SECTION 6

Estrous Cycle

Definitions

Estrous cycle

Progressive accomplishment of alterations in genital tract characteristic of estrus, metestrus, diestrus and proestrus produced by changes in ovarian hormones

Occurs in non-primate females

Period from beginning of estrus to beginning of next estrus

Estrous period or estrus

Period of sexual receptivity in female

Commonly called "heat".

Therefore:

Estrous = adjective describing the action "cycle"

Estrus = noun describing the event "standing heat"

Length of Cycle   Length of Heat

"estrous"         "estrus"

ewe    16-17 days    24-36 hours
goat 21 days 32-40 hours
sow 19-21 days 48-72 hours
cow 20-22 days 18-24 hours
mare 19-25 days 4-7 days

Phases of estrous cycle

Proestrus (FOLLICULAR PHASE)

Days 17 to 21 of estrous cycle of cow
Ovarian follicles are growing rapidly
Increase in E2β secretion by growing follicles
Decrease in P4 from corpus luteum (CL)
Mucosal layers of vagina and uterus multiply

Estrus

Day 1 of estrous cycle of cow
Period of sexual receptivity

Standing Heat

Surges of FSH and LH from anterior pituitary gland
Sow, ewe and mare ovulate during this phase
Metestrus

Days 2 to 4 of estrous cycle of cow

Short transitional phase after ovulation with decreasing E2ß and increasing P4 concentrations

Recently ruptured follicle is reorganizing into a CL

Cow ovulates during this phase

Diestrus (LUTEAL PHASE)

Days 5 to 16 of estrous cycle of cow

Continuation of luteal phase in species with long estrous cycles

Absent in animals with short cycles

CL becomes fully developed and P4 exerts a dominant influence on oviducts, uterus, vagina, pituitary and hypothalamus

CL remains functional for about 13 days in ewe and 15 to 17 days in sow, cow and mare

CL regresses at end of diestrus

Anestrus

Not a phase of estrous cycle

Period between diestrus and proestrus in monoestrous and seasonal polyestrous animals

Non-breeding season of ewe and mare
Varies in length
Characterized by quiescence of reproductive tract
Ends when proestrus begins

**Types of estrous cycles**

**Continuous estrus**

Occurs in rabbits and other induced ovulators
LH release is induced by mating
Ovulation occurs 8 to 12 hours after mating

**Monoestrous cycle**

Occurs in bears, wolves, foxes and some dogs
Only one estrous cycle per year
A long anestrous period separates each cycle

**Polyestrous cycles**

**True polyestrous cycles**

Two or more estrous cycles per year unless interrupted by pregnancy
Composed of proestrus, estrus, metestrus and diestrus merging into proestrus

**Seasonal polyestrous cycles**

Same as above except last diestrus of
breeding season would proceed into anestrus

Characteristic of ewe and mare

PROPOSED MECHANISM:

Retina of eye is sensor for light signals

Impulses travel by way of optic nerve to pineal gland

Pineal gland releases melatonin

Melatonin serves as mediator between photoreceptors, hypothalamus and/or anterior pituitary

Episodic surges of LH occur as breeding season begins

Short estrous cycles

4 to 6 days in duration

Characteristic of rat, mouse, hamster and gerbil

If mating does not occur, they become follicular cycles

If sterile mating occurs, pseudopregnancy begins and lasts about two weeks

Mating is needed to induce functional activity of CL (i.e., P4 secretion)
Long estrous cycles

Duration of 15 to 16 days or longer

Characteristic of cow, ewe, sow, mare and guinea pig

Does not require mating to produce functional CL

Sterile mating does not shorten or lengthen cycle

Divided into two phases

Follicular phase

Follicles growing, estrogenic phase

Luteal phase

Secretory phase of CL, progestational phase

Types of estrus

Post-partum estrus

Estrus that occurs within a few days after parturition

Rarely observed in ewe and cow

Sow

Occurs 3 to 10 days after farrowing

Ovulation rarely occurs
Non-fertile estrus

Mare

Called "foal heat"

Begins about 5 to 15 days after foaling and lasts 1 to 10 days

Mares usually ovulate but fertility may be lowered if abnormal reproductive tract exists

Silent estrus

Also called "quiet estrus" or "quiet ovulation"

Absence of psychological behavior of estrus

Occurs in all farm animals

Ovulation occurs

Split estrus

Initial estrus interrupted by a period of non-receptivity followed by another period of estrus

Frequently seen in mares, occasionally in cows

Anovulatory estrus

Estrus without ovulation

Occurs in all farm animals
Best example is postpartum estrus in sows

Nymphomania

Characterized as a continuous psychological desire to mate

Ovulation rarely occurs

Occurs most commonly in cows, less commonly in mares and rarely in ewes or sows

Cystic ovaries usually accompany nymphomaniac condition

Not all individuals with cystic ovaries display nymphomania

Types of ovulation

Spontaneous ovulation (Table 4-1)

Repeated ovulation at regular intervals except during pregnancy

LH release is cyclic and independent of mating stimulus

LH release is triggered by increasing concentrations of E2β

Occurs in cow, ewe, sow, mare, rat, hamster & guinea pig

Induced ovulation (Table 4-1)

Ovulation occurs after stimulation of vagina and/or cervix LH release occurs only after mating stimulus
Estrus persists for a variable length of time

Occurs in rabbit, cat, mink and llama

ENDOCRINE REGULATION OF ESTROUS CYCLE

Hormonal interactions (Figure 4-1)

Hypothalamus secretes GnRH into blood vessels connecting to AP

GnRH acts on specific cells of AP to release FSH and LH

FSH secreted into circulation, transported to ovary, and stimulates follicular development

LH secreted into circulation and acts synergistically with FSH to stimulate secretion of E2β by follicle

E2β has a (+) and (-) feedback on hypothalamus and AP to control release of FSH and LH

Peak concentrations of FSH and LH secreted at estrus are responsible for rupture of follicle and release of ovum (ovulation)

After ovulation, LH transforms follicle into a CL which secretes P4

LH stimulates P4 secretion by CL

P4 has (-) feedback on hypothalamus and AP to decrease FSH and LH secretion