Effects of vitrification of immature bovine oocytes on in vitro maturation

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Abstract

The aim of this study was to evaluate the effect of ethylene glycol (EG) concentration, equilibration time, and the use of two disaccharides in the vitrification solution used on immature bovine oocytes that were thawed and then matured in vitro. Factorial combinations of the following were tested: three equilibration solutions (ES), containing 3, 20 or 40% EG; three equilibration times, 0.5, 5 or 15 min; and two vitrification solutions (VS), containing 40% EG + 1.0 M trehalose or 40% EG + 1.0 M sucrose. The control treatment had fresh, non-vitrified oocytes matured in vitro. The total number of immature oocytes distributed across the 19 treatments was 2103. The combination VS with sucrose, an equilibration time of 5 min, and a ES with 20% of EG had the highest MII (metaphase II) rate (44.5%) that was more than twice the rate of the next best combination of vitrification treatments but less (P<0.05) than the non-vitrified control (74.6%). The lowest MII rates in treatments with sucrose were found in combinations of ES with 40% EG and equilibration times of 5 and 15 min (0.0 and 0.9%, respectively). The highest MII rate for treatments with trehalose was 5.3%. High chromatin condensation rates were found in treatments with trehalose. In conclusion, the use of trehalose in the vitrification solution impaired the oocyte maturation. Better results were obtained with sucrose. A high concentration (40%) of EG in addition to a long equilibration time (5 or 15 min) was detrimental to oocyte maturation. Vitrification of immature bovine oocytes using 20% EG in the ES, an equilibration time of 5 min, and a VS containing 40% EG + 1.0 M sucrose, yielded acceptable in vitro maturation rates.

Keywords: vitrification, oocyte, bovine.