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Effect of Antioxidants on the Development of Bovine Embryo Derived from in vitro Fertilization

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Objectives: The culture of embryos with a high O₂ tension in vitro may produce free radicals, which are detrimental to embryonic development. Superoxide dismutase (SOD) and others serve as radical scavengers in culture medium, which have been found to have beneficial effects on embryonic development in vitro. This study was to compare the treatment effect of a type of flavonoid and SOD as antioxidants on the bovine embryo development in vitro.

Methods: In vitro produced day 2 ($\geq 2 \sim 8$ cell) bovine embryos were treated with various concentrations of flavonoids (3,4-dihydroxyflavone; 0.5, 1, 5 and 10 μM) or SOD (300 and 600 IU) for 6 days. The treatment effect was assessed by in vitro blastocyst development rate and internal anti-oxidant gene expression level.

Results: In flavonoid test, 0.5 and 1 μM treatment groups were indicated higher development rates (40.0 and 42.1%) than control group (30.4%), while 5 and 10 μM treatment groups were not effect (24.5 and 30.0%) than control group, respectively. In SOD test, 300 IU treatment group was shown similar development rate (31.8%) to control group (30.8%). However, 600 IU SOD treatment was not good for the embryo development (22.7%). When the effect of 1 μM flavonoid or 300 IU SOD on the bovine embryo development was compared simultaneously, 1 μM flavonoid treatment group was better (42.1%) than 300 IU SOD treatment (31.8%) or control groups (30.2%). In addition, transcripts levels of anti-oxidant gene (Mn SOD) and anti-apoptotic gene (survivin) were significantly higher in the 1 μM flavonoid group than other groups.

Conclusion: This result indicated that a special type of flavonoid treatment supports for the in vitro developmental capacity of bovine embryos. Thus, flavonoid can be a good radical scavenger of poor in vitro environment for the embryo development.