Genetic Improvement and Reproductive Efficiency in Animals

Domestic livestock species provide quality food (milk and meat) for human beings. The increasing human population, rising incomes, urbanization and better social standards have increased the demand for food of animal origin which consistently put more and more pressure to increase the productivity per unit animal. This increase could be brought through selection of the best animals (high producing and rapidly growing), and providing them optimal environment. Selective breeding gradually increased the milk production of temperate cattle in the West from 2000 to 10000 liters per 305 day lactation. This genetic selection also resulted in creation of gene pool with the characteristics of lowered age at maturity and higher feed conversion ratio of livestock species. At the same time, use of proper reproductive techniques made calf production interval shorter (around 13 months) in cows. It resulted in more calves per cow lifetime and longer productive life per animal. Developing countries including Pakistan have lagged far behind in upgradation of genetic and reproductive efficiency of their animals. The application of the genetic and reproductive tools in local cattle and buffalo breeds is a dire need of the time so that their productivity could be brought at par with the animals in western world.

- Identification of high fertility semen-donor buffalo-bulls for artificial insemination would increase its popularity among farmers. The potential fertility of bulls can be measured with field fertility rates, but this procedure is expensive and time consuming.

- *In vitro* fertilization was tested to predict *in vivo* fertility of buffalo bulls. Studies were carried out to standardize protocols of *in vitro* fertilization (IVF) in buffalo for *in vitro* testing of bull fertility. Among the spermatological and IVF parameters, cleavage rate was identified as the most predictive of conception rate and it accounted for 75% of variation (Figure 1). The results suggest that the *in vitro* fertilization of homologous, zona intact oocytes is potentially an informative method for assessing *in vivo* fertilizing ability of buffalo bulls.

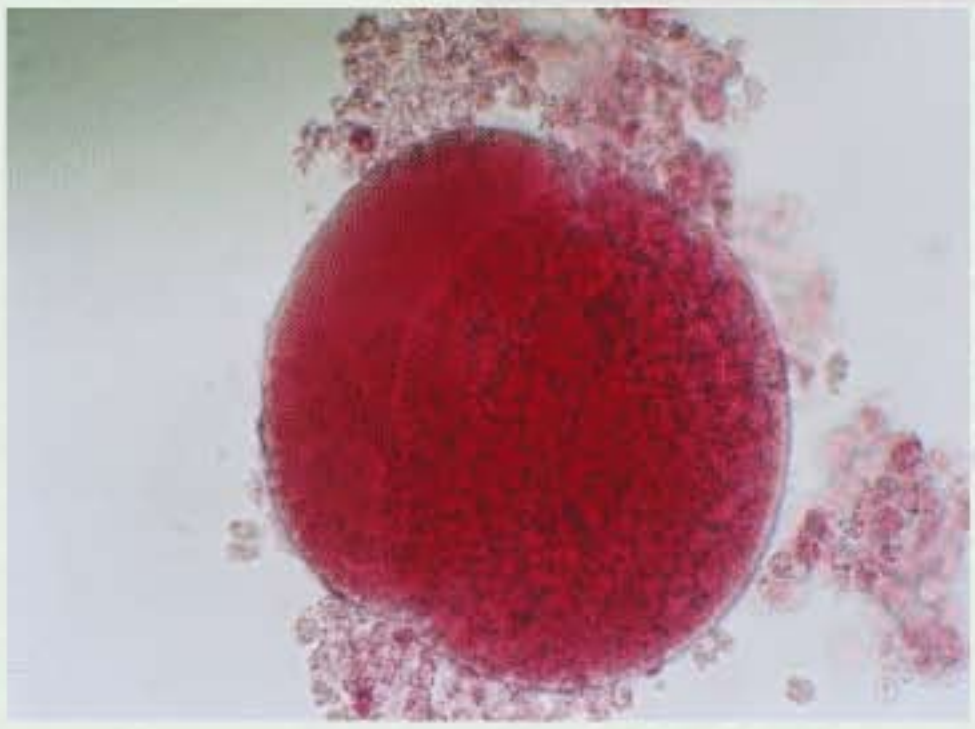

Figure 1. Photomicrograph showing two cell-stage buffalo egg (cleaved oocyte) 48 hours after *in vitro* fertilization.

- As an effort to improve fertility of frozen buffalo semen, the effect of non-enzymatic antioxidants (vitamin C or E) incorporated in semen extender was monitored. There was indication that non-enzymatic antioxidants, particularly vitamin E, in the extender improved the quality of frozen-thawed buffalo spermatozoa.

- Detailed experiments were performed to examine possible use of chilled (5° C) buffalo semen to improve conception rate after artificial insemination. The procedure was examined as an alternate to freezing semen. Skim milk was found as best preservative among five different extenders including cow milk, buffalo milk, camel milk and homogenized UHT milk. Use of gentamycine, tylosine and linco-spectin to control bacterial growth in the skim milk extended buffalo semen gave more than 60% conception rate in a small scale fertility trial.

Genetic Improvement of *Red Sindhi* Cattle

(SARC, Karachi)

- Genetic improvement of Red Sindhi cattle was initiated in 2002. Major traits of economic importance viz. milk production, dry period and calving interval were improved in the nucleus herd.
- By early weaning through feeding of suitable calf starter, the male calves of *Red Sindhi* can be reared for fattening purposes.
- Feed efficiency of calves reared solely on milk was better as compared to other groups but the cost of feeding of that group was higher.
- Calf starter having 16% CP and 3.0Mcal kg^{-1} ME is sufficient to introduce successful weaning in *Red-Sindhi* calves as it produced similar results to that of other calf starters with 18% protein and 2.8 or 3.0 Mcal kg^{-1} energy.