quality blastocyst formation showed an increasing trend, but it was not statistically significant.

These results demonstrated that increasing AMH expression by PPARγ agonists has a positive effect on oocyte competence and good embryonic development, especially in aged mice.

Here we report that upregulation of AMH in mice not only increases the number of ovulated

oocytes but also has a positive effect on oocyte maturation and embryonic development. This study may provide new insights into the overall impact of AMH regulation on female fertility and highlight therapeutic possibility to the aged patients.

This work was supported by a grant from the Korea Healthcare Technology R&D Project, Ministry for Health, Welfare & Family affairs, Republic of Korea (HI21C1350) and NRF - 2021R1I1A1A01042374.