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Bisphenol A (BPA) impairs oocyte development via suppression of nuclear and cytoplasmic maturation and reducing granulosa cells viability and functions

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Bisphenol A (BPA) a commonly used industrial chemical which is considered an endocrine disruptive chemical (EDC). Even though the effects of BPA as an EDC are well known, many questions related to its effects on reproduction still remain unanswered. Thus, the present study was conducted to analyse the effects of BPA on the mammalian ovary, using in vitro granulosa cell and oocyte culture models treated with selected doses of BPA. Isolated cumulus oocyte complexes (ovine origin) and primary granulosa cells (porcine origin) from local slaughter houses were exposed to different doses of BPA (0.3, 3.0, 30 µg/ml). After a 24 hour incubation period, cumulus cell expansion and nuclear maturation rates were determined in the oocytes. The porcine granulosa cells were also exposed to the same dosage and effect of BPA on viability and the prostaglandin synthesis cascade were analyzed. After 24 hrs treatment, the cumulus expansion was significantly reduced at 3 and 30 µg/ml BPA concentrations compared to the non-treated control ($p < 0.05$). The highest dose of BPA (30 µg/ml) showed the maximum effect. The cell density of the 24hrs treated primary granulosa cells was reduced along with the morphological changes such as a shrunken matrix and elongated cells. The effects of BPA increased in a dose-dependent manner and the viability was decreased significantly but, no significant differences were observed on cell doubling time. The mRNA expression of both PGES and PGFS were up regulated in 0.3 µg/ml BPA treated samples whereas the two genes were significantly down regulated in 30.0 µg/ml BPA treated samples. Interestingly, the expression of PGES mRNA was up regulated while the expression of PGFS mRNA was down regulated in 3.0 µg/ml BPA treated granulosa cells. Overall, our data suggests that the changes in the viability and gene expression of PGES and PGFS in granulosa cells may alter the ovarian function which could adversely affect the stability, growth and viability of cells which may ultimately have an effect on the cytoplasmic maturation of oocytes in mammals and the overall function of the ovaries as well.

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