



## **SUPPRESSION OF REPRODUCTIVE ACTIVITY**

It is a process of inhibition the sexual activity and reproduction ability of the animal during a specific season (breeding season) or permanently. The usual reasons why farm livestock is suppressed include:

1. Reduce aggressive and sexual behavior.
2. Management difficulties.
3. Improve meat and carcass quality.

### **Methods of reproductive suppression**

#### **A. Non-hormonal methods:**

##### **1. Non-surgical methods:**

##### **❖ Induction of cryptorchidism:**

In this method, the scrotum is artificially shortened to hold the testes close to the body, resulting in elevated testicular temperature and causing significantly reduced spermatogenesis.

##### **❖ Mechanical contraception:**

Common in mares including insertion of a marble or plastic ball inside the uterus after a few days post ovulation. This cause sends a message to the higher centers to suggest that there is a concept in the uterus lead to prevents regression of the corpus luteum and the pregnancy continued as a pseudopregnancy with the pause of estrus for a long time.



## **2. Surgical methods:**

- **Castration and vasectomy in males:**

Castration means removal of the total testes surgically leads to stop sperm production and androgens (testosterone) production, but the vasectomy means cut the vas deference of each testis lead to prevent semen ejaculation only and unceasing spermatogenesis and androgens production.

- **Ovariectomy (spaying) in females:**

Removal of the female gonads (ovaries) surgically leads to suppression of the female reproductive activity. The operation if includes the ovaries and uterus this called ovariectomy.

## **B. Hormonal methods:**

### **1. Gonadotropin hormone-releasing agonists and antagonists**

Agonists: a substance that initiates a physiological response when combined with a receptor. The mechanism of action of GnRH antagonists is through blockage and downregulation. GnRH agonists act by stimulating the release until downregulation occurs.

In the testes: LH regulates testosterone, responsible for spermatogenesis, male secondary sexual characteristics, and male behavior. FSH controls spermatogenesis.

In the ovaries: both hormones are essential for ovarian function being involved in the growth of follicles, formation, and maintenance of corpus luteum.



Consequently, deficiency of LH and FSH will cause suppression of endocrine and germinative functions and hence, fertility.

**In female: *Deslorelin***, an agonist of GnRH, acts initially by stimulating the pituitary gland to release LH and FSH in the stimulatory phase, followed by downregulation of GnRH receptors via inhibition of messenger RNA (mRNA) coding for the b-subunits of the gonadotropins.

**In the male: *Deslorelin*** implant in adult males is a well-established contraception method. The duration of the effect is unpredictable due to significant individual variability. Castration has been observed in the majority of males. Treated animals have a drop in testosterone level to basal concentration due to the decrease in gonadotropic support, which corresponds to the downregulation phase. The lack of gonadotropins leads to the arrest of spermatogenesis on the level of spermatogonium/primary spermatocytes.

## 2. Progestin

Melengesterole acetate MGA administrated orally was the first to show that progesterone can have a growth-promoting action over and above its estrus inhibiting ability. Temporary estrous suppression in the female is well achieved when administered in early pro-estrus, a long-acting injectable progestin suppresses estrus, but it should not be used due to the high incidence of side effects. Another progesterone device such as PRID, CIDR or (Mirena in women) cause stop the pregnancy for along time.



In both cases, no modifications in libido and/or sexual behavior were observed. Clinical signs are consistent with adrenocortical suppression and alopecia, hair discoloration, thinning of the skin, and mobilization of subcutaneous fat.

### **C. Immunological methods**

Immunosterilization/immunocontraception: production of antibodies against specific targets such as spermatozoa, LH receptors, and zona pellucida proteins.

#### **1. Sperm antigen immunization**

Spermatozoa are very antigenic and could be effective for males and females. However, whole spermatozoa are not a good candidate because some of the antigens are similar to other somatic cells leading to a detrimental immune response.

#### **2. Immunization against GnRH**

The presence of antibodies against GnRH will potentially inactivate the circulating GnRH. In the absence of GnRH, synthesis and secretion of gonadotropins are suppressed leading to inhibition of reproductive behavior and gametogenesis inducing gonadal atrophy in both males and females.

#### **3. Luteinizing hormone and receptor immunization**

Targeting LH and its receptor have been performed in animals. Repeated treatments were also necessary. Male, immunized against LH, after few injections, were infertile for up to one year. More recently, females vaccinated against bovine LH receptor had estrous suppression for more than 11 months and decreased



progesterone that lasted from approximately 6 months. In both studies, the effect of the vaccine was transitory and all animals returned to a normal physiologic reproductive status once the titers declined.

#### 4. Zona pellucida immunization

The principle of the ZP vaccine is that antibodies against ZP proteins would block the binding of the sperm preventing all the foresee events and maybe it will affect folliculogenesis. The zona pellucida (ZP) is a cellular protein outer layer produced in the ovary during oogenesis that covers mammalian oocytes and early embryos. The ZP has an important role in reproduction by protecting oocytes and early embryos within the oviduct. The ZP proteins mediate species-specific spermatozoa binding, leading to acrosome reaction and in consequence allowing the fusion of the sperm with the oocyte membrane. It is also involved in the polyspermy block.

Three glycoproteins produce the ZP matrix (ZP2, ZP3, and ZP4). All of these glycoproteins were able to induce immune responses; however, the self-immunization with ZP proteins produces a weak response.

Finally, there is also the intra-epididymal or intra-testicular injection of sclerosing substances such as in dogs. Mechanical devices to disrupt fertility are not used anymore due to the side effects.