**InVitro fertilization (invitro embryo production)**

**In vitro fertilization** is a process by which oocytes are matured and fertilized outside of the female. The resulting embryos are then transferred back to the same or different females for development to term.

Mature oocytes can be collected by flushing the oviducts shortly after ovulation or by aspiration of preovuolatory follicles. Follicular oocytes can be recovered by aspiration from follicles visualized with laparoscope, which avoids some of the disadvantages of major abdominal surgery. Oocytes can also be aspirated from ovaries collected at slaughter; in this case, the number of oocytes available is, for practical purposes, limited only by desire, but the genetic merit of the donor is usually unknown.

Follicular oocytes are generally not yet mature at the time of aspiration, and must be cultured in sterile medium to allow for nuclear maturation prior to fertilization. Spermatozoa must be capacitated before they are capable of fertilizing the oocyte, Capacitated spermatozoa can be recovered from another inseminated female or can be achieved by incubation for several hours after mixing cultured oocytes and capacitated spermatozoa, heparin is usually added to medium to induce capacitation of sperm in bovine, and the resulting embryos are generally cultured in vitro for an additional period of time before transfer back to the recipient.

High fertilization rates in invitro fertilization depend upon optimal number of fertilizable sperm with vigorous motility, and a fertilizable ovum with the first polar body.

Following invitro fertilization, the zygotes must be cultured for further development before they are transferred into the uterus or cryopreserved. There are three systems of invitro cultured of embryos

a-Transferring to the ligated oviduct of a temporary recipient,e.g.sheep or rabbit, and four or five days later, embryos are recovered, and frozen or transferred.

B-Zygotes cocultured in vitro with somatic cells(oviductal epithelial cells, granulose cells) in medium TCM99.

C-Simple medium without somatic cells support such as synthetic oviductal fluids (SOF).

**Advantages of invitro fertilization**

Transfer of invitro fertilized oocytes has resulted in births in most species, but has been most widely investigated and applied to cattle.

* One application of this technology is to obtain additional offspring from females with certain types of acquired infertility such as per ovarian adhesions.
* Frozen semen from valuable males, which may be long dead, can also be utilized much more efficiently.
* In vitro fertilization may also become a commonly used technique for assessing the fertility of both male and female gametes.
* Finally, fertilization invitro is a valuable adjunct technology in efforts to apply genetic engineering techniques to domestic animals.

**Problems associated with invitro fertilization (invitro embryo production)**

The Specific problems include a high incidence of polyspermy during in vitro fertilization. There are also significant post-day 35 fetal losses. Much of this loss was due to failure of normal allantoic development within the conceptus.Most serious is the birth of unusually large calves resulting from in vitro embryo production. Associated with this have been reports of breathing difficulties, reluctance to suckle and sudden perinatal death of calves. The reasons for this are still not clear, but the problem appears to be related to the fetus per se rather than the placenta.