Online HorseCollege

Student Workbook

3.H.09 Basic Reproduction

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Contents

Basic Reproduction 3.H.09 Workbook

Students are to complete Horse Care 3.H.05-08 online assessments prior to attempting Horse Care 3.H.09-12 and to follow all recommended safety considerations.

Practical assessments for Horse Care 3.H.09-12 are as follows:

A) Basic Reproduction

B) Pregnancy & Foaling

C) Skeletal System

D) Muscular-Skeletal System

These assessments incorporate the following unit from the SIS30710 Sport Industry Training Package which include the listed elements

RGRPSH401A Relate anatomical and physiological features to the care and treatment of horses

- Identify basic anatomy and physiology of horses
- Relate anatomy and body systems to the performance of racehorses
- Follow illness and injury management plans

Further information about this assessment is available at www.training.gov.au

Basic Reproduction Introduction

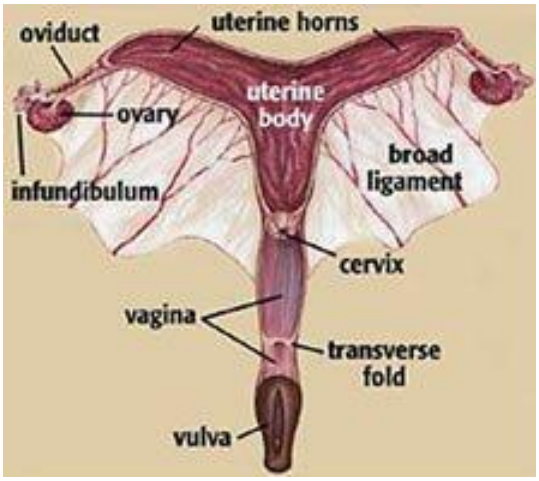
This workbook is an introduction to the reproductive system. In the following pages is information detailing parts of the female and male systems. Reproductive organs are divided into two categories; external genital organs and internal (or intrapelvic) genital organs.

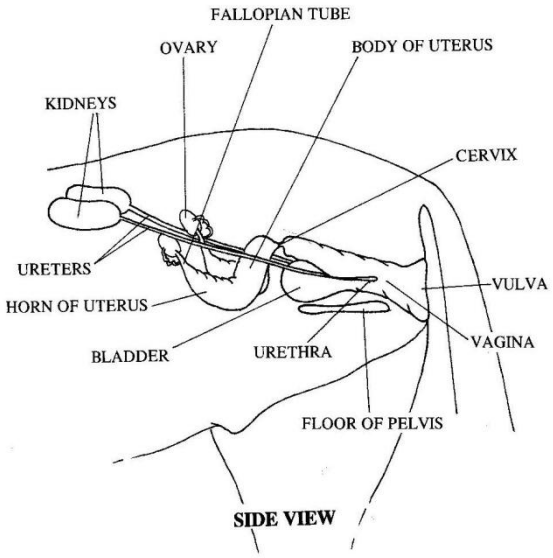
Also we cover some of the hormones and environmental factors that can affect reproduction.

Mare Reproductive System

The reproductive system of the mare is responsible for lactation, birth and gestation. The mare's reproductive tract lies horizontally within the abdominal and pelvic cavities. There is very little visible external structure so all monitoring of organs and internal structures must be performed by ultra-sonography or palpated manually by a vet.

Anatomy of the reproductive tract:-





Vulva:-

This is the external entrance to internal structures, lying directly below the rectum. The vulva protects the inner structure and consists of the labia, clitoris and vestibule.

Vagina:-

A muscular tube lined with mucous membranes and connects the vestibule to the cervix. The tissues in the vagina are distensible and elastic to accommodate the foal during birth and the penis during breeding. It is approximately 15 – 20cm long.

Cervix:-

Situated between the vagina and the uterus, the shape and characteristics of the cervix change in response to hormones. It provides a physical barrier to prevent contamination and infection entering the uterus.

Mare Reproductive System (cont.)

Uterus:-

This organ is Y-shaped, hollow and muscular. The two branches off the uterine body are called uterine horns. Each horn is about 25cm in length. The uterus is suspended within the body cavity by two broad ligaments. Its functions include protecting and nourishing the embryo and foetus, and to expel the foetus at birth.

Fallopian Tubes:-

Also referred to as the oviduct, the fallopian tubes connect from the horn of the uterus to the ovaries. These tubes are narrow and highly coiled and act to transport the ova (a reproductivee cell of the mare) from the ovary to the uterus. Fertilisation often occurs here and tiny hair-like projections (cilia) work together to transport the ovum down the oviduct.

Infundibulum:-

This cradles the part of the ovary from where the ovum emerges. It captures the ovum when it is released so it can be transported down the fallopian tube.

Ovaries:-

Ovaries are bean shaped and release follicles during ovulation. The size of ovaries will depend upon the individual and the season. During the breeding season they are larger. Inside the ovary is made up of an inner part the cortex and around that the medulla. When a filly is born the cortex contains all the eggs she will ever have. Ovaries are responsible for the production of hormones and ova. The ova or ovum is the reproductive cell of a mare, from which a foal will develop should it become fertilised by semen.

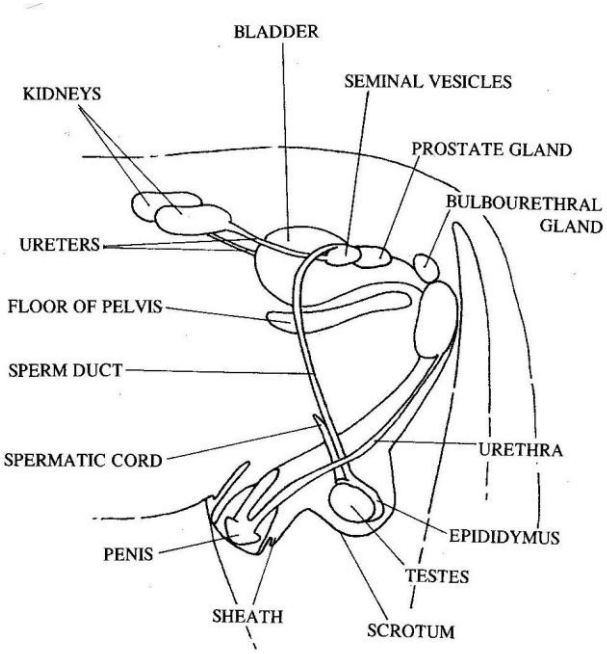
Mammory gland:-

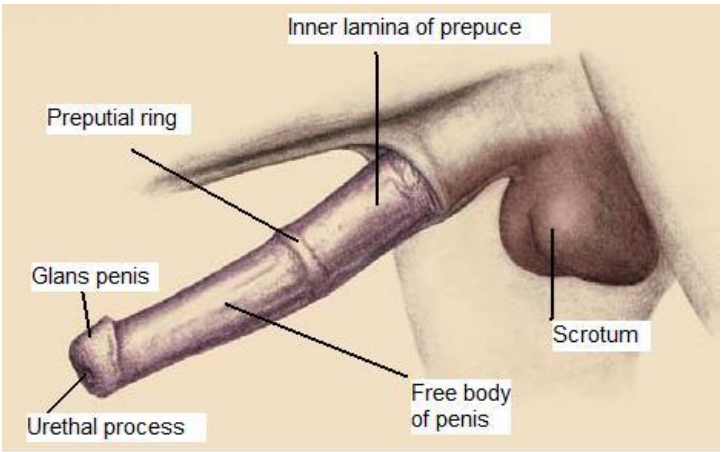
These are milk producing glands in the mare. The udder found between the hind legs is composed of a system of ducts which transport milk to the nipple or teat. Mares will begin producing milk shortly before the birth of a foal.

Stallion Reproductive System

A stallions' reproductive system is responsible for producing reproductive cells (sperm), to produce testosterone and to deposit sperm to the female reproductive tract.

Anatomy of the reproductive tract:-





External Anatomy:-

Scrotum:-

This is a sac on the outside of the body which holds the testes. The external skin layer of the scrotum has an unusual number of sweat glands which help to maintain the temperature at suitable levels for sperm production. Just under the skin is a layer of smooth muscle and inside that is a connective tissue which allows the testicles mobility.

Stallion Reproductive System (cont.)

Sheath/Prepuce:-

Surrounds and protects the penis. It is voluminous and can cause a sucking noise from the penis moving inside it when trotting. The sheath can accumulate smegma which is debris from glands and skin inside the sheath cavity. A build up of smegma can cause infection or become hard and cause discomfort.

Penis:-

The penis is held inside the body most of the time by muscles which when relaxed produce the penis outside of the sheath/prepuce. The penis is responsible for expelling urine and depositing semen. The spaces between the muscles of the penis fill with blood to produce an erection at which time it will double its length and width.

Glans Penis:-

This is the head of the penis. This area swells during mating to ensure the greater portion of semen goes into the cervix of the mare.

Internal Anatomy:-

Testes:-

Are held in the scrotum and produce sperm and the male sex hormone testosterone. There are two scrotal sacs, one to hold each testes. The testes are attached to the spermatic cord which attaches to the abdomen. They weight about 225 grams. Consideration to the size of the testes is given when selecting breeding stallions as generally the larger they are the greater the production and storage of sperm. A mature adult stallion can produce 5 – 7 billion sperm a day.

Epididymus:-

The epididymus is located on the upper surface of the testes and acts as storage for the maturation of sperm. It is a long thin tube and produces a small quantity of mucous to assist in moving sperm inside the spermatic cord.

Spermatic Cord:-

The spermatic cord contains different structures which together with the scrotum skin can lift or lower the testes to maintain optimum temperature for sperm production.

Sperm Duct/ Deferent Duct/Vas Deferens:-

This is a continuation of the epididymus to transport sperm on through the reproductive tract.

Stallion Reproductive System (cont.)

Seminal Vesicles/Vesicular Glands:-

These are located above the bladder and one lies on each side of the urethra, two in total. They produce a fluid which is high in protein and contains fructose and citric acid. This fluid increases the volume of ejaculate.

Prostate Gland:-

This gland produces the final fluid components to the sperm which is a watery, milky secretion.

Bulbo-Urethral/Cowper's Gland:-

These glands are closest to the penis and produce a grey, thin fluid which lubricates the urethra to allow efficient flow of the ejaculate.

Urethra:-

This is a passage for expulsion of urine and semen (A fluid which is secreted at ejaculation which carries sperm). It is covered by muscle and the contractions from this muscle move urine and sperm along the urethra.

The Endocrine System

This system controls the production, distribution and effect of hormones. Hormones are biochemical messengers that have controlling influence over bodily functions such as, in the case of reproduction for example the oestrus cycle of a mare.

The endocrine system consists of:-

- Endocrine glands: Glandular tissue at various locations in the body
- Blood supply: Transports hormones to their target organ
- Nerve supply: Provides sensory output and motor input from the autonomic (unconscious) nerve system. These outputs and inputs are the communication channels for the production, distribution and release of hormones.
- Hormones: 2 types of effects produced by hormones which are either stimulating or inhibiting. Stimulating hormones excite their target organ whilst inhibiting hormones hinder their target organ.

There are ten glands of specific importance to the endocrine system; the hypothalamus, pituitary gland, thyroid, thymus, adrenal gland, kidneys, genital organs, stomach's fundus, small intestine and the pancreas.

We will look at the glands which contribute to reproduction.

Hypothalamus

This gland receives sensory information such as light (sensory information is that which is experienced by the horse i.e., temperature, pain, smell). The hypothalamus can produce certain hormones which are released if neural input from the body notifies that a change within the body is needed.

Pituitary Gland

The several hormones produced by the pituitary gland regulate the activity of other glands of the endocrine system. Its hormones play roles in growth (growth hormone or GH), ovarian activity (follicle stimulating hormone or FSH), testicular activity (spermatogenesis stimulating hormone or SSH) and lactation (prolactin).

The Endocrine System (cont.)

Thyroid

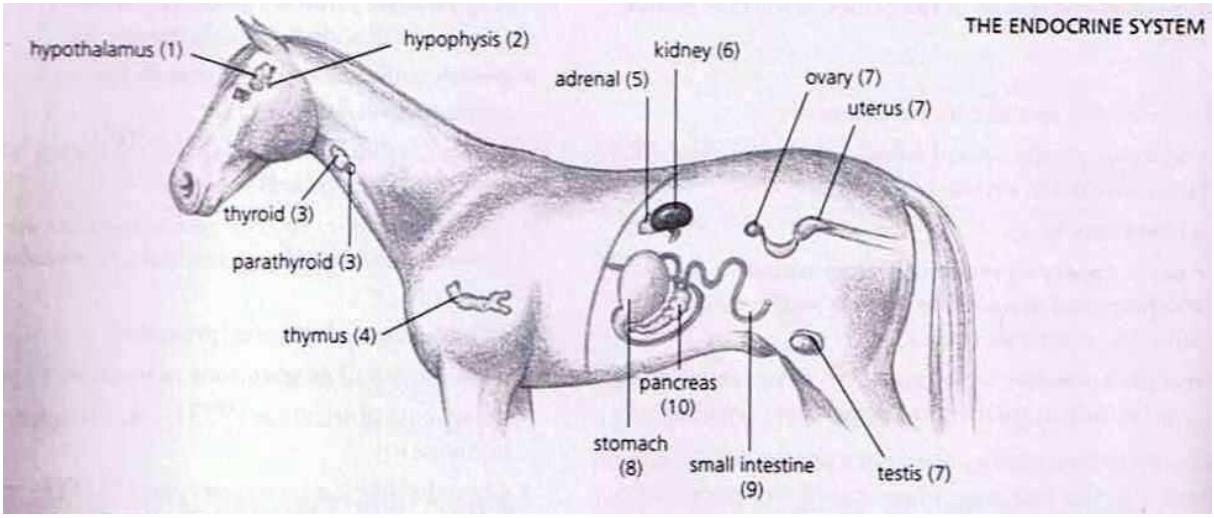
This gland is critical for life and controls metabolism and bone development (blood calcium levels). The thyroid works closely with the pituitary, adrenals and sex glands.

Thymus

The thymus is concerned with lymph cell production and function. Being that it is very active in young animals it is thought to be involved with the immune system.

Genital Organs (Testes & Ovaries)

These organs and glands influence oestrous behaviour, lubrication of genital tract, dioestrus, pregnancy and libido. Within mares oestrogen and progesterone play primary roles whilst in stallions testosterone is a key hormone for reproduction.



Hormones

Stimuli from the outside environment, such as the increase in the length of daylight hours, affect a part of the brain which releases hormones, stimulating the reproductive system.

Hormones are controlled by the endocrine system and are produced by glands and carried by the bloodstream to reach their target organ.

Hormones are not just a component of the reproductive system and have the ability to:-

- control the reproductive cycle
- regulate metabolism
- prepare for basic instincts such as flight, fight and mating
- inhibit and stimulate growth

Hormones in the Stallion:-

Hormones are released from the pituitary gland.

The main male hormone is testosterone. It is produced within the testes and is carried by the blood stream all around the body. The main function of testosterone is to produce growth and operate the accessory male organs such as the seminal vesicles, prostate and bulbo-urethral glands. This hormone also promotes the development of genitalia, libido, erection and the male characteristics of a stallion i.e. - larger muscle development (crest). A hormone known as interstitial cell stimulating hormone controls the production of testosterone.

Another male hormone is a follicle stimulating hormone which creates the correct environment in the testes for producing sperm.

Stallions also produce oestrogen.

Hormones in the Mare:-

The oestrus cycle is controlled by hormones and is a period of approximately 19 to 21 days where the reproductive system becomes active.

Oestrogen is responsible for receptiveness to the stallion, changes in the vagina which assist the transportation of sperm, altering the cervix to allow sperm to the uterus, producing favourable environments for fertilised eggs, the development of the udder and female characteristics.

The hormone Progesterone suppresses the output of other hormones which prevents the mare having further oestrus cycles. Progesterone is secreted while a foetus is developing to prevent possible additional fertilisations occurring. This is so the foetus can develop without interruption. A hormone called Prolactin is essential for the secretion of Progesterone and also for milk secretion.

Hormones

Oxytocin is responsible for contractions of the uterus at birth. However it is present during the oestrus cycle.

Relaxin is a hormone which causes bony structures in the pelvic area to expand to allow a large area for the foal to pass through at birth.

Pregnant Mare Serum Gonadotrophin is only produced in pregnant mares, as its name suggests and originates from the placenta.

Factors Affecting Reproduction

Hormonal changes which influence reproduction are seasonal. And there are factors which influence and affect fertility and the production of hormones.

Mating Seasons:-

The natural breeding seasons vary between the northern and southern hemispheres. In the northern hemisphere the natural breeding season for the mare is from March to July however it is determined by stud books and breed societies that mating season commonly begins in February and foaling season from January to July.

Whilst in the southern hemisphere natural breeding occurs from October to February. The determined mating season begins in September and foaling season occurs from August to December.

The natural breeding seasons are determined as the daylight hours get longer.

Daylight:-

The increase of daylight hours (spring equinox- where the number of daylight hours equals the number of darkness hours) triggers pituitary gland to release hormones which stimulate the production of testosterone in stallions and follicles in the mare. When the daylight hours are short the brain releases hormones which reduce the production of testosterone and follicles.

Therefore a stallion will have lower sex drive and sperm production outside of the spring equinox.

Temperature:-

This will affect the stallion more so than the mare. The temperature of the testes must be maintained at a suitable level for produced sperm to live.

In cold weather the muscle of the scrotum and the spermatic cord raise the testes to bring them closer to the body to keep them warm. In hot weather the scrotum is lowered away from the body to lower the temperature. The numerous sweat glands in this area also assist by perspiring, the perspiration is then evaporated which cools the testes.

Age:-

Mares over the age of 14 have a reduction in the ability to get in foal. This can be due to changes in the uterus which affect gland secretion and the oestrus cycle however the use of artificial controls for hormones and insemination can assist in the reproductive process.

Age also affect the stallion with stallions over the age of 17 considered as aged. As they get older the semen quality declines.

Factors Affecting Reproduction (cont.)

Condition:-

A mare or stallion in poor condition will set their priorities to put their survival first. For a mare to conceive and remain pregnant she requires qualities and quantities of feed which allow her to 1) live, 2) have a successfully conception and 3) produce a foal. If there is insufficient or poor quality feed she will put her survival first and either not become pregnant or abort the foal. In stallions poor condition can affect semen quality.

Overweight mares can be difficult to get in foal as the hormone operation in the body tends to slow down. Overweight stallions may have issues with the physical demands of serving mares.

Stress:-

Stress can affect fertility as it produces adrenalin. Adrenalin in the bloodstream will affect the quantity of hormones in the bloodstream which will in turn affect reproduction performance.

The stallions' reproductive performance can also suffer from stress which may be related to poor handling techniques, physical injury and unpleasant experiences which may be remembered from previous matings.

Infections and Diseases:-

Injury and illness can affect the reproductive organs and fertility of both the mare and stallion. Diseases can also be transferred from the stallion to the mare and vice versa.

Extension Lesson

Attend a breed show or volunteer at a breeding facility and observe the difference between stallion and mare behaviour.

Recommended Reading

Publication:-	Authors:-
NZ Pony Club Manual No.2 Pg.228-229	Elaine Knox-Thompson & Suzanne Dickens
The BHS Veterinary Manual Pg.591-596	P. Stewart Hastie

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