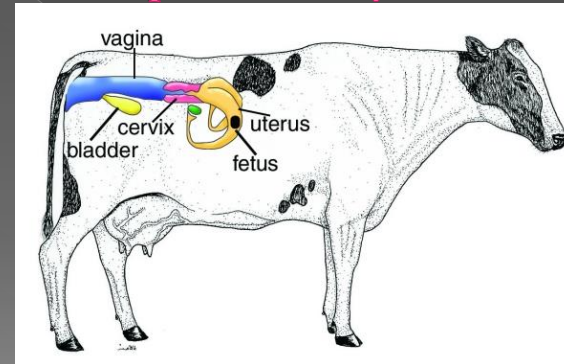


# FEMALE REPRODUCTIVE ANATOMY AND FUNCTION

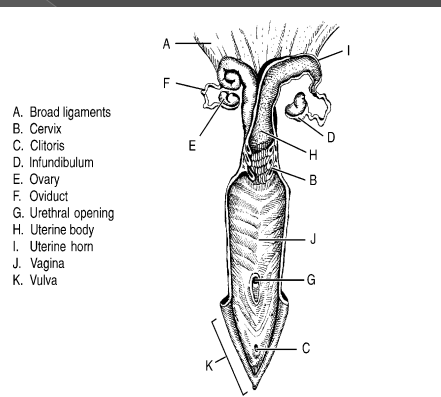
By  
 PC Sianangams, PhD  
 Department of Animal Science  
 School of Agricultural Sciences  
 The University of Zambia

## Reproductive System



<http://ovm.msu.edu/courses/AP/bessie/cowreproorgans3.jpg>

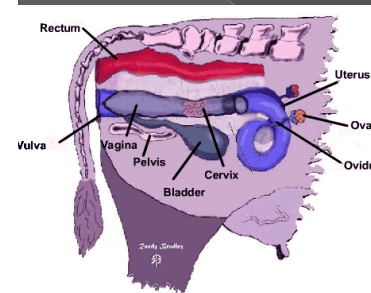
## Reproductive System



Broad Ligament  
 Mesovarium  
 Mesosalpinx  
 Mesometrium

Vestibule

## Female Reproductive System

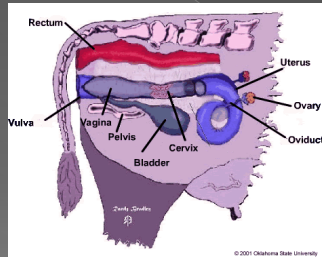


© 2001 Oklahoma State University

<http://biotech-adventure.okstate.edu/low/basics/reprod/animal/female/diagram/>

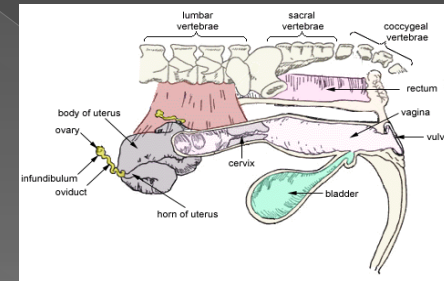
- Ovaries-
  - > Produce ova (cytogenesis)
  - > ovum contains 1/2 of genetic material
  - > Endocrine
- Oviducts-
  - > Site of fertilization
  - > Transport embryos to uterus
  - > Transport of spermatozoa and ovum
- Uterus-
  - > Site of embryonic development during gestation
  - > Endocrine

## Female Reproductive System



- **Cervix-**
  - > Connects uterus and vagina
  - > Serve as barrier during pregnancy
- **Vagina-**
  - > Female organ of copulation at mating
  - > Opening of bladder
- **Vulva-**
  - > External opening of reproductive system

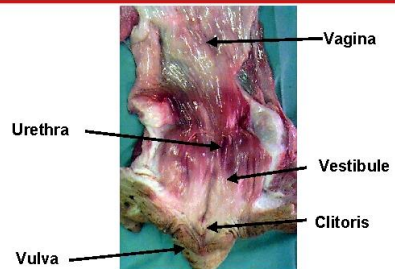
<http://biotech-adventure.okstate.edu/low/basics/reprod/animal/female/diagram/>



<http://www.ca.uky.edu/agripedia/Courses/ASC100/media/FEMALE.GIF>

The female reproductive organs consist of the ovary, uterus, cervix, vagina and vulva. Female reproductive tracts of various farm animals are similar to the cow, but differ primarily in the shape of the uterus and cervix.

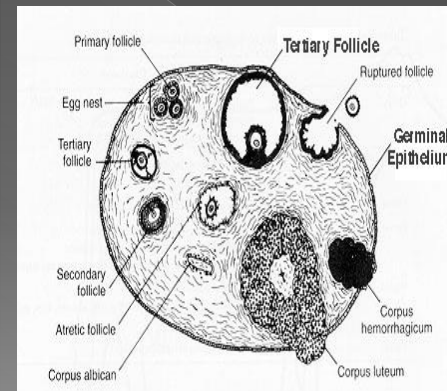
### Vulva-Vestibule-Vagina



<http://www.arsni.okstate.edu/course/3443/study/AnatomyFemalebovine/mfmg04.JPG>

- The vagina serves as a receptacle for the male's penis.
- In the cow, the semen is deposited in the vagina near the cervix during natural mating with the bull.
- When artificial insemination is used, an insemination instrument is threaded through the vagina and cervix and semen is deposited at the uterine side of the cervix.
- The external opening of the vagina is called the vulva.

## Ovaries



- The ovary, is responsible for two basic functions:
- Production of the gamete - ovum.
- Production of two primary reproductive hormones, estrogen and progesterone.

## Meet a marsupial that has 14-hour suicidal sex marathons



The dusky antechinus, a mouse-like marsupial, is endangered -- and not only because all the males die from the stress of having too much sex every year.

During their yearly mating season, the males have sex with as many females as they can and then they die from the stress. "The breeding period is basically two to three weeks of speed-mating, with testosterone-fueled males coupling with as many females as possible, for up to 14 hours at a time," researcher [Andrew Baker](#) said in a [statement](#) Monday (1<sup>ST</sup> June 2015!). "Ultimately, the testosterone triggers a malfunction in the **stress hormone shut-off switch**; the resulting rise in stress hormones causes the males' immune systems to collapse and they all drop dead before the females give birth to a single baby."

## •@TIMENewsfeed

Love him or hate him, the Antechinus mammal doesn't care; he'll still have sex until he physically disintegrates.

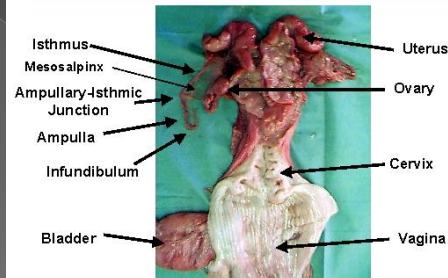


The Antechinus, a tiny mouse-like creature, is one of the only semelparous mammals in the world, which means sex is a once-in-a-lifetime thing. For most of **their lives they stay nice and chaste until they suddenly stop making sperm, which means they have only a few weeks to reproduce before they die.**

That's when the Antechinus becomes a real lothario. **He'll mate constantly, sometimes for fourteen hours at a time, and do nothing else.** His fur falls off, he starts to bleed internally, his whole body becomes infected. But the gangrene doesn't stop him. The Antechinus will literally keep mating until his body disintegrates and he dies a slow but satisfied death.

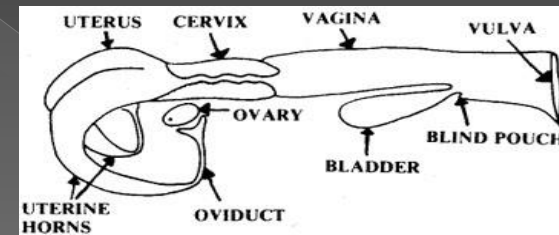
<http://newsfeed.time.com/2015/06/01/adies-meat-antechinus-the-meat-eater-that-eats-himself-to-death/>

## Oviduct



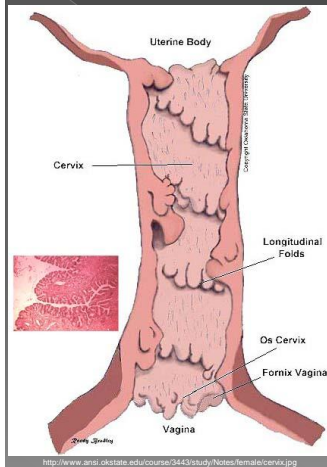
The oviduct begins as a funnel-shaped tube that engulfs the ovary. When ovulation occurs, the ovum is picked up by the infundibulum and channeled into the oviduct (also known as the Fallopian tube), where fertilization takes place if sperm are present.

## Uterus



- The uterus of the cow is bipartite, while the uterine horns are relatively long and well developed.
- The fertilized embryo moves from the oviduct into the uterine horn, where foetal development begins and continues to term.

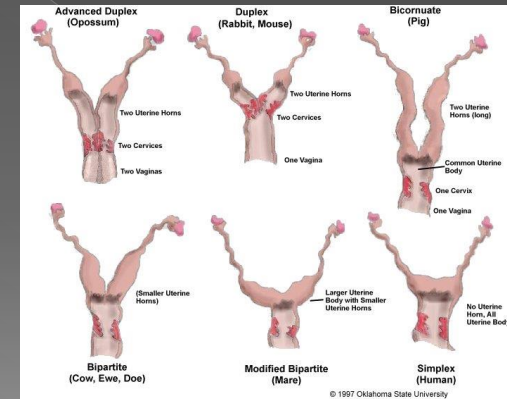
## Cervix



The cervix has annular rings. It has thick walls that allow a passage of sperm at mating and expulsion of the fetus at parturition.

During pregnancy, the cervix is filled with a thick mucus secretion known as the cervical plug, which protects the uterus from infections entering from the vagina.

## Female Reproductive Systems

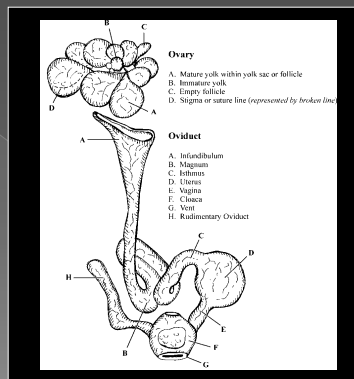


<http://www.ansi.okstate.edu/course/3443/study/Notes/female/tracts.htm>

## Reproductive System

When mature, the yolk is released by the follicle and engulfed by the infundibulum.

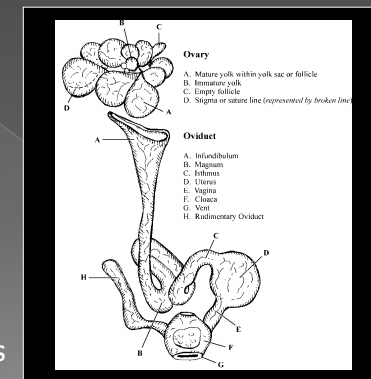
The oviduct consists of five parts: the infundibulum, the magnum, the isthmus, the uterus, and the vagina.



## Reproductive System

Mature female poultry have only one **functional (left)** ovary; the right ovary and oviduct degenerate and cease functioning before the bird reaches sexual maturity.

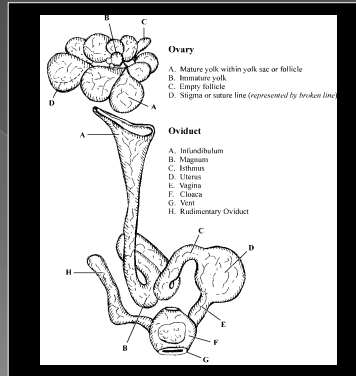
The ovary appears as a cluster of tiny, gray balls that are the oocytes.



## Reproductive System

At maturity, the ovary contains up to 4,000 tiny oocytes from which ovum may develop over time.

An ovum develops by collecting lipid particles from the blood to form the yolk.

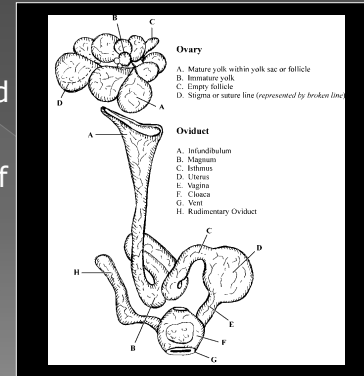


## Reproductive System

*Infundibulum* – funnel-like part of the oviduct that receives the yolk and is the site of fertilization.

*Magnum* – second part of the oviduct that secretes the thick white or albumen.

*Isthmus* – third part of the oviduct that adds the two shell membranes.

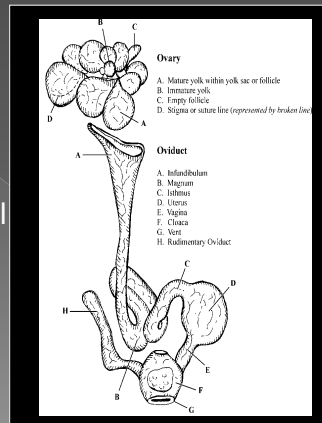


## Reproductive System

*Uterus* – the fourth part of the oviduct that secretes the thin white, the shell, and the shell pigment.

*Vagina* – the last part of the oviduct that holds the egg until it is laid.

From the oviduct, the egg passes to the cloaca and then out of the body through the vent at the time of laying.



Two essential organs of reproduction are located within the head of the animal.

The hypothalamus controls:

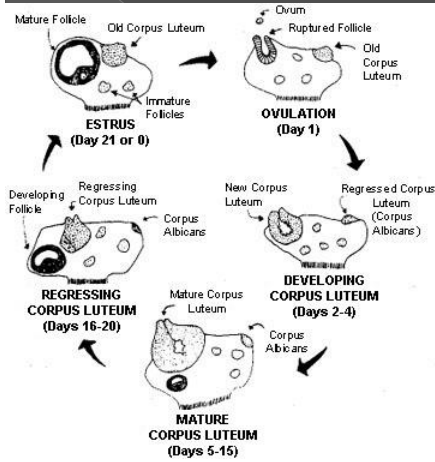
Body temperature, and the drive to eat and drink are just a few functions.

It sends and receives neural signals through the nervous system and hormonal messages through the endocrine system.

The pituitary gland, sits at the base of the brain. The pituitary is divided into two regions: the anterior and posterior pituitaries.

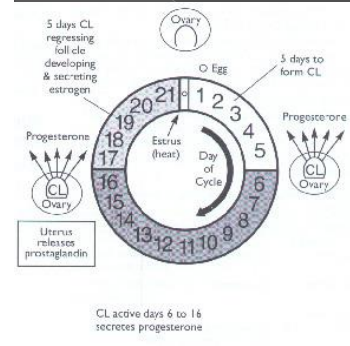


# Oestrous Cycle



- The ovarian changes during a typical 21-day oestrous cycle in which pregnancy does not occur.
- The development and regression of the corpus luteum (CL) and of the follicles are continuous processes

Lab-212.pdf



http://www.acces.edu/pub/docs/AANR-1027/

This cycle of ovum and corpus luteum (CL) development in cattle is called the oestrous cycle.

The cow is a non seasonal polyestrous species. Which means a cow can have multiple oestrous cycles throughout the year.

Two prominent structures are present within the ovary, the follicle and corpora lutea (CL).

# Gametogenesis

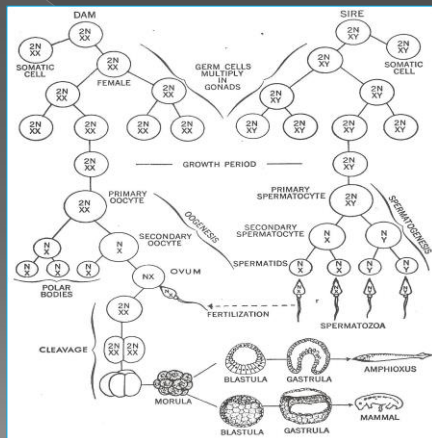


Table 27-1. Female Reproduction<sup>1</sup>

Animal	Onset of Puberty	Av. Age First Service	Length Estrous Cycle	Length Estrus	Gestation Period
Mare	18 mo (10 to 24 mo)	2 to 3 yrs	21 days (19 to 21 days)	5 days (4½ to 7½ days)	336 days (323 to 341 days)
Cow	4 to 24 mo	14 to 22 mo	21 days (18 to 24 days)	18 hrs (12 to 28 hrs)	282 days (274 to 291 days)
Ewe	4 to 12 mo (1st fall)	12 to 18 mo	16½ days (14 to 20 days)	24 to 48 hrs	150 days (140 to 160 days)
Sow	5 to 7 mo	8 to 10 mo	21 days (18 to 24 days)	2 days (1 to 5 days)	114 days (110 to 116 days)
Bitch	6 to 24 mo	12 to 18 mo	6 to 12 mo	9 days (5 to 19 days)	63 days (60 to 65 days)

	Time of Ovulation	Optimum Time for Service	Advisable Time to Breed after Parturition
Mare	1 to 2 days before end of estrus	3 to 4 days before end of estrus or the second or third day of estrus	About 25 to 35 days or second estrus. About 9 days or first estrus only if normal in every way
Cow	10 to 15 hours after the end of estrus	Just before the middle of estrus to the end of estrus	60 to 90 days
Ewe	12 to 24 hours before the end of estrus	18 to 24 hours after the onset of estrus	Usually the following fall
Sow	30 to 36 hours after the onset of estrus	12 to 36 hours after the onset of estrus	First estrus 3 to 9 days after weaning pigs
Bitch	1 to 2 days after the onset of true estrus	2 to 3 days after onset of true estrus or 10 to 14 days after onset of proestrus bleeding	Usually the first estrus or 2 to 3 months after weaning pups

<sup>1</sup> Data compiled from standard references, including Duker, Payne, Roberts, and Spector.

Oestrus (heat) is not always accompanied by ovulation, and vice versa.

Heat without ovulation will not result in pregnancy even though the female is bred.

## Age of Puberty

- Cattle: 6 to 12 Months
- Sheep: 5 to 7 Months
- Swine: 4 to 8 Months
- Horses: 12 to 15 Months
- Humans: 9 to 16 **YEARS**

## Length of Oestrous Cycle

- Cattle: 19 to 23 Days
- Sheep: 14 to 19 Days
- Swine: 19 to 23 Days
- Horses: 10 to 37 Days
- Human: 25 to 38 Days

## Duration of Oestrus

- Cattle: 6 to 27 Hours
- Sheep: 24 to 36 Hours
- Swine: 48 to 72 Hours
- Horses: 3 to 8 Days
- Human: ? Mating is a social event!

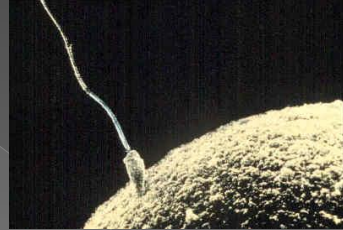
## Signs of Estrus

- Swollen (swollen) vulva
- Mucous discharge
- Restless behaviour
- Female receptivity to male
- Mounting others
- **Standing to be mounted**
- Bellowing



<http://www.goodecattle.com/spot.htm>

**Fertilization** – the union of the haploid sperm and the haploid ovum to form a diploid individual; the actual beginning of pregnancy.



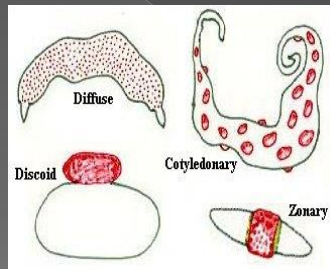
**Conception** refers to the nidation and maintenance of pregnancy

## Hormones



- **Oestrogens-**
- Prepares the pre-pubertal heifer and post-partum cow for cyclic sexual activity.
- **Progesterone**, secreted by the corpora lutea, suppresses the further development of follicles and the secretion of oestrogens. High levels of progesterone and low levels of oestrogens prevent a cow from coming into heat. Progesterone is necessary for preparing the uterus to receive the fertilized ovum and maintains the proper uterine environment for continuation of pregnancy.
- **Follicle stimulating hormone (FSH)** and **lutening hormone (LH)** are secreted & travel through the blood to the ovary.
- FSH and LH are mediated by gonadotropic releasing hormone (GnRH) coming from the hypothalamus to signal their release from the pituitary.
- FSH stimulates the growth, development and function of the follicle, while LH cause the follicle to rupture during ovulation and causes the subsequent development of the corpus luteum.

## Placentae



[http://arfd.cmbs.colostate.edu/hbooks/pathphys/reprod/placenta/plac\\_types.jpg](http://arfd.cmbs.colostate.edu/hbooks/pathphys/reprod/placenta/plac_types.jpg)

- Classification is based on:
- The gross shape of the placenta and the distribution of contact sites between foetal membranes and endometrium.
- The number of layers of tissue between maternal and foetal vascular systems.

### Placenta

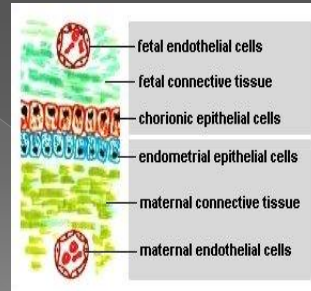
### Common Examples

Diffuse, epitheliochorial	Horses and pigs
Cotyledonary, epitheliochorial	Ruminants (cattle, sheep, goats, deer)
Zonary, endotheliochorial	Carnivores (dog, cat, ferret)
Discoid, haemochorial	Humans, apes, monkeys and rodents

<http://arfd.cmbs.colostate.edu/hbooks/pathphys/reprod/placenta/structure.html>

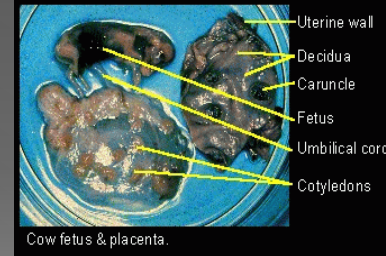
The three potential maternal layers in a placenta are:

1. Endothelium lining endometrial blood vessels.
2. Connective tissue of the endometrium.
3. Endometrial epithelial cells.



<http://arbi.cmbc.colostate.edu/books/pathophys/reprod/placenta/structure.html>

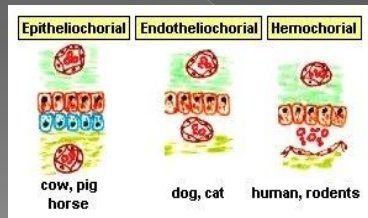
### Indeciduate, Cotyledonary Placenta



<http://www.uoguelph.ca/zoology/devobiol/splab/sld012.gif>

- A cow has a cotyledonary placenta.
- Cotyledonary: Multiple, discrete areas of attachment called cotyledons are formed by interaction of patches of allantochorion with endometrium. The foetal portions of this type of placenta are called cotyledons, the maternal contact sites (caruncles), and the cotyledon-caruncle complex a **placentomé**. This type of placentation is observed in ruminants.

Type of Placenta	Maternal Layers Retained			Examples
	Endometrial Epithelium	Connective Tissue	Uterine Endothelium	
Epitheliochorial	+	+	+	<a href="#">Horses, swine, ruminants</a>
Endotheliochorial	-	-	+	<a href="#">Dogs, cats</a>
Hemochorial	-	-	-	<a href="#">Humans, rodents</a>



<http://arbi.cmbc.colostate.edu/books/pathophys/reprod/placenta/structure.html>

## Gestation Length

- Cattle: 285 Days
- Sheep: 147 Days
- Swine: 114 Days
- Horses: 336 Days
- Elephant: 640 – 645 Days!
- Human: 270 -285 Days

## Reproductive Failures in Livestock

Sterility, or the inability to reproduce, may be caused by a number of reasons.

Permanent or temporary sterility (infertility) can be the result of specific physical defects, particular diseases, environmental factors, or nutritional aspects.

## Signs of Parturition

- ◉ Distended abdomen
- ◉ Mammary development & milk secretion
- ◉ Swollen vulva and relaxed pelvic ligaments
- ◉ Mucous discharge
- ◉ Relentlessness and separation from group
- ◉ Labor and Contractions

## Signs of Parturition

- ◉ Appearance of placental membrane
- ◉ Expulsion of fetus
- ◉ Expulsion of placental membrane
- ◉ Bonding behavior of offspring and mother (will vary between species)

