DEPARTMENT OF VETERINARY GYNAECOLOGY & OBSTETRICS

DELAYED PUBERTY - ITS CAUSES, CLINICAL APPROACH, TREATMENT & PREVENTION OF DELAYED PUBERTY

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Puberty is defined as the age at which the female or male gonads become capable of releasing the gametes (Oocytes or Spermatozoa).

Puberty in females is defined as the age at which they first express estrus with ovulation.

Regarding heifers, puberty has been defined as the first estrus that is followed by a normal luteal phase.
Age at puberty

Average age at puberty is:

- 7 to 18 months for exotic or crossbred cows *(Maturity: 30 months)*
- 4 to 5 months for does *(Maturity: 6-8 months)*
- 7 to 10 months for ewes *(Maturity: 12-18 months)*
- 12 to 24 months for mares *(Maturity: 36 months)*
- Bitch :6-20 month
- queen 7-12 month
Delayed puberty

• Define – lack or incomplete development of specific sexual characteristics past the usual age of onset of puberty.

• Delayed sexual maturity in buffalo heifers is one of the major reproductive problems (Gupta et al. 1994).

• It is known that hypothyroidism delays puberty in mammals.

• Interaction between the hypothalamo-pituitary-thyroid (HPT) and hypothalamo-pituitary-gonadal (HPG) axes may be important processes in delayed puberty.
It now appears that GnIH (gonadotropin inhibitory hormone) is conserved across various mammals and primates, including Cattle and inhibits reproduction.

We have further demonstrated that GnIH is involved in pubertal delay induced by thyroid dysfunction in female.
Cont..

- Thyroid status regulates GnIH expression by \textit{epigenetic modification} of the \textit{GnIH} promoter region.
Clinical approach

Most important challenging problem associated with dairy heifer

Lowered fertility in heifers

Responsible for huge economic losses to the dairy farmers

Decreasing life time milk yield and the number of calves produced by a cow in her lifetime
Hormonal preparations for induction of estrus include administration of
- Prostaglandin - Cloprostenol, Dinoprost
- Progesterone - successfully induces ovarian cyclicity in bovines (norgestomet ear implant)
- Gonadotrophins
- Gonadotrophin Releasing Hormone (GnRH) or their synthetic analogues (Buserelin, Gonadorelin)
- Equine Chorionic Gonadotrophin (eCG) has been frequently used with progesterone - induce fertile estrus and also to stimulate final follicular maturation and ovulation in anoestrus cattle.
• Compared to norgestomet alone, good fertility response could be achieved when PMSG was injected at norgestomet implant removal.

• Herbal plants (Prajana, Janova, Aloes, Sajni, Heatquick) help enhancing fertility in delayed puberty buffaloes heifers (increases the serum calcium but do not alter serum inorganic phosphorus concentration and serum progesterone concentration).

• To combat acyclicity in delayed pubertal buffalo heifers- Combination of different treatments have been tried for initiation of ovarian cyclicity.

• Exposure to suitable ambient temperature and correction of mineral deficiencies were capable of reducing the age of onset of estrus and conception. 
Enhancement of Puberty:

- Improved nutrition
- Growth promoting implants
- Use of progestins
- Use of Somatotropins
- Bio-stimulation
- Progesterone releasing intravaginal device (PRID)
Improved nutrition

Neural system designed to monitor (metabolic sensor) body metabolism and energy

Central link between nutrition and reproduction.

regulate GnRH and gonadotropins secretion.
• Identification of hormonal links between nutritional status and the metabolic sensor is essential for clarification of the mechanisms by which nutrition affects reproduction.

• Metabolic hormones (insulin and IGF-I)
  ✓ involved in controlling appetite and metabolism
  ✓ involved in regulating gonadotropin secretion.

• IGF-I
  ✓ involved in regulating LH secretion in bulls receiving different nutrition during calfhood.
Growth promoting implants

- Increase calf weight gains.
- Increase production of muscle tissue
- Reduce body fat production.
- **Significant improvements** in both growth rate and feed efficiency.

- It enhance average daily gain
  - ✓ Suckling calves by 4 to 8 percent,
  - ✓ Growing calves by 10 to 20 percent,
  - ✓ Finishing cattle by 15 percent.

- In addition, feed **efficiency**
  - ✓ improve by 6 to 8 percent in growing cattle
  - ✓ by 8 to 10 percent in finishing cattle.
Use of progestins

Essential for the

- Uterine development necessary for implantation blastocyst development
- Maintenance of the fetus
- Uterine tone during pregnancy
- Conditioning agent for normal bovine estrus
- Effect on tubal and uterine transport of sperm and ova
- Effects Vaginal epithelium, ovarian function, gonadotrophin elaboration, and oxytocin and relaxin actions.
Use of Somatotropins

• Somatotropin is a growth hormone found in cattle.

• Bovine somatotropin (BST) is a protein hormone produced in cattle by the pituitary gland located at the base of the animal brain.

• The hormone BST is a complex protein that is immediately broken down into small, inactive amino acids and peptides and rendered ineffective when it enters a cow's digestive system.
Bio-stimulation

- Chemical communication plays an important role in mammalian behavior and reproductive processes.
- Pheromones is one means of transmitting such information.
- Pheromones are air-borne chemical substances (“signals”) released in the urine or feces of animals or secreted from cutaneous glands that are perceived by the olfactory system and that elicit both behavioral and endocrine responses in conspecifics.
• Pheromones and other allelomimetic signals can exert profound effects on reproductive activity via the hypothalamic system that generates pulses of gonadotropin-releasing hormone.

• In mammals, pheromones are thought to act either singly or in combination through olfaction, auditory, visual (sight) or tactile stimuli.

• Pheromones in influencing the reproductive performance both in males and females.
Progesterone releasing intravaginal device (PRID)

PRID progesterone releasing intravaginal device (1.55 g of **progesterone** and 10 mg of **oestradiol benzoate** regime).

PRID can be used effectively to stimulate puberty, cyclicity and that the **highly indicative of the induced cyclicity**

**P4 greater than 1.0ng/ml**, allowing for the establishment of subsequent pregnancy in heifers with delayed puberty.
Thank you