BHA

LEVEL 3

THOROUGHBRED BREEDING

Workbook

BRITISH HORSERACING AUTHORITY

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INTRODUCTION

This workbook has been designed to support the training and development of more experienced stud staff that already have accumulated some skills in the Thoroughbred breeding industry.

It can be used to develop further understanding of the skills required to work in the industry, and will assist candidates working towards Level 3 stud work qualifications by helping to identify the evidence needed for portfolios and assessment criteria.

Each chapter contains information that broadly relates to the elements of the Level 3 breeding option qualification and highlights the specific areas of work likely to be undertaken by someone who wishes to develop their career in this sector.

Each chapter is supported by a series of 'self-tests' which aim to encourage the development of knowledge and understanding in a form that can be assessed.

CARE FOR AND PREPARE THE MARE FOR COVERING

In this chapter you will learn all about the procedures for preparing a mare for the covering season. Topics covered include:

- different types of mare
- the reproductive systems of mares and stallions
- artificial methods of encouraging mares to come into season
- hormones involved in the oestrus cycle
- methods of teasing
- the covering procedure
- health and safety.

Preparing the mare for the breeding season will depend on her breeding status. However, the most important preparation practices should be maintained all year round. These include correct nutrition, preventative medicine such as vaccinations, a worming and farriery programme, and sufficient exercise.

There are many factors that might affect a mare's ability to conceive and carry a healthy pregnancy, which will result in a healthy foal. Management practices that impact the environment in which the mares live can affect reproductive effectiveness significantly.

Smaller studs have the bonus of being able to give the mare individual attention, and gain an insight into her behavioural patterns. On larger commercial studs where some of the mares only board for short periods of time, they will find this level of individual attention difficult to maintain.

Whatever the size of stud, the mares should be sorted into groups according to their status, such as maiden, barren, pregnant and lactating. This will help significantly with the management of the mares and reduce the risk of cross infection.

MAIDEN MARES

Maiden mares require special consideration regardless of previous background. The transition to becoming a broodmare should be smooth and as stress-free as possible. Maiden mares should be grouped together so that careful attention can be paid to their oestrus state; some maidens can show erratic oestrus patterns and behaviour during their first breeding season. As with all new arrivals, they should be introduced slowly to the established herd and become accustomed to mixing with a settled group of mares.

Ideally, maiden mares should be allowed to start becoming accustomed to their new role from late summer/autumn in the year preceding their first breeding season. This gives them chance to adjust to their new surroundings, routine and feeding programme. Some maiden mares may take time to adjust mentally and physically from being a highly fit athlete to being a broodmare. However there are some mares that have taken a short break from their racing career, gone to stud then returned to training or racing through the early part of their pregnancy.

Mares going to stud for the first time should have an initial reproductive examination. This will enable her physical breeding ability to be assessed. This is also common practice for maidens that are to be sold for breeding purposes. Most mares have undergone puberty between the ages of 18–24 months, but some may still be physically too immature to be bred and maintain a pregnancy to full term. Older maiden mares can potentially suffer from long-term genital infections and should be assessed very carefully before going to become a broodmare.

BARREN MARES

Not every mare that is mated during a breeding season becomes pregnant, nor does every mare that conceives carry a foal to term. Failure of conception, early embryonic losses and abortions are a fact of life in equine reproduction, and problem mares must be managed properly for the following breeding season.

Management of barren mares, whatever the cause, should be addressed well before the subsequent breeding season. A standard breeding soundness examination should be conducted on these mares. This includes a complete assessment of the mare's health and reproductive history, a general physical examination to identify any underlying or obvious physical problems, examination of the mare's perineal conformation, rectal palpation, ultrasound, speculum and manual examination of the vagina and cervix, uterine culture and cytology, and endometrial biopsy. These areas should be addressed in every barren mare. If additional information is still required, additional procedures such as uterine endoscopy, hormonal profiles and karyotyping (chromosome analysis) can be done.

No matter what problems the mare has, a complete and thorough reproductive history is important in planning a subsequent course of action. Examining teasing charts from the previous year or two is extremely helpful. Equally important is information on the fertility of the stallion or stallions to which the mare was mated.

For information on pregnant mares, see 'Attend to the mare and foal during foaling'.

REVISION TEST

1. What is a 'Caslick' procedure and why is it a common form of treatment carried out in Thoroughbred mares?

2. What gland is affected by spring and autumn daylight and results in the mare's oestrous cycle?

3. What five factors would help contribute to the selection of breeding stock?

THE REPRODUCTIVE SYSTEMS

The aims and objectives of this chapter are to explain:

- the anatomy of the mares' and stallions' reproductive tracts
- how an understanding of the oestrus cycle can be related to optimum fertility
- the physiology of the reproductive systems
- the process of sperm production.

THE MARES' REPRODUCTIVE TRACT

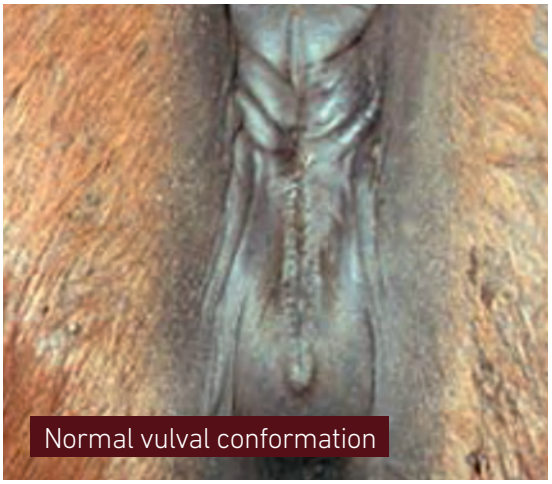
The key functions of the mare's reproductive organs are to:

- produce the ovum (egg), which will unite with a sperm to form an embryo
- provide nutrition for the embryo
- provide the perfect environment for development of the embryo.

REPRODUCTIVE ANATOMY AND PHYSIOLOGY OF THE MARE

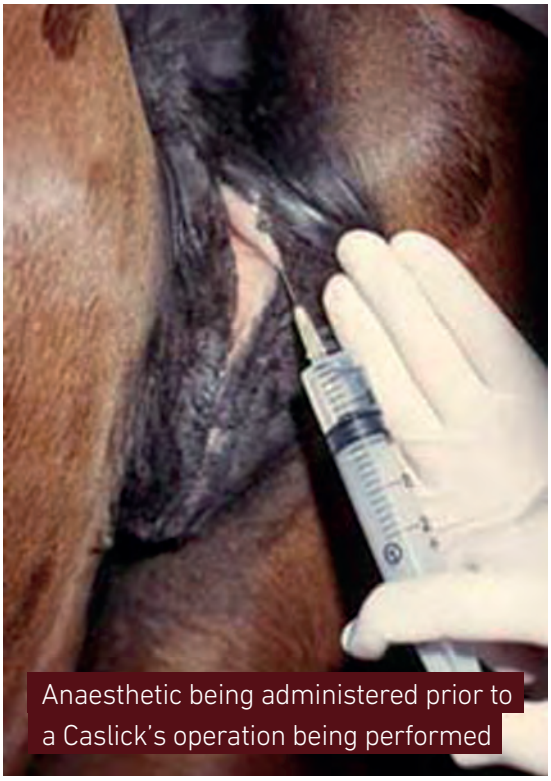
Anatomical Structure	Function
Ovary (paired)	The two ovaries are situated high up in the abdominal cavity, just behind the kidneys. They are hard and bean-shaped, but the exact size, consistence and shape is very much dependent on the stage of the oestrus cycle. The ovaries consist of a fibrous mass known as the **stroma**. The ovaries are responsible for: • follicle growth (secretion of oestrogen) • corpus luteum (CL) secretion of progesterone • producing ovum (egg). At birth, the ovaries contain thousands of ova which are not visible to the naked eye. No further ova will be created during the mare's lifetime. Once a filly reaches approximately two years old, she will become sexually mature and a number of sacs develop around the ova. These sacs are filled with fluid and are known as follicles. A small number of follicles increase in size during oestrus, and one of two will develop and enlarge prior to ovulation.

Anatomical Structure	Function
Oviduct (paired), also called fallopian tubes or uterine tubules	Each fallopian tube runs from the tip of each uterine horn and fans out to form a funnel structure (infundibulum) near the ovary; this is closely associated with the part of the ovary known as the ovulation fossa. The mare is unique among mammals as this attachment is the only site of ova release, whereas in other mammals the whole ovary can produce ova. Each fallopian tube is coiled and contains thousands of fine, flexible cilia which help to propel the ovum down towards the uterus. The fallopian tube measures approximately 25 cms in length, and is where fertilisation and storage of sperm occurs in the mare. If the egg is to arrive in the uterus, it must be fertilised within the oviduct because only a fertilised egg can pass through the junction and venture on into the mare's uterus. The equine egg is unique in that if it is fertilised it produces the hormone prostaglandin E2. This hormone causes the oviduct to relax, allowing the passage of the fertilised egg. Eggs that are not fertilised or die within the first five days do not produce prostaglandin E2, and the oviduct remains snug around them. Eventually they degenerate.
Uterus	The uterus is a hollow, muscular organ that is roughly Y or T-shaped which is made up of a body and two horns. It is suspended from the abdominal cavity by the broad ligaments which attach the horns of the uterus to the roof of the abdomen. When the mare is not in foal, the uterus is relatively small and collapsed. The hind part of the uterine body tappers to a muscular neck known as the cervix. The uterus is made up of three layers: • **serosa** – an outer membranous layer which blends with the broad ligaments • **myometrium** – a central muscular layer which is capable of strong contractions during labour • **endometrium** – an inner mucous membrane lining containing many glands and ducts. The uterus also performs the following functions: • secretion of hormones • site of embryonic and foetal growth and maturation.
Cervix	Connects uterus to vagina. Closed during pregnancy, dioestrus and anoestrous. Open during oestrus to allow for sperm introduction and parturition to allow for foal delivery.
Vagina	Connects external genitalia with internal genitalia. Accepts penis during copulation.
Vestibule	The vestibule extends from the vulval lips and houses the clitoris. The body of the clitoris is situated in what is known as the fossa, and contains three small cavities known as the clitoral sinuses. Due to its ideal environment for microbe reproduction, the clitoral sinuses can contain harmful bacteria. It is for this reason that the clitoris is swabbed prior to covering.
Vulvo–vaginal constriction	In maiden mares there may be a partial or complete hymen. This narrowing, also known as the vestibular seal, is a natural barrier against infection from external components, such as faeces or contaminated air. The seal is formed by a fold in the wall of the posterior vagina.
Vulva (consists of vulvar lips [labia] and clitoris)	Entrance to the vaginal tract. The vulva is visible externally and is situated below the anus. The vulval lips should be opposed and vertical, forming a seal. If the mare has poor vulval conformation (sunken anus, with a sloping vulva), a shelf is created blow the anus and faecal contamination may result. This can then lead to reproductive infections.

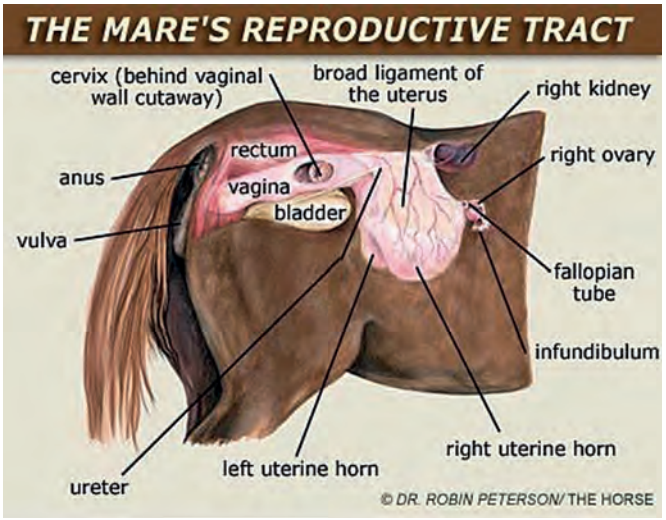


Normal vulval conformation

Abnormal vulval conformation



Anaesthetic being administered prior to a Caslick's operation being performed



CASLICK'S OPERATION

The Caslick procedure of surgically closing the upper part of the vulva has been commonly practised on broodmares for the past 60 years. The procedure evolved in an effort to treat what E. A. Caslick, DVM, had observed – the negative effect that air had on a mare's reproductive system.

MARE'S REPRODUCTIVE TRACT

Understanding the anatomy and physiology of the mare reproductive system is key to the operation of a successful equine breeding operation. It is not only mandatory for the vet, but the stud farm manager as well, to be well experienced in the details and individualities of the mare's oestrous cycle.

Understanding and being able to visualise the anatomy of the mare's reproductive system is mandatory for a successful breeding farm operation.

A vet using a technique called rectal palpation will examine mares at a stud farm daily or at least every other day.

Scanning the mare's reproductive tract

This procedure is performed in the following manner:

- With the mare in a set of stocks or restrained in a way to prevent excessive movement, the vet will take a plastic sleeve covered with a lubricating material (K-Y jelly) and enter the rectum of the mare with this sleeved hand and arm.
- Manure is removed until there is no faecal matter interfering with the vet's ability to actually feel through the wall of the rectum and grasp the left or right ovary. The vet can actually determine follicular structures, their size and consistency, during this process.
- The vet will continue to examine the mare's entire reproductive tract in the same manner and make notes as to what was found.

An ultrasound machine can be used in the same manner by taking the ultrasound probe into the palpating hand of the examiner. As you can see from the diagram, the rectum is located above the reproductive tract, making the palpation a fairly simple procedure.

THE MARES' OESTROUS CYCLE

TERMINOLOGY

Oestrous cycle refers to the entire reproductive cycle of the mare (usually considered to be 21 days).

Oestrus refers to the 'heat' stage of that cycle when the mare is receptive to the stallion and shows interest in being bred by the stallion. It is considered to be five days of the 21-day oestrous cycle on average.

Dioestrus refers to the period in the 21-day oestrous cycle when the mare is not receptive to the stallion – an average of 16 days, normally.

Anoestrus refers to the complete absence of oestrus; **winter anoestrus** refers to the short daylight days of the winter months when the mare will often not go through any oestrous cycles.

The mare is **seasonally polyoestrus**, meaning that she undergoes regular oestrous cycles during a portion of the year (late spring, summer and early autumn), and usually during the winter months she is in winter anoestrous. This is nature's way of preventing the arrival of a foal during bad weather.

These cycles are controlled by the mare's endocrine system (hormones produced by endocrine glands that control the cycle), which in turn respond to an increase or decrease in daylight duration with the onset of spring or autumn, which affects the pineal gland. This study of hormonal activity is known as **endocrinology**.

It is important to understand there is a closely linked feedback system between many of the reproductive hormones present in the mare, which will alter the level or presence of some hormones as levels of other different hormones increase or decrease. This means that artificially altering a single hormone will be likely to have an effect on one or more of the other hormones. The same can be said of natural hormonal changes – whether they are happening in a correct manner or not. Many of these hormonal changes do occur naturally, but when something becomes unbalanced either naturally or artificially, we can see oestrous cycle problems develop in the mare.

THE OESTROUS CYCLE

The horse's gestation length is approximately 11 months long. To ensure the survival of the species, the horse's natural breeding season has evolved to span the time from May through August. Foals that are born during this time frame will receive ample nutrition from their dam, since grazing conditions are at their peak. These foals will also have a chance to grow and become more physically capable of surviving harsh winter conditions with potentially scarce food resources.

The horse industries use of January first as the universal birth date for foals, and the competitiveness of the horse racing industry, have resulted in owners desiring foals to be born between 1 January and the middle of April. This requires breeding mares between the start of the Thoroughbred industry's covering season on 15 February and the end of May. Unfortunately, for the mare owner, this is when the mare's reproductive tract is transitioning from being non-functional during winter anoestrus and the ovulatory season.

A mare comes into season (oestrus) as a result of hormonal changes. As previously stated, the breeding season in the Thoroughbred industry begins on 15 February and ends on 15 July. In other breeds or in wild horses, the season will begin around February/March and end around September/October. The oestrous cycle will occur regularly during these months, although all mares will vary individually.

During the months of October and February there is normally no ovarian activity – this period is known as **anoestrus**. Owing to the start date in the Thoroughbred industry, artificial methods can be used to stimulate the mare's hormonal system into thinking spring has arrived and encourage them to start cycling earlier than normal. These methods include:

- correct nutrition and good body condition
- exposing the mare to 14-16 hours of daylight through the help of artificial means.

NUTRITION AND BODY CONDITION SCORING

The maiden/barren and early pregnant mare have the same nutrient requirements as the mature horse at maintenance. A preparation time of 4–6 months is advised to increase the chance of conception and to minimise the return to the stallion for re-covering. For both the maiden and barren mare, it is important to start monitoring her general appearance, body condition and cycles. When a young mare (2–4 years) is prepared for her first breeding season, it is essential to monitor her development, growth and condition more closely.

At the beginning of the breeding season it is recommended that breeding mares are maintained in a moderate to moderate-fleshy body condition (Henneke body condition score of 5–6). A moderate body condition shows no crease or ridge on the back (flat). The ribs are not visible but can be felt. Neck and shoulders are in a smooth line with the body, and the tail head begins to feel spongy. A higher condition (body condition score of 7–8) has no significant negative or positive effects on the conception rate, anovulatory period and numbers of cycles to conception of the mare. However, a thin body condition (less than 5) is known to impair a mare's reproductive performance.

Visit https://extension.umaine.edu/publications/1010e/ for more information on the body condition scoring system.

INCREASED DAYLIGHT HOURS

A number of different lighting regimens have been developed over the years; the one that has consistently proven most successful for many years is referred to as the 'Instant On' method. Requirements of this technique are as follows:

- The mare needs to be exposed to 14–16 hours of daylight every day until she is either confirmed pregnant or a similar number of hours of natural daylight results from the passing of the seasons.
- This needs to be started after she has been exposed to a sufficient number of 'short' days, to reset her biological response to the longer days.
- If a mare is maintained under natural lighting until approximately December first, or 8–10 weeks before her desired breeding date, this goal should be achieved.

Once the lighting regimen is started, it is critical that the mare be brought inside before dark and that the extra hours of 'daylight' are added after sunset rather than before sunrise. It is also imperative for success that the correct number of hours is achieved, and that the barn lights are not left on all night. Leaving the lights on all night can be counterproductive. A minimum level of lighting also has to be achieved to ensure success.

A good rule of thumb is that you should be able to read a newspaper in the darkest corner of the stall. Usually, a light bulb between 100 and 200 watts will achieve this minimum level. The type of light is not critical, meaning that the light can come from fluorescent lights. The lights should be in the stable; if they are not, then all shadows need to be eliminated so that the mare does not stand in a shadow, thus negating the lights.

If a mare is stabled for some or all of the day, these lighting requirements need to be met during her entire time inside. If she is outside, enough stimulation occurs even on overcast days. Keeping a mare under lights does not shorten her transitional period, it just encourages it to start earlier in the year so that the ovulatory season will also start earlier, thus meeting the goal of breeding the mare to foal during the desired time of year. Most mares, when kept under these conditions, will begin cycling when intended, but not all mares will.

Another innovative design is the Equilume ™ light mask. This mask allows the mare to be under artificial lighting but doesn't mean they need to be stabled in order to achieve the lengthened daylight hours.

For further information visit http://equilume.com/

In early spring the rise in temperature, extended daylight hours and improvement in the quality of grass stimulate the **hypothalamus** (the section of the brain that has direct control over the pituitary gland) to release hormones 'instructing' the **anterior pituitary gland** to produce **follicle stimulating hormone (FSH)**. This hormone stimulates the ovaries and the oestrous cycle begins.

Equilume™ Light Mask

© Equilume

To begin with, one of the thousands of follicles present grows rapidly and resembles a hard cyst on the surface of the ovary. Follicles can grow to 6cm in size before they ovulate. The developing follicle has short lived powers of hormone production – the innermost layers produce **oestrogen**, which causes increased mucus production and circulation within the vagina, cervix and uterus.

The oestrogen activates the visible signs of oestrus, signalling that the mare is 'in season', sometimes known as being in heat. This is when the mare is most receptive to the stallion and will allow covering to take place. This period of the oestrous cycle will last between four and seven days, although this is variable between mares.

The pituitary gland will now start to produce **lutenizing hormone** (LH) which enourages further growth and follicular maturity. Once it is fully developed and mature, the follicle will soften and rupture, releasing the egg (ovum) into the fallopian tubes via a specialist indent in the ovary known as the **ovulation fossa**.

A mare showing receptivity to the stallion during the oestrous (heat) period.
The picture on the left shows closed teasing, the picture on the right shows open teasing.

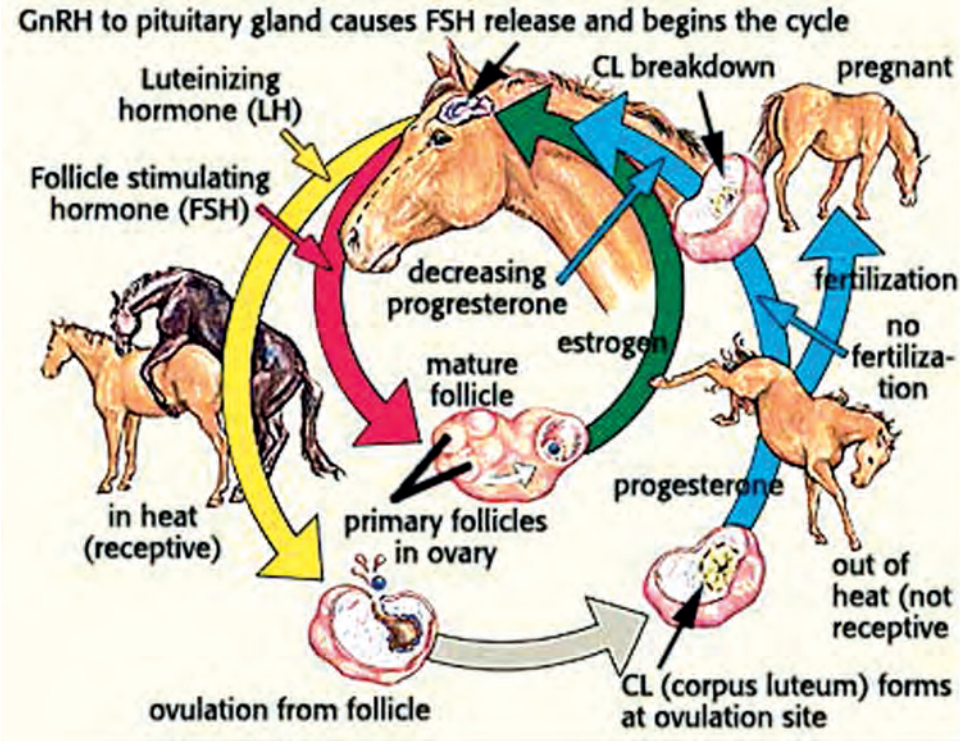
This is the first stage of ovulation, which usually occurs at around day 20 of the whole cycle or approximateley four days after the mare comes into season – although in young mares or those with a hormone deficiency this process can be delayed.

The empty follicle now starts to fill up with blood and is known as a **corpus haemorahagicum**. During the vet check this structure will be visible on the scanner and could cause the mare to flinch in discomfort. The inner layer cells within the follicle multiply rapidly – they replace the blood and form a soft, cyst-like yellow body in the ovulation fossa. This yellow body, known as the **corpus luteum**, is a temporary but very important gland. It will produce large amounts of **progesterone** for the next 14 days before being reabsorbed.

The release of this progesterone will reverse the effects of the oestrogen and bring to an end the time in oestrus and receptiveness to the stallion.

The pituitary gland will cease to produce sex hormones whilst under the influence of progesterone. If the ovum has been fertilised, the corpus luteum (CL) will continue to produce progesterone – this hormone will stimulate the uterus for preparation for pregnancy whilst further suppressing oestrogen, ensuring that the mare does not return in season.

If there is no successful fertilisation of the ovum, the uterus produces the hormone **prostaglandin** which will breakdown the corpus luteum. The CL will undergo a process of **luteolysis** (reabsorption) and the levels of progesterone in the mare's bloodstream will decrease. The pituitary gland will then recommence production of the sex hormones and the cycle will begin once again.



Sexual functions of the mare

PHYSIOLOGICAL CHANGES DURING THE OESTROUS CYCLE

	Ovaries	Uterus	Cervix	Vagina
Anoestrus	Small, hard, bean-shaped, with very small follicles	Thin walled and flaccid	Pale, dry/tacky and closed	Pale and dry
Transitional period	Become larger and softer. Waves of follicular growth resembling a bunch of grapes	Flaccid, begins to develop some tone	Soft	Depends on stages of follicular waves, either moist or dry
Oestrus	Well developed, soft follicles	Becomes swollen, thickened and flaccid	Moist, pink and swollen	Becomes more moist and pink
Ovulation	Follicles become very soft prior to ovulation. Release of follicular fluid and ovum. Ovary tender	As above	Completely relaxed	As above
Post-ovulation	Corpus haemorrhagicum forms in ovulation fossa	As above	Cervix starts to tighten	As above
Dioestrus	Progesterone produced. CH changes to CL. Reduced ovary size	Uterine wall has more 'tone' and feels less turgid	Begins to tighten. Looks pale and dry	Mucus reduces, becomes pale and dry

HORMONES ASSOCIATED WITH REPRODUCTION

Hormone	Primary Production Site	Target Organ	Effect	Therapeutic Use
Oestrogen – heat hormone	Ovary (ovarian follicle)	Uterus, cervix and external genitalia of mare	Expression of oestrus. Female sex characteristics, genital tract changes	Enhances oestrus (heat) but may interfere with normal cycling
Progesterone – pregnancy hormone	Corpus luteum of ovary (CL) also the placenta during pregnancy	Uterus Mammary gland	Maintains pregnancy	Prevent abortion. Synchronise or suppress oestrus (regumate)
Prostaglandin	Uterus	Corpus luteum (CL)	Luteolysis (CL regression)	Synchronise oestrus. Treat persistent CL
Gonadotropin releasing hormone (GnRH)	Hypothalamus	Pituitary gland (master gland)	LH and FSH release	
Follicle stimulating hormone (FSH)	Pituitary gland	Ovary – mares Seminiferous tubules – male	Growth of follicle – mare spermatogenesis – male	Same as effect
Luteinizing hormone (LH)	Pituitary gland	Mature follicle – mare Leydig cells – male	Follicle maturation and ovulation Stimulates testosterone production	Same as effect – gonadotropin (HCG)
Oxytocin	Pituitary gland	Uterus, mammary gland	Uterine contraction, milk let down	Retained placenta elimination, induce abortion or foaling
Prolactin	Pituitary gland	Mammary gland	Milk production	
Relaxin	Ovary, placenta	Pelvic tissues	Relaxation of pelvic area for foaling	

FOAL HEAT

Between five and nine days post foaling the mare may come into season. This is called the 'foal heat'

Often the foal will develop diarrhoea at this time, which can make the detection of oestrus in the mare easier. For a long time, it was thought that the diarrhoea was due to hormonal changes occurring in the mother. However, the diarrhoea has been seen in orphan foals, and this would suggest that the relationship is coincidental. The diarrhoea is now thought most likely to be a normal physiological feature of the foal's early development.

Occasionally, a mare might not appear to have a foal heat. This can occur when the mare gives birth early in the year and the mare effectively enters a seasonal anoestrus. It is important to remember that some mares are reluctant to show behavioural signs of oestrus when they have a young foal due to their normal protective, maternal instincts.

An enormous reduction in the diameter of the uterus (**uterine involution**) occurs very rapidly after foaling, which is largely due to an increase in uterine contractility. This uterine involution is characterised by many features, perhaps the most obvious of which is reduction in size of the uterus. Recognition of delayed involution is a key issue as it forms an influential part of the decision to mate the mare on the foal heat.

Although some studs will cover a mare on this heat, it has been proven to yield the lowest conception rate, so it is generally best to leave the mare uncovered on this season and instead, with the use of synthetic hormones, 'short cycle' her.

A mare should never be covered on foal heat if she has suffered dystocia (a difficult foaling) or has had a retained placenta.

THE STALLION'S REPRODUCTIVE TRACT

The key functions of the stallion's reproductive tract is to produce sperm and to put sperm into a position within the mare so it may unite with an ovum to form an embryo.

© Dr Dickson Varner

THE SCROTUM AND TESTES

The scrotum is a sac positioned between the hind legs and houses the testes. The testes produce **sperm** and the hormone **testosterone**.

The outer skin of the scrotum is thin and elastic and contains sebaceous and sweat glands. The middle layer consists of elastic, muscular tissue, while the inner layer consists of connective tissue which is lined with a thin membrane which allows the testes to move within the scrotum.

Each testicle is sited in one half of the scrotum and is divided by a thin layer of tissue. The testes should be roughly oval-shaped with their size being dependant on the size of the horse and the time of year. The testes of a mature Thoroughbred stallion measure approximately 10 x 6 x 5cm, and weigh in the region of 300g.

Each testicle is divided into lobes by sheets of fibrous tissue. Each lobe houses a network of seminiferous tubules which are responsible for the production of sperm along with **Leidig** cells, which secrete testosterone.

Temperature control is important as the optimum temperature for sperm production is 3˚C lower than body temperature. The scrotum has the capacity to regulate the proximity of the testes to the body through the contraction of the **cremaster muscle**. The blood supply is cooled as the spermatic artery divides into a capillary network before entering the testes.

In foetuses, the testes are positioned close to the roof of the abdomen and towards the corresponding kidney. Prior to a colt foal being born his testicles are within the abdominal cavity. Shortly before birth they descend through the inguinal ring, and into the scrotum. Sometimes for a variety of reasons one or both (more commonly one) do not descend as they should. The vaginal rings close during the first two weeks of the foal's life, and this will prevent a testicle that has not fully descended from the abdomen at that point from subsequent descent. The '**vaginal ring**' is the peritoneal lining of the internal inguinal ring.

If one testicle remains undescended, the horse is referred to as a 'rig', or **unilateral cryptorchid**.

Whilst unilateral cryptorchids can reproduce, their fertility will be affected; this is because the high temperature within the abdomen prevents sperm production from the retained testicle and will lead to a lower sperm count. When neither testicle has descended, the horse is known as a bilateral cryptorchid. The horse will look physically to have been castrated, and whilst he will be sterile, he will still be producing testosterone and will show the behavioural characteristics of a stallion.

Anatomical Structure	Function
The epididymis	This consists of a very long tube, which is tightly coiled back on itself and emanates from the anterior surface (front part) of each testicle. The enlarged front end (the head) connects to the ducts emerging from the testes. The sperm formed in the testes passes into the epididymis for maturation and storage.
The vas deferens	This is also called the **ductus deferens**. This tube is a continuation of the epididymis and transports sperm from there to the urethra. It measures approximately 1cm in diameter and has a thick, muscular wall. The vas deferens enters the abdomen in the spermatic cord through the inguinal canal. The tube dilates once it is in the abdomen to accommodate and store semen.
The spermatic cord	This structure contains the vas deferens, the spermatic vein, lymph vessels and nerves. The blood in the spermatic artery is cooled by the surrounding network of capillaries of the spermatic vein before supplying the testicles. The cremaster muscle, which is adjacent to the spermatic cord, acts to vary the distance between the testes in the scrotal sac and the body allowing for temperature regulation.
The inguinal canal	This is the channel through which the testes descend soon after birth. On some occasions, a colt may have a very large inguinal canal through which a part of the intestines may pass, resulting in an **inguinal hernia**. If this is unnoticed due to being small, and the colt is castrated via the standing method, there is a danger of some of the abdominal contents passing through the castration wound.

Anatomical Structure	Function
The urethra	This tube connects the opening of the bladder with the tip of the penis. It separately transports both urine and semen. Within the penis the urethra is covered by muscle; this muscle contracts which adds force to the passage of the fluids. Inside the pelvic area there are three sets of glands known as the **accessory glands** – these empty into the urethra. These glands are the: • **bulbo-urethral glands** – these are positioned behind the seminal vesicles (see below) near the roots of the penis. Secretion contributes to the seminal plasma • **prostate gland** – this gland partially surrounds the urethra and secretes a clear fluid which is responsible for cleansing the urethra of bacteria and urine prior to ejaculation • **seminal vesicles** – a large pair of elongated sacs approximately 16–20cm in length located on either side of the bladder. Secretion contributes to the gelatinous part of the seminal plasma.
The penis	The penis is housed within the sheath, the folds of which are lubricated by a natural, greasy smegma. This provides the perfect environment for microbes which cause venereal diseases to grow. The body of the penis is composed of erectile tissue, which becomes engorged with blood and fully erect when the stallion becomes aroused. Although this blood does not usually escape until post ejaculation, a stallion can lose an erection without ejaculating. During ejaculation the tip of the penis (the **glans**) becomes swollen further to help dilate the cervix of the mare further. This ensures that the majority of the seminal fluid enters the uterus, and to prevent the leakage of semen from the mare. In order to avoid damage to either the stallion or the mare, the glans must return to near normal size before the stallion dismounts.

STALLION AND MARE SELECTION

The Thoroughbred exists because its selection has depended, not on experts, technicians, or zoologists, but on a piece of wood: the winning post of the Epsom Derby. If you base your criteria on anything else, you will get something else, not the Thoroughbred.

Federico Tesio

Thoroughbred racehorses have been bred for over 300 years and are selected from a rigorous selection for superior racing ability. Along with racing ability, pedigree should be at the very forefront of breeding stock selection combined with the following points to consider:

- **proven quality** – Did the mare perform well on the racecourse? Is she from a family of good performers including Black Type horses?
- **temperament** – Does she have any vices?
- **conformation** – Is she well put together and free from any conformational defects which could be passed to the foal and inhibit progeny performance?
- **pedigree** – Is she from solid breeding lines containing broodmare sires and a strong family?
- **reproductive soundness** – An internal inspection by a vet will be required to ascertain this
- **previous pregnancies** – Have any previous pregnancies or foalings been difficult?

COST

If you are a small breeder then this aspect of breeding will require planning and management. Some of the costs incurred will include:

- **stud fees** – this is agreed between the stallion owner/boarding stud and the mare owner/agent
- **keep fees**
- **transportation** – to and from boarding stud and also to covering stallion if not boarded at stud that stands him
- **general management** – worming, farriery, dentistry
- **routine vets fees**:
  - inoculations – flu and tetanus, equine herpes virus
  - clitoral and uterine swabbing
  - blood tests
  - post foaling attention to mare and foal
- **specialist vets fees**:
  - examination for breeding soundness
  - additional swabs
  - examination for failure to show oestrus
  - hormone treatments
  - treatment of uterine infections
  - examination to assess readiness for covering
  - pregnancy diagnosis – this may have to be repeated more than once
  - dealing with twins
- emergency vet fees:
  - parturition problems
  - ailments affecting the mare and/or foal.

The vast majority of Thoroughbred foals born into the industry are bred as potential commercial ventures and will be sold as either foals or yearlings.

FACTORS TO CONSIDER WHEN CHOOSING A STALLION

STUD FEE AND ASSOCIATED TERMS

The stallion's stud fee generally reflects his quality and there are different terms upon which these are paid.

- **Live foal guarantee** – this is now a common provision in horse breeding contracts. It is a form of warranty offered to the mare owner by the stallion owner. Basically, it says that if the mare fails to produce a live foal from the breeding, the stallion owner will breed the same mare again without charging another stud fee. Can be called Standing Live Foal (SLF).
- **No foal – no fee** – if the mare loses her pregnancy by the 1 October deadline, then no stud fee is payable.
- **1 October terms** – the stud fee is payable on 1 October provided the mare is still in foal.

THE STALLION

Stallions should only be retired to stud and used if they are of outstanding quality. When looking for a potential stallion, the following should be taken into account:

- **achievements** – he should have a very good record of success in his discipline
- **conformation** – as with the mare he should have no physical or hereditary defects that could be passed to the future offspring
- **movement** – his action is of great importance; the future racehorse must be able to gallop
- **temperament** – how did he manage in his career environment?
- **fertility** – how many mares has he had successful progeny from against how many he has covered?
- **progeny** – unless he is in his first three years as a stallion, research his progeny's race performance; if he is still to have runners, then look at his progeny's sales results

- **genetic potential** – study his pedigree and make sure it is full of quality; the potential foal will carry a proportionate amount of genes from each ancestor, so the pedigree is of great importance
- **size** – this is a particularly important factor for a maiden mare. Whilst the size of the mare's uterus governs the size of the foal, some stallions tend to throw large foals which could result in foaling difficulties for the maiden mare.

Having selected a short list of stallions for your mare, the next step would be to view them. Nearly all Thoroughbred studs that stand stallions will have a website, social media outlet along with brochures filled with information. Some even have a pedigree 'nicking' service.

TEASING

The Thoroughbred covering season in the Northern Hemisphere starts on 15 February. It is therefore important to ensure that all the barren and maiden mares are ready for the breeding season by this date. This would mean they are 'cycling' and showing periods of being in-season and are free from any disease or infection.

The normal cycling of mares starts in the spring. To help encourage Thoroughbred (TB) mares to start cycling earlier in the year most TB studs will extend the winter daylight hours by putting the mares under lights from mid-December. This means that artificial white and heat lights will be used to encourage the mares to start coming into season earlier in the year than they would normally.

From 1 January all mares need to have had a variety of veterinary tests done. These include:

- blood tests for equine viral arteritis (EVA) and equine infectious anaemia (EIA)
- reproductive swabs to check for any sexually transmitted diseases (STDs). These are essential for any TB mare to be covered. The swabs are taken from the clitoris and cervix. The clitoral swab will test for the presence of contagious equine metritis (CEM) and the cervical swab will test for the presence of endometritis.

Around the same time:

- the vet will perform a scan of the reproductive tract to assess what stage of oestrus the mare is at
- check that vaccinations for equine herpes virus (EHV) along with flu and tetanus are up to date for the year.

Please note: The above swabs and blood tests are for low risk mares that have been based in the UK or Ireland the year before.

Further information for requirements on mares from other countries or ones that are deemed as being **high risk** can be found at: www.newmarketstuds.co.uk/breeders.php

You will also find a copy of the HBLB Codes of Practice on Equine Diseases via this link. It is advisable to familiarise yourself with this publication in case you ever are involved with cases of the diseases outlined in the manual.

It is also vital that the mare has her hind shoes removed before the season begins. Following these checks, the mares can then be teased.

Teasing is the term used to identify whether a mare is in season by using a stallion. Each mare is individual and teasing routines are designed with that in mind. The mare is usually in season for 3–7 days within a 21-day cycle.

The teaser can be any breed of stallion provided they have a good temperament and are capable of the role. It is a potentially dangerous role for handlers and teasers as the interaction between mare and teaser can be unpredictable. It is also the teaser's job to 'bounce' mares. Bouncing is the term used when a stallion mounts a mare but without covering her. This ensures she is receptive and is not going to kick out and damage the actual covering sire.

The teaser's role is a very important one, he increases the chance of conception by accurately predicting the in-season mare and the correct time for covering. Not all studs have teasers and not all studs that do, use them in the same way. But teasers do help identify in-season mares and help protect valuable sires from injury from difficult mares.

A teaser stallion with a correctly fitted bib

Please note the teaser in this picture is wearing a 'bib'. This prevents a teaser from penetrating any mare he bounces.

Teasing can be a potentially dangerous process, and care should be taken to ensure the safety of staff and horses. The following points should be considered:

- handlers should wear suitable protective clothing (skullcap, gloves, strong footwear)
- suitable tack should be put on the mare and teaser for optimum control (e.g. a bridle or chifney)
- the handler should be positioned to the side of the mare to avoid being struck by a foreleg
- the mare should be held parallel to the board, and the teaser allowed to approach her head and then her quarters from the other side
- the teaser should be allowed to sniff the neck and then quarters of the mare; time should be given to allow the mare to show if she is in season or not
- foals are normally left with a handler in the stable during the teasing process.

There are various methods of teasing that can be used, the most common one is 'closed teasing'.

A teasing or trying board or bar is placed between the mare and teaser. This helps prevent injury to the horses and handlers by not allowing the horses to make physical contact with their limbs.

Another method of teasing is open teasing. This method is more natural than closed teasing as there is no board between the mare and teaser. It can be used in various settings, including groups of mares in a field. However, it can be very dangerous to both horses and handlers, and for this reason only experienced competent staff handle the horses.

Some teasing boards are built into the fence line of the paddock – the teaser can then be walked around outside the perimeter of the field and mares that are in oestrus can come up and be teased.

Teasing should never be undertaken over a stable door. If a mare is not in oestrus she can badly damage the door or injure herself on the door furniture. If the stallion tries to rear over the door, he could damage his head on the door frame. It also does not allow the stallion to differentiate between his 'job' and his non-working time.

If a mare is not in season (i.e. in dioestrus or anoestrus), she may show the following signs:

- aggressive or violent attitude towards the teaser
- swishing or clamping down her tail
- putting her ears back
- trying to move away from the teaser.

In contrast, if the mare is in season (i.e. in oestrus), she will be:

- placid
- amenable to the stallion
- leaning toward the teaser
- arching her back
- straddling and lifting her tail
- winking the lips of her vulva and passing cloudy, strong-smelling urine.

Not all mares will exhibit easily seen external signs of being in-season – these mares are known as having 'silent heats'. This is why mares are also internally checked by a vet for in-season signs as it is very important to optimise timing for covering and conception.

COVERING

PASTURE BREEDING

This is the most natural method of covering and is where the stallion runs loose with his mares. This method is not practised in many breeding operations as the stock involved is valuable and the risk of injury is quite high.

The main advantages of pasture breeding are that it is more natural along with being less labour intensive. The disadvantages of using this system are:

- risk of injury – although most stallions will use their instincts to avoid being kicked, accidents can still happen
- the stallion may prefer some mares and ignore others, even though they are well in season – this will result in the mares not being covered
- infections could become more difficult to control
- fewer mares could be covered as the stallion will be frequently covering, which will expend his energy levels
- very difficult to be accurate on covering, conception and therefore expectant foaling date.

IN-HAND COVERING AND PREPARATION OF THE MARE

A veterinary surgeon will normally examine a mare before covering and take a further swab to ensure she is still free from infection and STDs prior to cover. STDs can infect the stallion and prevent the mare from getting in foal. The vet will also ensure that the mare is close enough to her ovulation point to be covered and may administer either injections or an implant of a synthetic hormone (LH) to help the mare to ovulate.

As the Thoroughbred Racing Industry only allows natural covering and most Thoroughbred stallions are very busy during the covering season, there will be limited if any availability to cross-cover a mare. This is why it is so important to ensure that the mare is at her optimum time to be covered and conceive first time.

The usual process for covering a mare is as follows:

- If the mare is visiting an outside stallion all the relevant paperwork should be sent to the stud that stands the stallion, prior to the mare's arrival for covering.
- The mare must be transported with her passport and a completed Freedom from Infection Certificate.

Scanning microchip in the stocks

Foal correctly positioned in front of stocks


Bandaging a tail before covering


An example of a covering unit

- If visiting an outside stallion, this is known as a 'walk out'. Having arrived at the stud, the mare should have a bridle fitted before she is unloaded and placed into a set of stocks. The mare will then have her identification checked by scanning her microchip and checking the markings in her passport. This is to ensure the correct mare is seen by the correct stallion.
- If the mare has a foal at foot it must be taken off the horse lorry with her and be visible to the mare at all times.
- All staff should wear protective clothing according to yard practice. Jewellery and perfume should not be worn.
- Whilst in the stocks the area around the mare's vulva should be washed down and a single use tail bandage, such as vet wrap, applied.
- Some mares may have had their vulva stitched; this is called a caslick's operation. The stitches will need to have been removed prior to covering. This procedure is known as an episiotomy.

THE COVERING AREA

In the non-Thoroughbred breeding world, mares are often covered in the pasture either in-hand or they run loose in a herd with the stallion.

Owing to the value of Thoroughbred breeding stock, especially the stallions, this method is deemed to be far too risky. Nearly all 'stallion stations' standing Thoroughbreds will have a purpose-made covering unit. The unit should be a well surfaced, covered area with good lighting and ventilation. It should also have two entrances and exits, one for the mare and one for the stallion, CCTV and a viewing gallery for mare owners to observe the covering.

COVERING UNIT EQUIPMENT

In the covering area, the mare is fitted with covering boots on her hind feet to help soften any kicks she may aim at the stallion. Occasionally mares will take a dislike to wearing these boots and try and kick them off. If the stallion is known to be overly vigorous with his teeth or front legs, a leather cape will be fitted over her neck and withers according to the stud's policy. It is usual for the mare to be twitched prior to the stallion's arrival.

Mares with foals at foot are covered with the foal in view. Normally foals will accompany the mare into the covering pen and be held by a member of the stud's staff either in a foal cage, or in the corner of the covering barn.

The handler at the mare's head should stand to the side of the mare, out of reach of the stallion's forelegs, while the stallion is mounting or covering the mare. Teamwork is essential throughout the process and one person should have responsibility for giving instructions.

The stallion handler should have complete control of the stallion as he approaches the mare. Once in position, the stallion will be encouraged to tease the mare. He will do this by vocalising, licking, nuzzling and biting. He may also exhibit the flehmen posture – this is when he curls his top lip back and extends his head and neck upwards and forwards. In doing this, he smells the mare's pheromones (scent) via a gland situated in the lining of his nasal cavity. The stallion should now have achieved an erection – this can happen very quickly or could take a long time, be patient and wait until he is ready before taking the next step. The stallion should be encouraged to

mount from behind and slightly to the nearside. If the mare is tall, she will be positioned in a hollow with the stallion on a hill made from the surface of the covering pen. One person will normally be responsible for checking that the stallion has ejaculated.

Some stallions may ejaculate immediately and this could be missed by the handler. Occasionally, stallions will dismount prior to ejaculation; he is normally still interested, maintains an erection and will soon remount the mare. In some cases the stallion has a very poor libido, will lose interest and dismount before ejaculation.

Signs of ejaculation are:

- thrusting will cease
- flagging' (pumping the tail up and down)
- the stallion will dismount and lose interest along with his erection
- urethral pulses will be detected on the penis.

As the stallion dismounts, the mare is normally turned to prevent her from kicking him, and she will be walked for a few minutes afterwards.

After covering, the mare's tail bandage, boots and twitch will be removed and the stallion's penis will be washed off with warm water. A sample of semen can also be taken to check the motility levels.

A mare correctly prepared for covering

A: Leather neck cape – this is fitted to the mare's neck to prevent injury if the stallion bites her once he is mounted

B: Breeding roll – this is placed between the mare's hindquarters and the stallion. It prevents deep penetration which could cause internal damage to the mare and is often used with maiden mares

C: Leather leg strap – these are sometimes used as a restraint to hold a mare's front leg up until the stallion has successfully mounted. It must then be released to allow the mare to bear the weight of the stallion

D: Skull cap – these must be worn correctly by everyone in the covering shed to prevent head injuries

E: A twitch – this will help keep the mare's attention on the handlers and also assist with keeping a maiden, nervous or difficult mare still

F: Covering boots – these are used to prevent injury to the stallion if a mare kicks out.

Stallion covering a mare

Stallion being washed down after covering

Clearly marked individual containers for washing the stallion's penis after covering

ARTIFICIAL INSEMINATION

The use of artificial insemination (AI) in horses has been around for a very long time and, through the years, has had a profound impact on the horse industry. Most of this impact has been of the positive variety, but there have also been some negatives. Just when AI first made its appearance on the equine scene is open to debate. There is a somewhat romantic story of an Arab chieftain who allegedly stole some semen from a prized stallion owned by a rival. The chieftain then inseminated his prize mare with this semen to obtain a 'super' foal. This story dates from 1322.

The use of AI in Thoroughbreds bred for flat and jump racing is not allowed and highly discouraged. The Jockey Club has explicit rules against the use of AI. The Jockey Club rule book states that horses eligible for registration must be the result of a stallion/broodmare breeding, defined as one including 'the physical mounting of a broodmare by a stallion with intromission of the penis and ejaculation of semen into the reproductive tract'. It is also noted that 'any foal resulting from or produced by the processes of AI, embryo transfer or transplant, cloning or any other form of genetic manipulation not herein specified, shall not be eligible for registration'.

All this aside, there are certain areas of the AI process that have their place when it comes to Thoroughbred breeding. This is the process of semen collection and evaluation and will be discussed later on.

REASONS FOR USING AI

AI may be preferable to natural service for one or more of the following reasons:

- The stallion may be a great distance away – semen can be quickly transported to the mare from stallions based worldwide. This in itself would reduce transport costs and stress to the mare through long journeys.
- The mare may be injured or unable to travel for some reason.
- The mare may be a bad traveller or fail to settle in unfamiliar surroundings.
- The mare may be susceptible to uterine infections – AI greatly reduces the transmission of venereal and other diseases.
- Each ejaculate collected from the stallion can be diluted into a special solution of nutrients and antibiotics known as an extender. This solution can then be 'split' into several portions (dependent on the quality, motility and density of the semen) to allow more than one mare to be covered per ejaculate.
- It enables better quality control of the semen quality and allows for more frequent semen evaluations to take place.
- If of a good enough quality following an evaluation, the semen can be frozen. This will allow the stallion's lines to continue following castration or death.

Among the disadvantages of AI are:

- the higher costs due to the considerable technology and skill required to collect, evaluate and ship semen properly
- the need for considerable amounts of paperwork and the need for tightly controlled regulations for the control of diseases to guarantee the export of healthy semen
- the requirement of adequate infrastructure for transporting the semen
- semen from some stallions will not tolerate the cooling and/or the freezing and thawing process
- mare owners in remote areas might not be able to have the stage of the mare's cycle determined.

For an AI programme to be successful, strict attention should be paid to health precautions and hygiene. There should be strict adherence to guidelines and national codes of conduct for disease control appropriate for your country to reduce the risk of disease transmission. Bacterial cultures from the stallion's semen, urethra, and prepuce submitted to an appropriate laboratory to identify any venereal pathogens should be performed. These samples need to be taken regularly if the stallion is involved in both a natural breeding and AI programme.

A BRIEF OVERVIEW OF THE AI PROCEDURE

The collection of semen should be undertaken by experienced stud staff with the correct safety measures in place.

Stallions can either be trained to collect from:

- a dummy mare
- an in-season or ovariectomised mare – this is a mare who has had both her ovaries removed and whose oestrous cycle is managed by synthetic hormones
- the ground without mounting either of the above.

Once the stallion has been teased and is erect, he should be encouraged to mount either an in-season mare or the dummy mare – his penis is then guided into an artificial vagina (AV). The AV is the normal container used for collection, as its design very closely resembles the mare's vagina. Some stallions can be reluctant to ejaculate into the AV but minor changes can be made to the water temperature and pressure which can assist with overcoming this issue.

There are several types of artificial vagina available commercially. Although there are differences, they all follow the same general design format of having a tubular inner liner, usually of latex, which is surrounded by a fillable water jacket encased in a harder outer shell. Attachable at the distal end is some form of collection apparatus to capture the ejaculated semen; this apparatus will often include a filter of some sort to remove the gel fraction of the ejaculate and any detritus such as smegma.

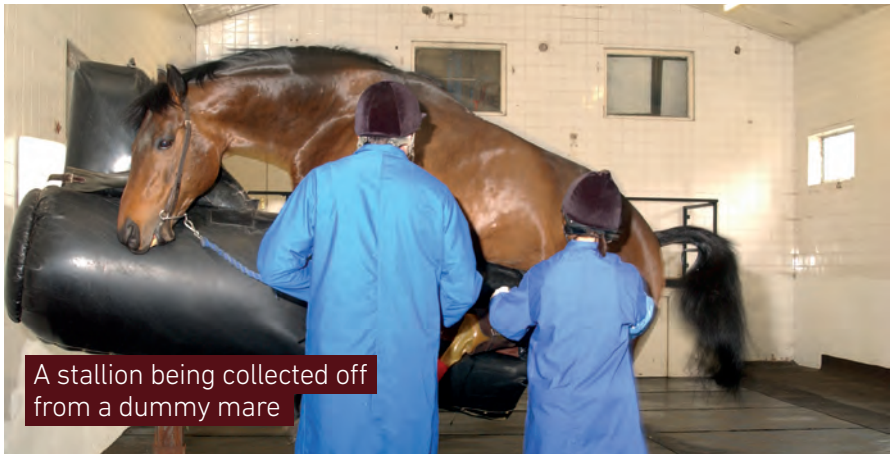
Once collected into a warmed, light proof container, the semen is then analysed for motility, density and quality, before having a semen extender added to it and the sample being split for shipping.

The fertility of semen can be adversely affected by a single or combination of the following:

- exposure to sunlight
- temperature shock
- careless collection or insemination procedure
- poor mare management
- exposure to spermicidal substances such as:
  - detergents, disinfectants or tap water
  - any product which contains preservative
  - disposable syringes with rubber-ended plungers
  - antibiotics containing preservatives
  - some brands of disposable gloves
  - most lubricants, except K–Y jelly
  - air.

The following types of semen can be inseminated into the mare:

- raw – no extender added and the mare must be on the stallion stud
- chilled – extender added, chilled down and shipped to the mare in specialist containers
- frozen – extender added, chilled and then deep frozen in liquid nitrogen before shipping in specialist Equitainers.



A stallion being collected off from a dummy mare

As with all coverings, the handlers should wear head and foot protection

INSEMINATION OF THE MARE

As with in-hand covering, the mare should have current swabs and blood tests, be in season and at the point of ovulation. Her tail should be bandaged, and her anus and vulva washed down with clean water only as detergents act as a spermicide.

Once she is prepared, the semen can be removed from its shipping container and passed into the mare's uterus via an insemination catheter. Semen is generally shipped in two separate sterile syringes in 40ml doses. This allows the mare to be inseminated again if she hasn't ovulated 18 hours after the first dose. Post insemination, the semen quality can be checked under a microscope either by a trained AI technician or a vet.

The mare insemination form must be filled in by a vet as soon as the mare has been inseminated. The form details the mare's identity along with date and time of insemination to ensure a valid identity of recipients of the stallion's semen.

If the mare successfully ovulates following the first insemination, then any remaining semen must be destroyed by the vet.

Pregnancy testing can be carried out as per in-hand covering.

EMBRYO TRANSFER

Whilst this practice is not allowed in the breeding of Thoroughbred race horses, it is common place in certain breeds.

The research in the UK was undertaken by Professor 'Twink' Allen and it is a pioneering aspect of modern equine breeding.

The process involves removing a fertile embryo from the donor mare and placing it into the uterus of a recipient mare, which will then carry the foal.

Some advantages of this process are:

- most donor mares are outstanding competition mares; using this technique allows her to carry on competing but still producing offspring
- more than one foal can be bred per year out of the donor mare
- the donor mare may be unable to carry a foal due to age or damage to the reproductive tract.

Whilst this procedure has caused controversy in the breeding world, many people have taken advantage of its technique despite the financial costs involved.

The chosen recipient mare or mares have to have their oestrous cycles synchronised with the donor mare via the use of hormone treatments. This is vital as the embryo will need to be transferred to a very similar environment as the one it has been removed from.

EXAMINATION OF THE MARE AFTER COVERING AND PREGNANCY DIAGNOSIS

Immediately after covering the mare's vulval area, it should be checked for signs of damage that may have occurred during the covering procedure.

Twenty-four hours post covering, the vet will perform a rectal scan of the mare's ovaries to check for ovulation and also check all is normal with her uterus and vagina. If the mare has ovulated she can then be scanned for conception and pregnancy. Establishing whether a mare is pregnant through the absence of oestrus is not satisfactory as there are other factors which could result in her failing to show signs of being in oestrus.

METHODS OF PREGNANCY DIAGNOSIS AND FOETAL DEVELOPMENT

The most accurate way of diagnosing pregnancy in a mare is ultrasound scanning. With advances in modern technology, vets can now use a Doppler scanner to measure blood flow to the foetus which will give an indication of whether the pregnancy is viable.

The ultrasound scans should ideally be performed on the following days post ovulation:

- Days 15–16 – mobility phase and easy to detect twins
- Days 19–20 – double check for twins/cysts
- Day 28 – check for foetal heartbeat and normal development
- Day 42 – check for normal foetal development
- Day 60 – check for normal foetal development and gender.

OTHER METHODS OF PREGNANCY DIAGNOSIS

HORMONE TESTING VIA BLOOD OR URINE TESTS

Progesterone – this is present in blood or milk, but is also present at various stages of the oestrous cycle.

Equine chorionic gonadotropin – formed in the placenta and will be present in the blood from day 40 post ovulation until day 60 when levels drop.

Placental oestrogens – present in blood plasma and urine from day 150 or pregnancy to day 300.

Blood and urine tests are not reliable for pregnancy testing. A negative blood test will only be accepted by a stud if it is accompanied by a negative manual examination or ultrasound scan.

DAYS OF PREGNANCY

DAY 9

Sometimes, with the naked eye, you can see only the 'embryonic vesicle' which houses the embryo. Normally a microscope is used. The vesicle looks like a shimmering, firm, translucent bubble, less than ¼ inch in diameter. On the ultrasound screen, you will see it as a black circle in a sea of grainy grey (your mare's uterus). At this point, the embryo is no larger than a pinpoint.

DAY 24

The vesicle has grown to 1 inch in diameter. It's a shimmering, flabby, translucent bubble with a dark red dot (the embryo) at one end. A network of thread-like blood vessels emanates from the ¼ inch dot. You can barely make out the beginnings of animal features: a head; tiny bumps that will become eyes; a fleshy tail nub; and four little buds that will eventually become legs. On the ultrasound monitor, you will see the vesicle as an irregular, guitar-pick shaped black blob in a sea of grainy grey. Generally, around Day 24 an embryonic heart is large enough to be seen on the ultrasound screen. To find it, focus on the 'floor' surface of the blob. You will see a white smudge, about ½ an inch in diameter, resting there; this is the embryo. Within the smudge, a tiny black dot, about the size of a pinpoint, will be flashing on and off like a computer screen's cursor – this is the pea-sized embryo's beating heart.

DAY 40

The vesicle is now 2 ½ inches in diameter, roughly spherical in shape, and somewhat collapsed. The ¾ inch embryo within is now recognisable as a four-legged critter: it has a blobby dome for a head, eyelids, rudimentary ears, ridges where the nostrils will be, and functional elbows and stifle joints. An ultrasound would reveal the vesicle as a roundish black blob: look for the white smudge of an embryo to be suspended from the blob's ceiling, rather than resting on its floor. This shift of position is step one in what researchers call 'the rise and fall of the embryo'. It results from filmy membranes at the top of the vesicle coming together to form the umbilical cord. As they do so, they shorten, pulling the olive-sized embryo up to the ceiling like a chandelier.

DAY 50–55

The embryo is now slightly over an inch long, nesting within the confines of the 3-inch vesicle. You can see tiny ribs under its skin; its domed head looks like that of a chihuahua, and has developed a distinct skull. Little triangles represent its ears; the hock and fetlock joints have developed. At this stage, your future foal officially will graduate from embryo to foetus. On an ultrasound monitor, you'll find the foetus back on the vesicle's floor, due to a lengthening of the umbilical cord. Because of its size – now about that of a pecan – this will be your last opportunity to view the foetus via ultrasound; in a matter of weeks, it'll be too large for the screen.

DAY 60

The vesicle is now flabby and shapeless, conforming to the uterine walls; the foetus is about 2 1/2 inches long. You can see that it clearly resembles a horse, thanks to the development of tiny hooves, complete with soles and frogs. Its head is still tucked, but less so than before. The foetus is hairless, and about the size of a hamster.

DAY 80

The foetal head and neck will not be tucked, and are being held level with the spine in the 'normal' horse position. Its sex is now viable: you can see that little lumps have formed for the scrotum, if it's a male, or the udder, if it's a female. The foetus is now about the size of a chipmunk.

DAY 100

Your mare's 7-inch foetus is about the size of a six-week-old kitten. You can see a bit of hair on its lips; its ears are unfurling from its head. They're now nearly ½ an inch long and are curled forward. The coronary bands look like raised lines encircling the tops of its tiny 1/4-inch hooves.

DAY 150

Gaining more than a pound every 10 days, the foetus now is about the size of a rabbit. Hair graces its chin, muzzle and eyelids. If you look closely, you'll see that eyelashes have emerged.

DAY 180

The foetus has quadrupled its weight in just 30 days. Mane and tail hairs have appeared; it's about the size of a beagle.

DAY 240

Now about the size of a small lamb, the foetus has whisker-like hairs on its chin, throat and muzzle.

DAY 270

Your mare's foetus now looks like a foal: fine hair covers its body, and it now has a swatch of hair on its tail.

DAY 320

In the last week or so, the foetus' lungs have developed to the point that they can function in the 'real world'; its legs have strengthened to the point that they can support its weight; and its hair has coarsened, from the fine, silky texture of foetus hair, to that of a full term foal. As far as development goes, the foetus is 'done'. (Normal equine gestation can range from 320 to 365 days.)

PREGNANCY FAILURE

Unfortunately not all pregnancies will develop into a healthy live foal. This may be due to one of many reasons, which at the time of loss might be undetectable.

Pregnancies can fail at any point post ovulation and below are a few examples and reasons:

- Week 1: The egg may have been fertilised but not reached the uterus and died within the fallopian tube.
- Week 2: Five days post ovulation the fertilised egg will reach the uterus. If the uterus is an inhospitable environment through inflammation of the endometrium or a regression in the CL, it will be impossible for the conceptus to develop.
- Weeks 3–5: If a hormone imbalance resides in the mare, then during this time the CL may regress and fail to continue the production of progesterone which stimulates the uterus to prepare for pregnancy.
- Weeks 6–20: Once organogenesis (the organs have developed) is complete (day 40) the future foal is known as a foetus. If it should die during this period, the membranes will be reabsorbed by the mare.
- Week 21–term: From four months of pregnancy the foetus develops a recognisable skeleton.

ABORTION

Abortion is when the mare will expel the foal and uterine contents before full-term pregnancy is complete. Depending on the stage of pregnancy you may or may not find the foetus. If the mare aborts in a paddock then predators such as foxes or badgers can remove the foal. If an abortion occurs then the mare and foetus should be checked by a vet to ensure the cause.

TWIN PREGNANCIES

Nowadays with modern ultrasound scanning, twin pregnancies are extremely rare. If a twin pregnancy is detected in the early stages, then one must be 'pinched' out as they pose a huge risk to the survival of the mare and the pregnancies.

REVISION TEST

1. In the case of low fertility, name the detailed investigations which may be carried out on a stallion before undertaking a semen evaluation.

2. From what part of the mare's reproductive tract is the endometrial swab taken?

3. What is the function of the hypothalamus?

STUD DOCUMENTATION

In this chapter you will learn about the documents and communication required on a Thoroughbred stud. There are many forms that will need to be completed in order for a stud to accept visiting horses.

This chapter should give you an understanding of the following:

- methods of communication
- forms required for horses arriving and departing
- forms required for covering and all aspects of breeding.

Internal and external communication is a vital part of ensuring the smooth running of a stud farm. The best form of internal communication is via a mobile phone. It is very important that all the staff involved with the daily running of the stud are informed of the tasks needed to be completed – they must also be informed of any owners/agents visits. The stud groom/assistant manager is generally responsible for communicating with the staff. Failure to do this could result in a unhappy owner, staff and horses.

Keeping records is a very important part of a stud and they should be kept regardless of the size of the farm. Keeping accurate records improves the overall efficiency and helps to optimise the chances of mares getting in foal and all stud stock remaining healthy.

The principle records kept include:

- veterinary (to include all routine vet work, plus work needed for breeding season)
- farriery
- arrival and departure forms
- swab and blood test results forms (checks must be made for certified laboratories)
- worming
- foaling (to include detailed foaling records and a diary of changes during the run up to foaling)
- teasing (to include completed teasing charts)
- covering (to include details and reasons for cross coverings)
- horse information
- locations of horses
- registrations
- nomination forms
- breeding requirement forms (http://codes.hblb.org.uk/)
- equine losses.

Locations and daily chores can be kept in a day-by-day format in the form of a diary, along with the individual horse's record sheet which should be kept in the stud office.

A covering chart should also be kept for each stallion on the stud, giving details of covering, scans and pregnancy diagnosis for each visiting mare, and a system should also be used for recording teasing results.

Key members of staff must be allocated to ensure accurate records are kept and are continually monitored. Forward planning is equally important to ensure that procedures are carried out in accordance with the stud's policy. Where appropriate, information must be distributed to other staff. This can include the mare's behaviour, foaling history, covering stallion etc. Instructions must be delivered to ensure that all staff appreciate the confidentiality of the information disclosed.

A breach in confidentiality could result in a loss of business for the stud or even legal action against them. Nowadays it is very good practice to have a social media policy in place; this prohibits the publishing of any non-official information and photographs of the horses based on the stud to a social media website. Most studs will have their own official sites and an appointed person to share relevant information.

Owners of horses boarding on the stud must be kept informed of their status whilst the horse is there. This information should include:

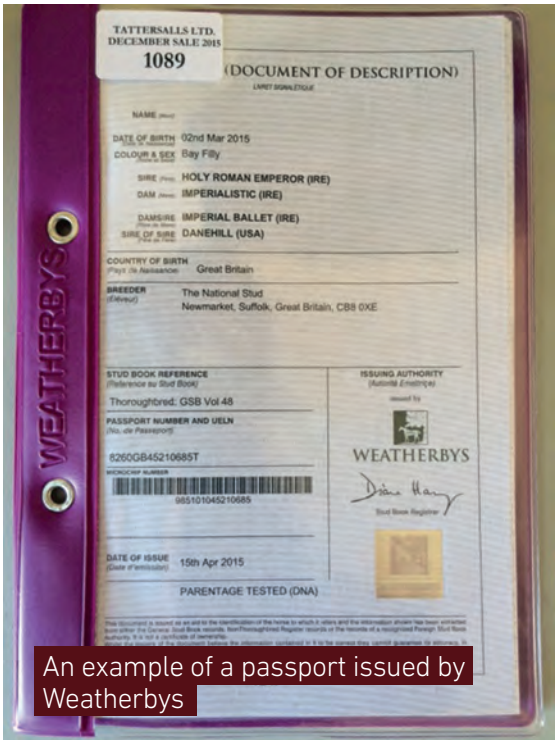
- foaling date and outcome
- covering date
- scanning results
- pregnancy diagnosis
- any deviations from expected progress
- any infection, illness, disease or injury.

In addition to the horse-related records, it is also important to maintain records for:

- paddocks – records can include grazing rates, rotations, machinery operations, fertilisers, herbicides, soil and herbage analysis reports, service lines (i.e. water, electricity and telephone), fencing, hedge trimming and maintenance contracts
- machinery
- buildings
- staff
- accounting
- owners
- accidents
- insurance
- health and safety
- risk assessments
- information contained in the staff handbook (disciplinary procedures etc.)
- plan of the stud, including access points
- grid references for emergency services.

There are various ways in which records can be stored. These include:

- **diary** – ideal to ensure that 'important actions' are planned and performed; can also be used as the initial record of information
- **notebook** – limited use but can be a useful format where information is recorded in chronological order
- **ring binder** – portable or semi-portable storage of medium amounts of paper-based information. Ring binders offer easy access to information and allow sorting (alphabetically or numerically)
- **box file** – allows the storage of medium amounts of paper but not as accessible as ring binders
- **computer** – might require skilled operators (especially if specialist stud software is being used) and this can alienate staff. Computers are unrivalled for speed of access and ability to produce a range of reports from a single database. They must be backed up to avoid loss of data in a power failure or if they become damaged
- **card index** – a very old fashioned method used for storing clients' or suppliers' details (e.g. telephone numbers and addresses)
- **wall charts** – these offer storage for medium amounts of data in a format that is easy to interpret
- **white boards** – these can be placed in every yard and supply information on the horses' status and behaviours, along with various veterinary treatments
- **black boards** – these can be used on individual horse's stable doors and contain information such as status needed for teasing or veterinary procedures
- **filing cabinets** – allows storage of large amounts of information including passports, annual accounts etc. Can be used as a secure format for confidential records
- **specialist record books** – these can be triplicate books and used for vet work, farriery, worming, arrivals, departures, coverings, foaling, teasing etc.



© The National Stud

An example of a passport issued by Weatherbys

© The National Stud

An unsealed microchip – these are inserted into the horse's neck via a sterile syringe

REGISTRATION PROCEDURE

From 1 July 2009, it is an offence for a horse not to have a passport. All equines, regardless of whether they are pedigree stock or not, have to legally have a passport. Failure to do so could result in a fine of up to £5000. Only the owner or breeder of the horse can apply for a passport.

PROCEDURE FOR OBTAINING A PASSPORT FOR A THOROUGHBRED IN THE UK AND IRELAND

A foal can only be registered if the mare is correctly registered as a broodmare (see relevant section in this workbook on how this is done).

A Weatherbys covering certificate will also need to be obtained from the stallion owner, unless it has been lodged electronically.

All foals need to be microchipped and have their identity taken by a qualified veterinary surgeon in order to obtain a passport. This must be done by the time the foal is six months old.

If a Thoroughbred mare is to become a broodmare then her passport will need to be returned to Weatherbys and be over-stamped so that they have a record of her change of use.

For further information on the registration of Thoroughbreds, please visit the following link: www.weatherbys.co.uk/horses-racing/bloodstock-studbook

REVISION TEST

1. What are the documentation requirements for incoming boarding mares?

2. What information would mare owners expect to be kept informed of?

3. Which organisation are Thoroughbreds registered with?

ATTEND TO THE MARE AND FOAL DURING FOALING

In this chapter you will gain an understanding of all aspects of caring for the in foal mare up to and during foaling.

The topics you will gain a knowledge of are:

- facilities required for foaling
- signs of foaling
- problems during foaling
- problems that can affect the newborn foal.

A heavily pregnant Thoroughbred mare in good condition

The pregnancy duration is divided into three trimesters and the nutritional needs of a non-lactating, pregnant mare from early pregnancy through to around month eight should not really differ from the care received by a non-pregnant horse. During the first two-thirds of the pregnancy, the foetus doesn't grow rapidly, so good grass and a normal balanced diet will ensure that the mare stays healthy. The biggest concern is that the mare remains at a healthy weight and does not become over- or under-nourished. Specialist equine nutritionists can help to plan a diet tailored to the mare's requirements.

During the last trimester (months 9–11), the foetus will grow rapidly and so will the mare's dietary requirements. Many Thoroughbred mares will reach this stage of their pregnancy during the winter months, so care must be taken to ensure she is having sufficient feed to meet these extra demands and energy requirements on her body.

As the foetus develops, it will take up more room in the mare's abdominal cavity, so there will be less room for forage feeds, and care must be taken not to over feed on chaff and hay as this could cause an impaction within the intestines. Specially designed stud mixes or cubes can be fed in the recommended quantities.

WEIGHT, FEEDING AND FITNESS

The aim is to have a fit pregnant mare at the correct weight.

The overweight mare tends to have a much more difficult foaling. Her lack of fitness and muscle tone means the act of foaling has much less effort put into it. Fat mares tend to 'chuck it in' halfway through the job, resulting in a slower delivery, which can cause all sorts of problems. A greater rate of professional assistance by attending personnel is required in an attempt to get the foal out with minimal internal damage to the mare. The rate of recovery for a fat, unfit mare is also hampered, slowing down the initial nursing duties that must be carried out by the mare in a very short period of time. Internally, the uterus is much slower to contract, again due to lack of muscle tone. This has a direct effect on the fertility of the mare for that season.

The underweight mare also invites problems, both to herself and the foal. Certainly she will also suffer from lack of strength during the foaling process. She is more likely to suffer serious internal damage. She is also more likely to produce a 'weedy' foal, which will require extra attention to get it up and going. This foal is more likely to have other health problems, and be foaled early. The mare is less likely to provide the required levels of colostrum, and support the foal with adequate milk.

Mares should kept active – do not confine them to a small paddock. Mares have a need to roam wide open spaces and to socialise. A large, well-pastured, well-sheltered paddock, with your other pregnant mares if possible; also having to walk a distance to feed and water is ideal.

Most pregnant Thoroughbred mares will not require rugging as it will have to be removed at some stage prior to foaling.

The Foaling Unit at The National Stud, Newmarket

FOALING FACILITIES

Nearly all Thoroughbred studs will have designated foaling units that have been designed especially to house mares due to foal.

Facilities for foaling Thoroughbred mares will vary from stud to stud. Whenever possible, foaling boxes should have:

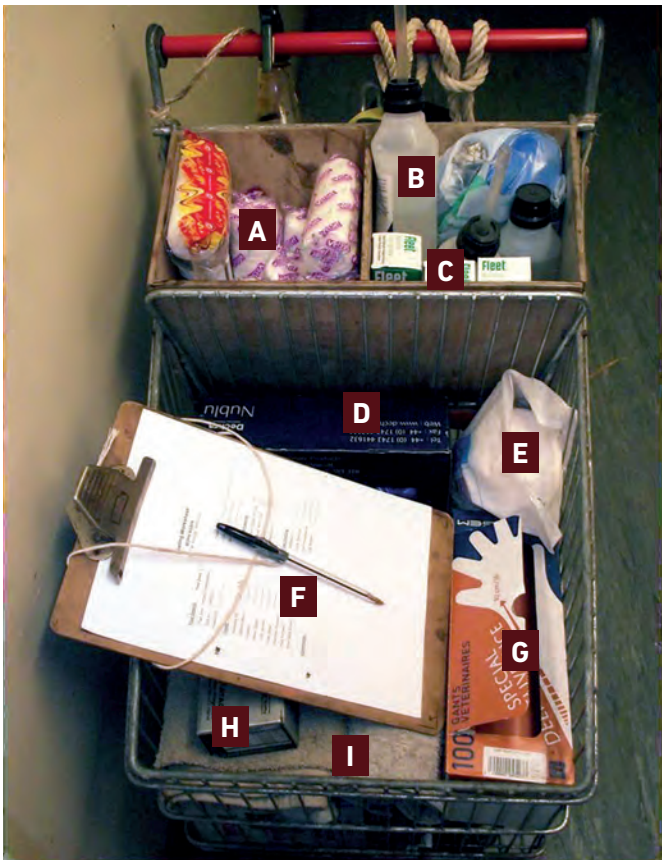
- plenty of space for a mare and foal – the ideal size is 4m x 4m
- good ventilation without draughts
- a free-draining floor
- sufficient headroom
- a wall-mounted feed and water source
- a sliding or outward-opening door
- a suitable power supply and good lighting
- a warm, clean room for the foaling attendant to observe the mares from
- a communication system (i.e. telephone or radio)
- round corners so that the mare cannot get cast, or the foal get trapped in a corner
- two doors to ensure suitable access if the mare is lying down
- a supervision window
- reasonable access for the veterinary surgeon

Correctly bedded down foaling box

- being sited close to nursery paddocks
- deep wheat straw beds to the door, with high banks
- CCTV with a monitor that can be watched by staff day and night
- chalk boards on the individual door that have notes on the mare's status and history
- a large white board either in the sitting up room or in an accessible place – this should have all the information on the various mares in the boxes along with contact information of vets and senior staff.

The foaling box should have all the bedding removed and be thoroughly steam cleaned after each foaling to help minimise the risk of spreading infection.

FOALING EQUIPMENT



A: Tail bandages

B: Lubricant

C: Enemas

D: Disposable gloves

E: Cotton wool

F: Foaling sheet

G: Arm length gloves

H: Refractometer

I: Towels

A: Foaling ropes

B: Hibuscrub used to treat the foal's naval

C: Oxygen cylinder

- Other equipment required:
- Sterile scissors
- Replacement colostrum (frozen/powdered)
- Feeding bottle and teats
- String – to tie up afterbirth
- Black bin bag or bucket – to place afterbirth in once passed and checked
- Sterile plastic jug and whisk to prepare colostrum.

SIGNS OF FOALING

A pregnancy usually reaches full-term at around 340 days but varies hugely between mares – anywhere from between 320 to 360 days is completely normal. The mare's udder may start to develop up to six weeks prior to foaling, with maidens often only bagging up relatively close to foaling. Some mares will show no signs at all, and must be watched very closely. Waxing up takes place anywhere from a week or more to an hour before foaling, or not at all.

The mare's pelvic muscles may relax a couple of days prior to foaling and a hollow develops either side of the tail. Within 24 hours of foaling the mare's vulva will start to relax and lengthen. Most mares will foal as night falls or just before dawn when they feel their most secure. Though they can just as easily foal during the day, in the paddock, so they need monitoring closely, checking them and their udders for development every 20 minutes.

Mares close to foaling should be kept under close supervision with the minimum disturbance. Many studs will have closed-circuit television cameras in foaling boxes, or organise sitting up rotas.

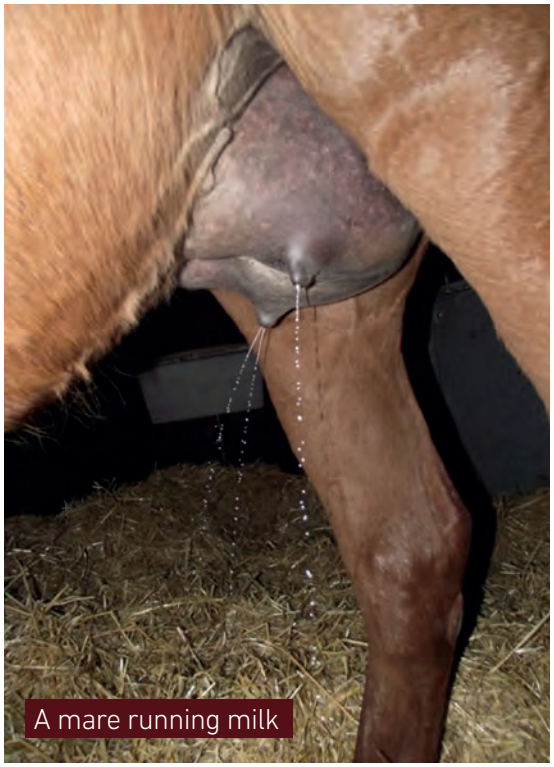
The actual process of foaling, or parturition, can be divided into three stages:

Stage one:

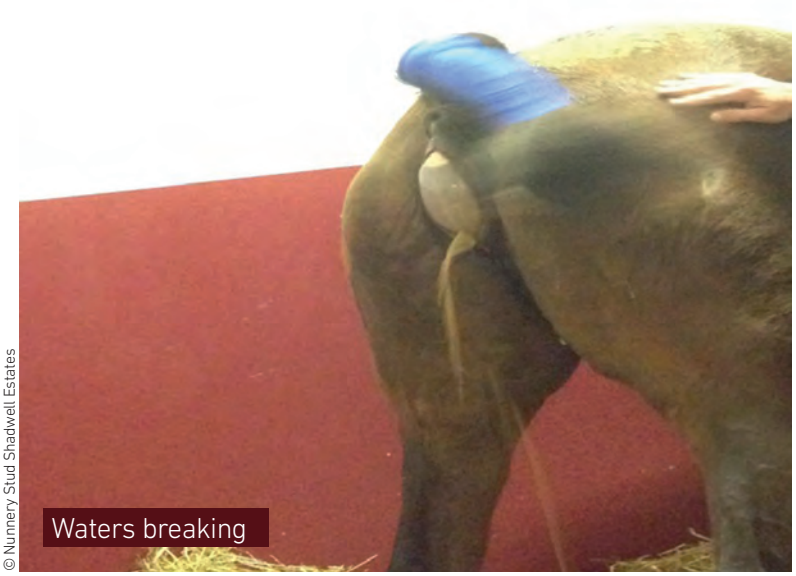
- Restlessness (may show colic-like symptoms), looking at flanks, getting up and down.
- Increased heart and respiration rate.
- Sweaty patches.
- Lasts on average between 2–6 hours (this is very mare dependant).
- Apply a tail bandage at this phase so as not to disturb the mare later. The wrapped tail will prevent stray hairs interfering with the foaling process, and also keep the tail cleaner.

Stage two:

- The 'waters' (allantoic fluid) will break (straw/brown coloured fluid). At this point the presentation of the foal should be checked. The allantoic fluid is made up of water, albumin, lactic acid and various salts.
- Abdominal contractions.
- The mare will get up and down and strain at this point.
- Waters breaking meaning that allantochorion ruptures, and the allantoic fluid is released. The allantoic fluid will look a lot like urine – and it is in fact comprised primarily of fetal urine.



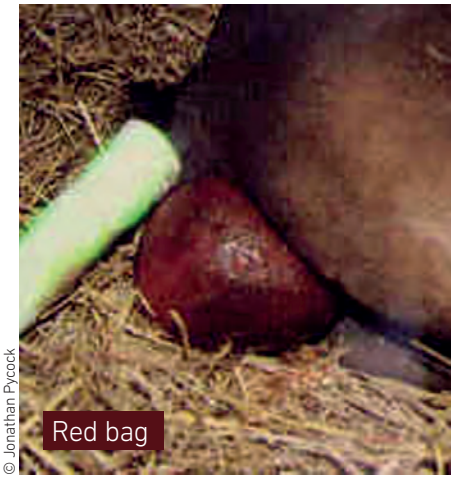
A mare running milk



Waters breaking

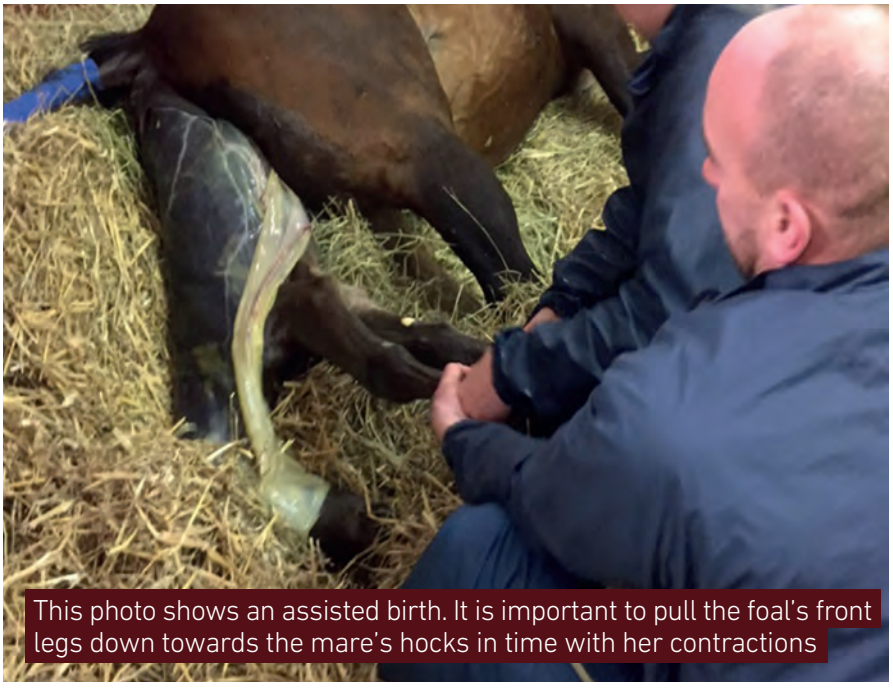
- Within around 5–20 minutes of the passage of the allantoic fluid, the white amniotic membrane should become visible. If the membrane that appears is red, do not hesitate to intervene and rupture that membrane manually, seeking the white membrane within, and manually encouraging passage of the foal. A red membrane is indicative of a '**red bag delivery**', meaning that the allantoic membrane failed to rupture, but rather is separating from the lining of the uterus, and the foal is in danger of suffocation.

Feet showing



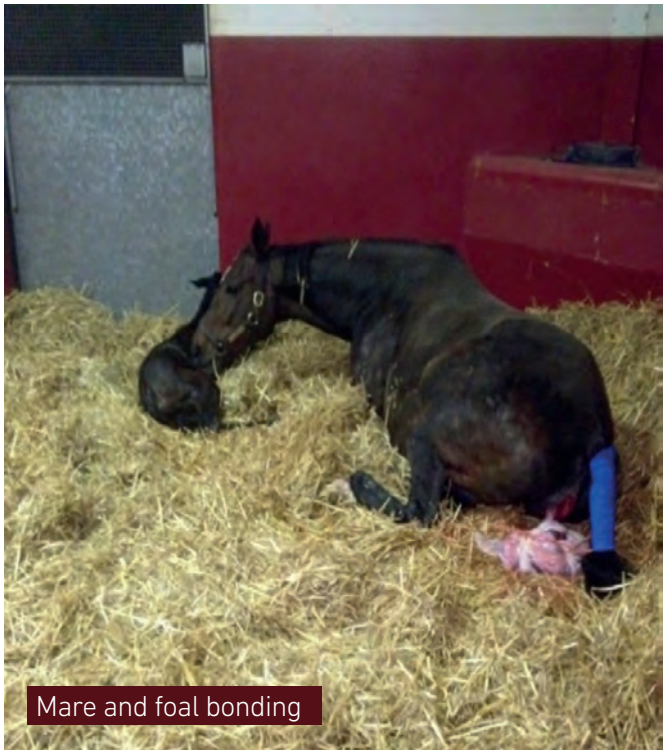
Red bag

- Please note that the string in the picture will be used at a later stage of foaling to tie up the afterbirth.
- Once you can see the amnion you should check the presentation of the foal. Wearing examination gloves, one should be able to feel two front feet with the soles pointing down, with one foot slightly more advanced than the other (to ease the passage of the shoulders through the birth canal), with the head on top. The foal will keep advancing with each contraction.
- Within the white membrane, you should now see the appearance of a foot, followed shortly by another foot, and then the nose. If you have seen the appearance of the white membrane, and no foot within 20 minutes, or a foot and no second foot or the nose within 15 minutes, you should – if experienced in foaling – determine the position of the foal. You may be looking at a dystocia (malpresentation) situation, and time is of the essence to achieve a healthy outcome (and even then, you may not).


This photo shows an assisted birth. It is important to pull the foal's front legs down towards the mare's hocks in time with her contractions

- The mare can sometimes struggle getting the shoulders through and assistance may be given by gently pulling on the forelimbs to provide tension – the amnion can also be ruptured.

From the 'waters' breaking to the foal being on the ground, the time should not be more than 20–30 minutes.



Mare and foal bonding

Foal suckling for the first time

Stage three:

- Once the foal is out the mare will often lie down for up to 20 minutes – do not disturb her at this point.
- Once the umbilical cord has broken, some studs will pull the foal around to the mare's head, so that she can see the foal and start the bonding process.
- The foal's umbilical stump should now be treated with an antiseptic solution.
- The afterbirth should now be tied up to avoid it being trodden on by the mare.
- The foal should exhibit a strong suck reflex and be making attempts to stand within 15 minutes of being born.
- Expulsion of the placenta – in most mares this will occur within 30 minutes of foaling (no longer than two hours).
- The placenta should be checked to ensure it is complete (keep it bagged in cold area for the vet to examine).

POST FOALING

The following are a checklist and guidelines to follow post-partum. It is important to assess the condition of the mare and foal individually and not as a pair.

THE FOAL

The newly born foal should be able to sit up on their sternum and hold their head up within the first 2–3 minutes after birth.

Each eye should be checked for an entropion (inverted eyelid). This can occur in one or both eyes – if the presence of one is detected it can be gently rolled out. It should then be checked regularly as they can roll back in and a vet may need to stitch it down.

The mouth should be checked for an overbite (parrot mouth) or an underbite (sow mouth).

An enema should be administered to aid in the passing of the first droppings (meconium).

The umbilical cord is broken either by the mare getting up or the foal trying to get up. If it continues to bleed it can be clamped manually until it stops and then dressed with dilute iodine or chlorhexidine. This should be closely monitored and re-sprayed over the next few days to ensure that it is dry. If it has not dried up or the foal is seen to be leaking urine through its umbilicus, a vet should be notified. This is important as the umbilical stump provides the main entry route for infection in the foal.


Enema being given


Attached umbilical cord


Entropian


Treating umbilical stump

The foal should have developed a suck reflex about 30 minutes post-partum.

The foal should be standing and nursing within two hours of birth (may need assistance).

It is essential that the foal gets an adequate supply of high-quality colostrum within the first few hours of life. A foal is born with no immunity and must obtain all its antibodies from the mare's colostrum (colostral immunoglobulins). Maximum absorption occurs within the first 6–8 hours of parturition, after which it declines significantly as the specialised cells in the foal's small intestine that absorbs these immunoglobulins gradually becomes replaced. If a foal is not standing and nursing within two hours it can be given a bottle of colostrum. Once the foal has nursed, ensure that the milk does not run out the foal's nostrils. This is a sign of a cleft palate.

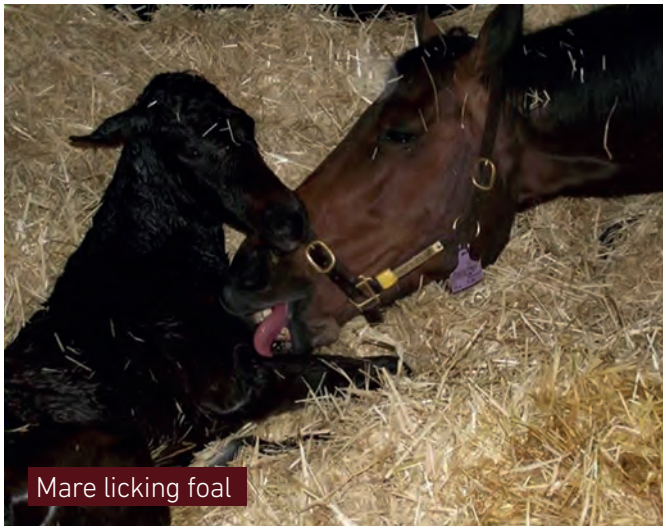
Look out for signs of jaundice in the foal (mucous membranes and whites of the eyes will develop a yellow tinge and the foal will become lethargic). The vet should be called immediately once the foal starts to display these symptoms.

Neonatal isoerythrolysis or jaundice foal syndrome is an uncommon but potentially life-threatening condition of newborn foals. It has been estimated to occur in 1–2% of equine births.

The condition occurs when a foal ingests colostrum containing antibodies directed against its red blood cells. Destruction of red blood cells releases a pigment called bilirubin that may cause the gums, white parts of the eye and faeces to become yellow or jaundiced.

Look out for the foal straining and displaying symptoms of colic, this may suggest a meconium impaction and may require a second enema or vet assistance. The colic symptoms may also be an indicator of broken ribs.

The most common sign of an ill or compromised foal is one that looks sleepy and won't nurse. It may look like it's nursing but the presence of milk staining on their heads will show that they haven't actually nursed. It is very important to frequently check the mare's udder has been nursed – the udder should be soft and the teats wet.


Mare licking foal


A correctly laid out placenta

THE MARE

It is important to also keep a watchful eye on the mare post foaling and note any sudden changes in her condition or temperament.

The mare should be affectionate towards her foal and should get up and start licking it shortly after birth. Maidens can sometimes take a bit longer to accept their foal as they can be a bit bewildered by the whole situation and should be watched carefully in case they display any signs of aggression towards their foal.

The placenta can be tied up by tying a series of knots in it or by using some twine. It should be tied up above the hocks so the mare can't stand on it and tear it. This also gives weight to the placenta and aids in its passing. The placenta is usually passed in 1–3 hours. Extra weights can be added to it to encourage passing. A vet should be notified if the placenta has not passed after three hours, as retained placenta can cause severe infection of the uterus which can lead to toxaemia and laminitis. Once the placenta has been passed it should be checked for any tears or missing sections.

A sample of colostrum should be taken and tested using a refractometer to ensure that it is a suitable quality for the foal to absorb antibodies; if it is of low quality then it must be supplemented. Supplemental colostrum can be powdered colostrum or high-quality colostrum collected from another mare and frozen; this is the most commonly used method of supplementing colostrum. When using frozen colostrum do not use a microwave to thaw it out as microwaving can destroy the immunoglobulins.

The mare may show signs of pain post foaling, this is normal as her uterus is still contracting and she is passing her placenta. She should be watched for any significant deterioration in condition and her gum colour should be monitored. Also check for any noticeable tearing of the vulva. Some mares, particularly maidens, experience pain when the foal nurses for the first few times and they may need to be held.

Check that the mare is passing droppings as the foaling may have caused some swelling internally which makes it painful to pass droppings, in which case a vet's attention is required as she might start to display symptoms of colic.

Another important factor to consider is the size of the mare's udder and if she is producing enough milk. If the mare fails to produce enough milk she can be given a stimulant to increase milk production.

Most foalings are straightforward and require very little intervention and assistance. It is important to try to recognise in advance the likelihood of a problem occurring and not to hesitate in seeking veterinary assistance, as timing is crucial in achieving a successful outcome for both mare and foal. The foaling season can be challenging at times but it is also an exciting and extremely rewarding time of year.

A refractometer

Mares and foals being led

Foal standing

CARE OF THE NEWBORN FOAL

A foal will normally get to its feet within the first hour of birth and should start to suck shortly afterwards. The mare's first milk is the colostrum, which contains antibodies and nutrients essential for the foal's survival. It is vital that the foal receives this colostrum.

The foal's first droppings, called the meconium, should be passed within the first 24 hours. If the foal is unable to pass the meconium professional help should be sought. Most studs will administer an enema to the foal as a routine part of the after care.

The mare's udder should be checked regularly after foaling to check she is providing sufficient milk. Foals that go 'off suck' require prompt professional attention.

Mares with young foals can be very protective and may show aggression to handlers. Extra care should be taken to ensure the safety of stud staff and the foal.

A foal being 'cradled'

Exercise after foaling is beneficial for both mare and foal. For the mare, it assists the uterus in returning to its normal size and the passing of any remaining fluids; for the foal, exercise provides the opportunity to develop balance and strengthen limbs. Many studs will turn the mare and foal out into a small paddock, known as a nursery paddock, on their own within one or two days. To start with the foal must be 'cradled' to ensure it is stable when being taken to the paddock and an extra person required to walk behind the foal and its dam.

FOALING AT GRASS

In the Thoroughbred breeding industry, foaling at grass is common place in the southern hemisphere. Obviously this method is as 'nature' intended, but it is not always practical, particularly if the weather is very wet and cold as it would be with the early foaling mares in the northern hemisphere. The quality of the soil should be taken into account; heavy clay would not be a good option to foal on. Observation is also difficult as most mares foal during the early hours of the morning, so outdoor lighting would need to be set up. The paddock's fencing should also be carefully looked at as there is also always a danger that the mare may foal near a fence – a particular danger if the fence is not of good quality (wire) or if there is a ditch on the other side.

PROBLEMS REQUIRING VETERINARY ASSISTANCE

RED BAG

Instead of the amnion presenting first, a velvety red membrane appears. The chorioallantois has failed to erupt due to premature separation of the placenta and the foal is being deprived of oxygen. Immediate rupture of this membrane and a swift delivery of the foal is necessary.

MALPRESENTATION

This is any deviation from the correct presentation (front feet and head).

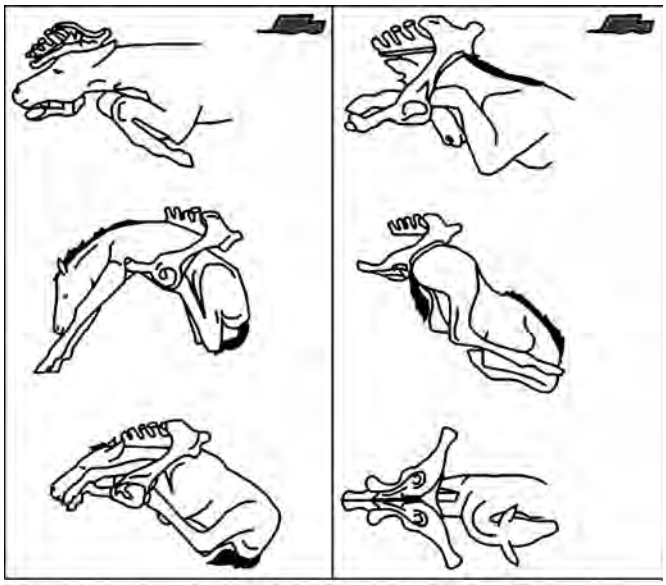


Figure 3. Various abnormal positions of a foal during foaling. (From Evans, *The Horse*, 1990.)

Dystocias (abnormal presentations)

TWINS

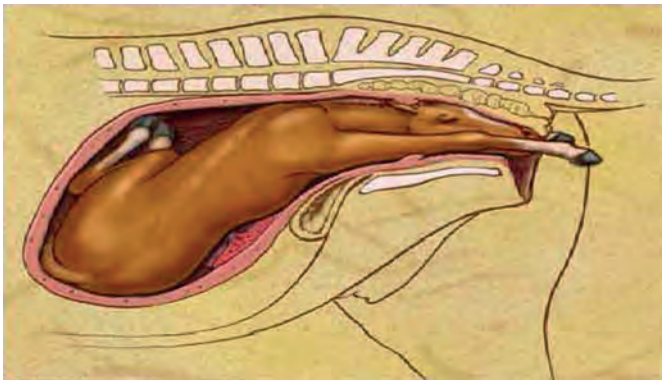
The recent return from Weatherbys regarding coverings and outcomes for the 2014–2015 period showed that no twins were foaled in 2015 and only two mares produced twins in 2014. Twins will very rarely survive to full term and, with modern ultrasound scanning, will be detected very early and one removed.

OVERSIZED FOAL

Foal is too big for the mare to deliver.

COMPROMISED FOAL

A difficult, prolonged foaling may result in an oxygen-deprived foal.



A normal presentation

REVISION TEST

1. List six pieces of equipment found in the foaling kit.

2. Give three signs that a mare is approaching foaling (i.e. within the next 1–2 weeks).

3. The mare has been straining for some time, but the waters have not broken, and on examination a thick red membrane is visible between the vulval lips. What is the correct term for this, why is it a problem and what must you do about it?

CARE FOR THE MARE AND FOAL

This chapter discusses caring for the mare and foal post foaling.

You will gain an understanding of the following topics:

- Vital signs of both mare and foal
- Importance of colostrum
- Conditions affecting foals
- Flexural limb deformities
- Weaning
- Fostering
- Handling the mare and foal.

Mare bonding

Although foaling can be a very exciting time, it is essential not to have too much human intervention and disturb the mare and foal more than is necessary. In the case of a difficult foaling, or if you have a sick mare or foal, then this rule won't apply as it is in the best interests of both to have emergency veterinary intervention in this situation.

THE FIRST HOURS POST FOALING

The foal's and mare's vital signs should be checked twice daily for three days post foaling. Any deviations from the normal rates could be indicative of a problem that may require urgent veterinary attention. Foals that are ill can very rapidly deteriorate and it is important that the illness is spotted and treated as soon as possible.

Healthy newborn foals will begin attempting to stand and suck after around 60 minutes of being born. They will be very uncoordinated at first, but are best left to get to their feet unaided no matter how tempting it is to try and assist them. If however the foal hasn't managed to rise or attempted to get to its feet, assistance after 2–3 hours will need to be given. These foals might have flexural limb deformities or other conditions affecting the skeleton (i.e. windswept). Conditions that affect newborn foals will be discussed later in this chapter.

Once the foal is successfully standing, it should have a good 'suck reflex' and be looking for the teats. The foal will need to search for the teats and be left to do so unaided to begin with.

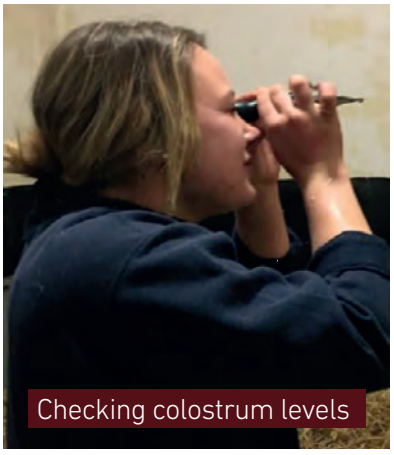
Not all mares (especially maidens) are immediately maternal – some may refuse to allow the foal to suckle. These mares might need to be restrained and possibly have a foreleg lifted in order to allow the foal to suckle.

The foal's intestinal tract is designed to have the ability to absorb proteins into the bloodstream from the mare's colostrum, including the immunoglobulins. However, there is only a short window that this passive transfer can take place. The highest rate of absorption is in the first three or four hours, with excellent levels experienced for about 12 hours after birth.

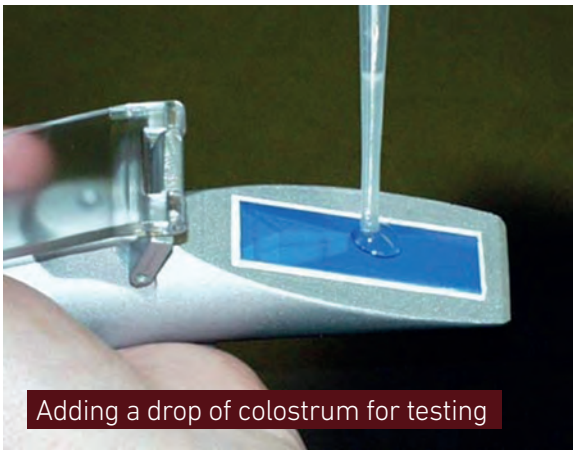
Table showing vital signs of a foal for the first 24 hours

Age	Heart Rate (beats per minute)	Respiratory Rate (breaths per minute)	Rectal Temperature (°C/°F)
Birth	60–80	Gasping	37–39/99–102
0–2 hours	120–150	40–60	37–39/99–102
12 hours	80–120	30–40	37–39/99–102
24 hours	80–100	30–35	37–39/99–102

WHAT IS COLOSTRUM?


Checking colostrum levels


Using a refractometer


Adding a drop of colostrum for testing

Colostrum is the thick, sticky yellowish coloured fluid produced by the mammary gland of the mare during the last few weeks of pregnancy. It is comprised of carbohydrates, fats, proteins and electrolytes. Colostrum is rich in antibodies that are critically important for immune protection of the newborn foal. Colostrum is also an important source of nutrients, vitamins, and other factors important in development of the immune system.

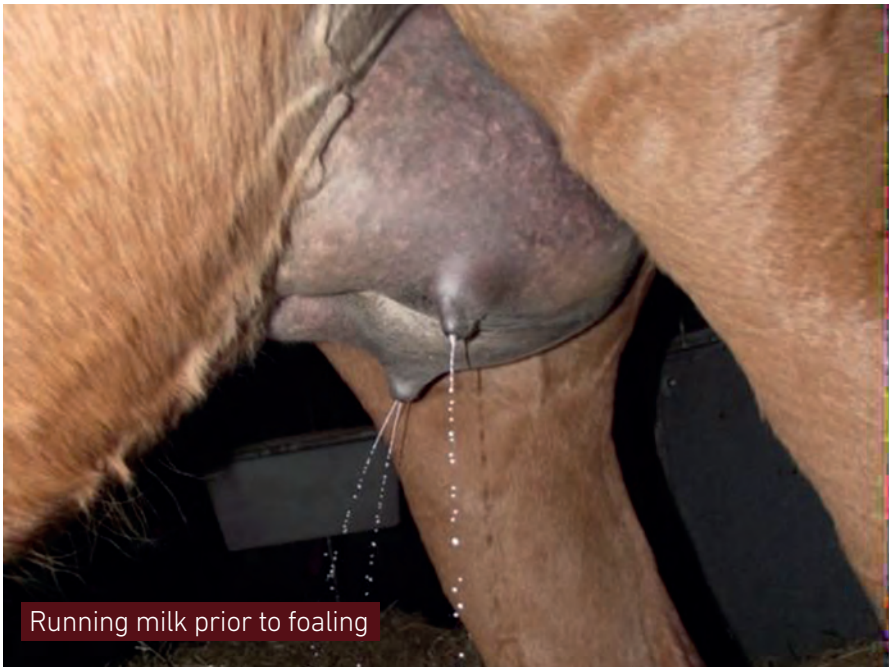
The multi-layered placenta of the horse prevents transfer of antibodies from the mare to the foetus across the placenta. Consequently, foals are born without antibody protection and are dependent on antibodies from the mare acquired through ingestion of colostrum for protection against infectious diseases during the early neonatal period. **Failure of passive transfer** of maternal antibodies significantly increases the risk of life-threatening infections. A foal is born without immunities (antibodies or immunoglobulins) so at that point is exposed to any undesirable infectious or bacterial pathogens. Passive transfer is the transfer of antibodies from the mare's colostrum to the foal's bloodstream.

Mares produce colostrum only once during the course of a pregnancy. The mammary gland selectively concentrates antibodies from the blood of the mare during the last two to three weeks of pregnancy. Vaccination of the mare 4–6 weeks prior to foaling will increase the concentration of immunoglobulins in colostrum.

Factors affecting production of colostrum include age, number of previous foalings and health of the dam. The most common causes of poor quality colostrum at the time of foaling are premature leakage of milk, failure of udder development, advanced mare age, maiden mare status, and premature delivery of a foal. Mares that drip or run milk for several hours prior to giving birth lose colostrum that is vital to the survival of the foal. In that situation, it is recommended that colostrum be stripped or milked out of the mare and saved for the foal. The colostrum should be strained through a gauze filter into a labelled plastic bottle and either refrigerated or frozen if foaling does not appear to be near.

The quality of the colostrum must be checked to ensure that it is rich in the vital antibodies and nutrients that will ensure the foal's immune system is boosted and protected. The use of a refractometer is now commonplace on most studs.

The colostrum also acts as a natural laxative – it stimulates peristalsis (the involuntary constriction and relaxation of the muscles of the intestine or another canal, creating wave-like movements which push the contents of the intestinal canal forward). This action is particularly of importance to the foal as it assists in the removal of the meconium (faecal matter composed of intestinal secretions, swallowed amniotic fluid and cellular debris) which must be passed within the first 24 hours. Failure to remove this faecal matter can result in toxicity in the foal and is the most common cause of colic in the newborn foal. The weight of the meconium can equal 1% of the foal's body weight at birth.



Running milk prior to foaling

If the colostrum is of poor quality <800 mg/dl then it shouldn't be used to freeze and keep for future use. In cases when the colostrum quality is below recommended standard then the foal can either be given good quality colostrum from stock and/or receive a plasma transfusion from the vet practice following the result of an igG (Immunoglobulin G) blood test. This blood test is generally taken 18 hours post birth.

Essentially, foals that are at a higher risk of not receiving enough colostrum can be placed into the following categories. A number of these foals may not need colostrum sourced from alternative places – it may be just a matter of milking it from the mare and manually giving it to the foal by either stomach tubing or bottle feeding.

MARE NOT SUPPLYING LARGE ENOUGH VOLUMES AND OR POOR QUALITY COLOSTRUM

- Mares that run milk prior to foaling
- Aged mares
- Some maiden mares

MARES THAT HISTORICALLY GIVE UNSATISFACTORY IGG RESULTS, INDICATING POOR QUALITY COLOSTRUM IS PART OF HER MAKE-UP

Stress-related foaling

- The mare may foal prematurely, so the milk production is not at its true potential.

Weak foals

- Those that have health issues at birth such as septic foals, dummy foals.
- Dysmature or premature foals.
- Foals from maiden mares will quite often be on the weaker side and slow to get to the nipple.

Foals with early conformation/ other issues

- Very contracted tendons, being well over in the knees or extremely upright on fetlocks.
- Tendon laxity such as very down on fetlocks or windswept (unstable, unevenness through hocks).
- Retained meconium, causing pain and abdominal colic, will prevent the foal from wanting to nurse.

BEHAVIOURAL (MARE)

Maiden mares

- They can be over fussy, continually wanting to keep the foal under her nose, hence swinging the udder out of reach. They also don't like the feel of a foal nursing, so may squeal, give little kicks and so on, resulting in the foal losing confidence to continue attempts to nurse.

Foaling in the paddock with other mares

- If a mare foals with horses in the paddock, the disturbances created by curious mares, or worse – mares trying to steal the foal – can impact heavily on the foal's opportunity to nurse.

NERVOUS OR AGGRESSIVE MARES

Foal rejection

- Can happen and is mainly in maiden mare. They can foal and just get up and walk away. Mares can also become aggressive towards their foals. These foals should be fostered on to 'batty' or nurse mares.

As the colostrum from the mare passes antibodies to the foal it is vital to ensure that she receives her flu and tetanus booster six weeks prior to her foaling due date. If she hasn't received this during the time frame, or she has poor/no milk colostrum, the foal will require a tetanus antitoxin injection either at birth or within 24 hours of being born.

Some studs will routinely issue antibiotics to foals for three days following birth, although many now opt to have a full blood count done at the same time as the igG and vet health check.

Foals can also be weighed at this point to see if they are a healthy birth weight. Many studs will then weigh them monthly to ensure they are on the correct path for optimum growth and development. Over or underweight foals can develop issues such as physitis or degenerative joint disease (DJD).

The vet check should include:

- temperature, pulse and respiration (TPR) ranges
- suckling frequency
- check for broken ribs
- check for cleft palate
- check for wry nose
- limb evaluation
- blood tests for igG and white blood cells (WBC).

The mare should be checked for:

- normal TPR parameters
- vulval tears
- cervical tears
- placenta retention
- milk production.

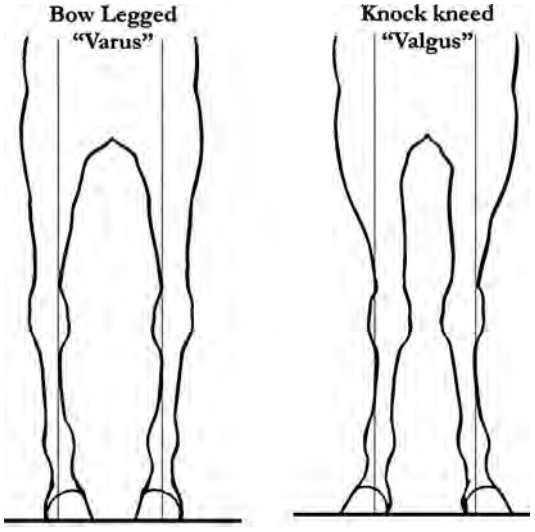
COMMON ABNORMALITIES IN FOALS

ANGULAR LIMB DEFORMITIES

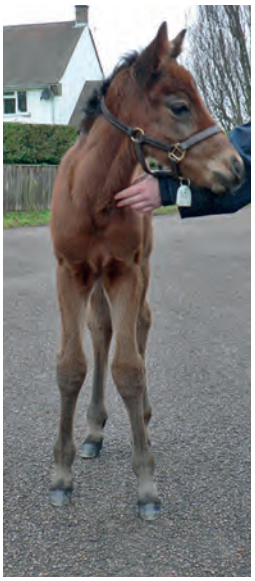
Angular limb problems are common. Foals are usually graded on a scale of zero to three (with zero being straight) to help evaluate severity and improvement of the problem. Most foals will improve without treatment within the first 30 days of being born. Each type of deformity is treated differently, but treatments can involve periosteal transection, limited turnout, special trimming and/or shoes, and monitoring through radiographs for changes and/or deterioration in the foal's conformation. They can come in the form of **carpal varus** and **carpal valgus**. Many foals are born 'over at the knee' due to constriction of the tendons, but these tend to improve on their own.

CONGENITAL PAPILLOMAS (WARTS)

These can be found on various parts of the body; however, the head and legs are the most common locations. Warts are usually not a problem unless they haemorrhage from trauma. Haemorrhaging can usually be easily stopped. Warts will usually clear up on their own.



Angular limb deformities




24-hour-old foal showing limb abnormalities


Same foal one month later

DELAYED OSSIFICATION OF CUBOIDAL BONES

Crushing of the carpal (knee) or tarsal (hock) bones can be found in premature foals or term foals with conformational problems. These foals should have minimal turnout and can be splinted.

DIARRHOEA

This problem can be serious with many critical results. Diarrhoea in the foal can be due to a non-life-threatening situation, such as milk overload, a change in the gastrointestinal flora, or be related to foal heat. However, it could be related to such serious diseases as rotavirus or bacterial infections. Rotavirus can affect foals at any age, is highly contagious, and is very hard to control, with bleach being the disinfectant of choice. Treatment involves supportive care and isolation. A vaccine is available pre-foaling for broodmares to reduce the severity of the disease in older foals, although it has not been known to help young foals.

Bacterial diarrhoeas are typically caused by clostridium and salmonella species, are usually profuse and watery, and are usually seen with depression and toxaemia. Faecal cultures, virus isolation, and rotavirus tests are used for diagnosis.

ENTROPION

This occurs when the eyelid turns inward against the eyeball. This is the most common eye problem, and it can be treated with a manual manipulation or stitches.

FAILURE OF PASSIVE TRANSFER

Foals which don't receive enough antibodies through the colostrum suffer from failure of passive transfer. All foals which have not reached an igG level of 400 mg/dl should receive one or more litre of plasma intravenously.

FLEXOR AND EXTENSOR ABNORMALITIES

The most common flexural weaknesses (back at the knees and weak pasterns) will usually correct themselves in the first few weeks. Turnout is restricted. Trimming and special shoes can be used for support. A small bandage with extra padding behind the heel bulbs can serve as adequate protection until the foal strengthens or until shoes can be applied.

FRACTURED RIBS

Fractured ribs can be fatal if the rib penetrates the lungs or heart. Foals should not be turned out into a paddock until its ribs have been checked by a vet. Fractured ribs are most common after dystocia or in very large foals.

HEART MURMURS

Most heart murmurs can be considered normal and will go away within two weeks, but if one does persist, a cardiac ultrasound examination is suggested. Normal heart murmurs can be found in very excitable foals, but will go away if the foal is lightly tranquilized. However, abnormal murmurs will not diminish with tranquilization.

HYPOXIC ISCHEMIC ENCEPHALOPATHY (DUMMY FOALS)

This syndrome is also known as neonatal maladjustment syndrome and can be seen in foals which might have been affected by premature placental separation (red bag delivery), dystocia, or non-elective caesarean sections. Signs such as delayed nursing or standing, wandering, and/or seizures can appear as early as 48 hours after birth or as late as five days. These foals are usually referred to a veterinary hospital.

LEG OEDEMA

Some foals might develop swelling in the lower legs, with no fever or illness.

MECONIUM IMPACTION

If the foal has a retained meconium, it could cause colic. If the foal passed his meconium before birth due to stress in utero, then the amniotic fluid will be faecal tinged and the amniotic fluid that entered the foal's lungs might have been contaminated. This could lead to meconium pneumonia.

NEONATAL ISOERYTHROLYSIS (NI)

Neonatal isoerythrolysis is when the foal inherits different blood antigens (types) from the stallion and the mare. As a result, the mare has produced antibodies to these antigens, which are concentrated in her colostrum. The foal nurses the colostrum, and, depending on the concentration and type of antibodies, the foal develops haemolytic anaemia (anaemia resulting from decreased red cell survival time) within 24–96 hours of age. Affected foals become jaundiced (have yellow membranes), depressed and anaemic.

PATENT URACHUS

The urachus is the in-utero connection between the foetal urinary bladder and allantoic cavity. In normal foals, this structure closes soon after delivery, and it eventually completely degenerates to a group of ligaments. If the urachus does not close, urine will exit the umbilical area. Bacteria could enter and cause illness, so treatment is generally antibiotics until the hole closes. Surgical intervention is sometimes required.

PREMATURE FOALS

Due to differences in foetal maturation, a wide range of gestational lengths is possible, with a normal gestational length between 322–345 days. Some mares will foal as early as 310 days and have a normal foal. However, foals born under 310 days might need intensive therapy to survive.

SCLERAL (EYE) HAEMORRHAGE

This can be caused by trauma at birth and generally causes no problems.

SEPTIC ARTHRITIS (JOINT ILL OR NAVEL ILL)

Caused when bacteria enter into the blood stream via an untreated umbilical stump, they can lodge and grow in the joints of the limbs. Bacteria can then cause septic arthritis, also known as joint or navel ill. On rare occasions, joint abscesses can form. Foals will present with lameness, a high temperature and will require urgent veterinary treatment in the form of high dose antibiotics, a joint flush and sometimes surgery. X-rays may also be taken to see if there is any spread of infection to the bones.

UMBILICAL BLEEDING

If haemorrhaging occurs, a commercially available clamp can be used to stop the bleeding. These foals should be watched for signs of infection over the next two to three weeks. If an infection develops, antibiotics can be given.

UMBILICAL HERNIA

These can be felt upon first exam; however, they become more obvious after several weeks. Hernias are usually treated closer to weaning.


Umbilical hernia

WINDSWEPT FOALS

A foal might be termed a windswept foal if it has a conformational abnormality that results in both limbs being slanted in one direction. This could be caused by improper foetal position during the last few weeks before birth. A veterinary will need to evaluate the curvature of the long bones and look for any spinal deformities. Affected foals are confined to stall rest until improvement warrants a change to a round pen or nursery paddock. Surgery might be required; however, most foals will correct themselves.


Windswept foal

Wry nose syndrome

Wry nose syndrome

WRY NOSE SYNDROME

A foal with wry nose will have the upper jaw and nose deviated or turned to one side. A deviated nasal septum (the cartilage plate that separates the right and left nasal passageways) is also usually present, which results in obstruction of the airway and difficulty breathing. This is the greatest functional concern with wry nose. There will usually be poor alignment of the teeth, although most foals can still nurse and in most cases are bright and active.

Very mild cases of wry nose might resolve on their own with time. More severe deviations will need to be treated surgically. Radiographs of the head will help the veterinarian assess the severity and recommend treatment options. Foals with wry nose can sometimes also have a cleft pallet.

FOSTERING

Sometimes foals for various reasons will need to be fostered onto other mares. These mares are known as nurse or 'batty' mares and are generally a 'gypsy' cob type mare as they are very amenable. If a Thoroughbred mare loses her foal, she will generally not be used to foster another foal.

Reasons for fostering include:

- death or illness of mare
- sick foal
- mare produces little or no milk
- dangerous mare
- mare rejects the foal.

CHOICE OF FOSTER MARE

Any mare that is to be used as a foster mare must be of a suitable temperament i.e. relatively quiet, well-handled and a good mother who is unlikely to harm her new foal, once bonded. She must also be able to produce the volume of milk necessary to nourish and encourage the normal growth of her new foal.

Draft cross mares make particularly good foster mares because of their calm temperament and the volume of milk that they usually produce. The foster mare must be disease free and preferably vaccinated against tetanus and equine influenza and equine herpes viruses. Even when a foster mare is required following an emergency, when speed is of the essence, the risks of introducing infectious disease must be considered and assessed, in order to protect other horses.

In most cases, a mare only becomes available for use as a foster mare if she loses her own foal. The National Foaling Bank and other organisations may be able to 'hire' a suitable foster mare until the foal is ready for weaning. In some circumstances, such organisations may accept your foal in order to achieve the fostering process, or may send an experienced groom with a foster mare to stay at your premises until the foal is fostered successfully. Most Thoroughbred studs have their own band of draught type mares who will be in foal to the teaser stallions and once they have foaled, will be on standby to foster a Thoroughbred foal if needed.

A successful fostering of a Thoroughbred foal onto a gypsy cob mare

THE FOAL

Foals for fostering should ideally be less than three weeks of age as they are more difficult to foster after this time. All foals are born without natural protection against infection. If a newborn foal is to be fostered it is essential that it receives colostrum either from its own dam or from a donor source within the first 24 hours of its life. If it is not possible to obtain colostrum the foal should receive a plasma transfusion from a suitable donor. For fostering to be successful, the foal must be strong and well enough to stand and nurse unassisted. It must be able to suck vigorously before any attempt at fostering is made.

PREPARING THE MARE AND FOAL FOR INTRODUCTION

If the mare has lost her own foal at or near foaling ask if it is possible to have her own placenta, as this may be useful during the fostering process. The mare should be left in the box with the dead foal. It was once common practice to skin the dead foal and to use the skin as a 'coat' for the foal to be fostered. Once the bereaved mare is quiet and calm, the dead foal should be removed and replaced with the foal to be fostered.

Ideally there should be two or three capable people assisting a fostering process. The mare should be deeply sedated and held in a bridle by a competent handler. Many people apply a strong smelling ointment (such as Vicks Vaporub) to the mare's nostrils to mask the smell of the foal, but this is not always helpful or necessary, depending upon the response of the individual mare. A twitch should be available in case it is needed.

The mare's udder should be clean and full of milk but not tight or painful otherwise she may resent the foal's approaches. The foal should be made hungry by withholding milk for a couple of hours prior to introduction, but not weak by excessive withholding of food. Where possible, its own smell should be masked by rubbing its coat with the foster mare's own placenta or by fitting it with a clean foal rug.

THE INTRODUCTION

The introduction should be made in a relatively large, clean stable. The mare is held firmly and confidently with her hindquarters in a corner and the foal is introduced to her at the level of her shoulders, keeping the foal and handlers away from her back legs. The foal should be held so that the mare can see and sniff the new foal. The mare's reaction is monitored closely. If very fortunate, her response will be to call and 'talk' to the foal immediately as though it was her own, suggesting that she will readily accept the orphan foal.

More commonly, mares behave unpredictably and aggressively, attempting to bite, strike and/or kick at the foal. The mare must be clearly reprimanded for showing this type of behaviour. In such cases it may be necessary to apply the twitch, hold a front limb up or pinch a fold of skin just in front of the shoulder to see if this will distract the mare enough to allow the foal to approach her more closely.

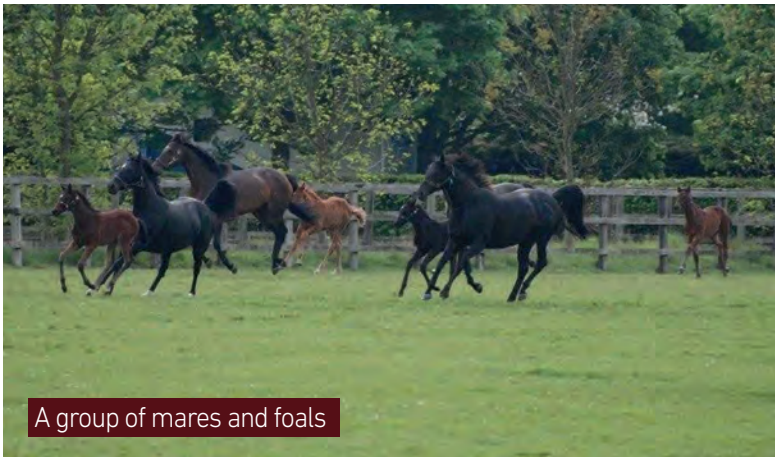
The foal must not be put at risk and it must not be left unattended at this stage as initial apparent acceptance may 'wear off'. Some


An older foal having a foal slip fitted


Mare rearing up


Foals bonding in a field


A young foal turned out in a safe field


A group of mares and foals

mares may be 'intelligent' enough to wait patiently for an unguarded opportunity to show aggression. Even where fostering is successful it can take many hours and even days for the mare to fully accept the foal. The foal is usually happy to suck but will soon be discouraged if the mare behaves aggressively towards it or will not allow it to suck. At this stage it is useful to let the foal wander around in the stable slightly away from the mare so that she can see it and get used to its presence in her box. If the foal wishes to lie down, let it do so but at a safe distance from the mare. Every now and then encourage the foal to approach the mare and attempt to suck.

If the mare remains aggressive towards the foal in spite of combinations of sedation, twitch, voice and other restraint, it is not worth persevering and it will be necessary to try to obtain an alternative foster mare.

It may take only a few minutes or sometimes many hours or days to be sure that a fostering has been successful. Once the foal is sucking and moving freely around the stable without the mare threatening it or preferably with her calling and apparently accepting it as her own foal, sedation can be discontinued. Do not leave the mare and foal alone together until you are totally confident that acceptance is complete.

Mare milk replacer must be available for use where the fostering process is going slowly, in order to provide the foal with essential nourishment and fluids to maintain strength whilst not eliminating hunger and the desire to suck.

CONCLUSION

Fostering can be a very successful and satisfying exercise. Most mares make natural mothers and it is always nice to see a mare that has lost her own foal accepting another mare's foal. Orphaned foals that are raised on foster mares are easier to manage, healthier and better developed both physically and mentally than hand-reared foals. Hand-reared foals seldom thrive and usually lack social development. However, if there is serious risk of injury to the foal during an attempt at fostering, or if a foster mare is not available, hand rearing may be the only option.


Student handling bag of feed


Leading mares and foals

CARE FOR THE MARE POST FOALING

A few hours after giving birth the mare can be given a bran mash which will help warm her stomach and act as a mild laxative. If all is well over the following 24 hours, the mare and foal can be turned out into a nursery paddock for a few hours. This will help to strengthen the foal's limbs along with assisting the mare's uterus with the involution process and expulsion of any fluid debris that may have accumulated internally.

Many studs now put leather foal slips onto the foals straight after birth. This should be done with one person 'cradling' the foal whilst the other person fits the head collar. Foals can be difficult to catch at first and may require cornering through the appropriate positioning of the mare in the loose box or paddock.

When leading out a newborn, it is essential that it should be led alongside the mare with a person following to keep it moving forwards. The foal should not be left to follow the mare on its own as this could be dangerous to not only the foal, but the mare could panic and cause injury to herself and the handler if he cannot see her foal.

Mares with foals at foot are still capable of misbehaving.

Mares and foals will be turned out into groups; this allows the foals to play and develop mentally and physically and will assist with its growth.


Holding mares and foals in paddock

NUTRITION OF THE MARE AND FOAL

Nutritional requirements of a lactating mare and those of her foal are of great importance. An underweight, undernourished mare will not only look poor but ultimately the growth of her foal will be affected.

A healthy newborn foal that weighs 50kg should have doubled its birth weight by the time it is eight weeks of age. Foals and youngsters gain approximately 90% of their mature bodyweight by the time they are 15 months old. It is for these reasons that a good quality, balanced diet is essential.

The time of year must be taken into consideration when calculating a feed ration. Mares that are foaled early in the season won't have the benefits of the spring grass and will be expending energy keeping warm.

The aims of feeding the mare and foal are to:

- sustain life
- satisfy the appetite
- provide warmth
- maintain condition

- provide nutrients for healthy growth
- enable the mare to supply quality milk
- assist in avoiding metabolic disorders such as equine metabolic syndrome (EMS) and laminitis
- provide the foal with the best possible start in life for his future competition work. Feeding a Thoroughbred foal who will race at two is an awful lot different to feeding a future dressage horse.

There are many feed companies who make specific diets aimed at the various needs of each breed. Many studs employ the services of qualified specialist nutritionists who will regularly visit and evaluate the horses.

HANDLING OF YOUNGSTOCK

In the first few years of life a young horse has a lot to learn and to cope with. There are many experiences to undergo, some enjoyable and some not so!

The foal's first contact with humans must be made a pleasant one; you will need to gain his trust. Rough handling at this or any point in the future training and development can result in a non-cooperative horse that could potentially become aggressive towards humans. It must be understood that the early training creates a blueprint for the rest of the horse's life.

Foals should be handled from birth and taught to lead, be groomed, have their feet picked up and generally be very well handled. This will make for a well-rounded individual who should be easy to train. It must be remembered that unlike most other breeds, the Thoroughbred can potentially be under saddle and racing by the age of two. Many will have passed through sale rings as foals and yearlings, prior to entering training. In order to achieve these feats, the young Thoroughbred needs to have had a well-rounded education.

One of the most stressful times of a foal's life will be the weaning process. Preparations must be made well in advance to make this process as smooth as possible for both mare, foal and the handlers.

Most foals are weaned at around 5–6 months of age. They will by now be somewhat independent, eating a specially designed hard feed, have started their vaccination programmes and have undergone regular handling.


National Stud

There are two main methods of weaning, these are:

GROUP WEANING

This is the most commonly used method of weaning on Thoroughbred studs as it is considered the least stressful. You require a minimum of three mares and foals, all of whom have been turned out together during the summer. By now the foals will be eating hard feed from a creep feeding pen. These pens are specially designed to ensure that the mares don't have access to the foals' diet.

One or two mares will then be removed from the herd and their foals will remain behind in the group with the other mares and foals. Generally the dams of the eldest foals are removed first, with the rest of the mares being removed over the next few days. Care must be taken to ensure that all the foals are settled and twice daily checks made to ensure that all is well.

The mares are normally taken to a paddock out of ear shot of the foals. This paddock needs to have 'rough' grazing, as lush grazing could encourage the mares to continue to produce milk and develop mastitis.

ABRUPT WEANING

This method is used generally by single mare and foal owners who keep their horses at home. The mares and foals are brought into their familiar stables, and then the mares are taken out leaving the foal behind and shut in the stable. The mare(s) are then taken to a paddock out of earshot and the foal will remain in the stable for a couple of days before being turned out with either a 'nanny' horse or another foal. This method can be very stressful for both mare and foal, and injuries can occur if the stable hasn't been checked for safety and suitability.

Mares and foals must be checked twice daily for the following signs:

Mares:

- Injury
- Mastitis – hot swollen udder

Foals:

- Injury
- Loss of condition
- Eating
- No signs of stress-induced illness

Once foals are happily weaned and relaxed, they can then begin their education once more for their future career in the racing industry.

Health and safely is of paramount importance when handling mares with foals at foot, or singularly. Horses can become stressed during the weaning process and this could result in them causing injury to themselves and their handlers.

It is recommended that suitable personal protective equipment is worn by the handlers and correct restraint methods are used to lead mares (i.e. bridles).

REVISION TEST

1. Describe two problems that can occur post foaling.

2. Explain why it is important to check the placenta after foaling and what you are looking for.

3. Why is it important to closely monitor a maiden foaling mare after foaling?

HANDLE AND PRESENT STALLIONS UNDER SUPERVISION

This chapter covers handling and presenting stallions under supervision.

The topics you will gain an insight into are:

- stallion psychology and behaviour
- stallion management
- post covering veterinary procedures
- methods of covering, including artificial insemination
- stallion selection
- pedigree analysis.

Individual stallion bridles

Stallion enjoying turnout

STALLION PSYCHOLOGY AND BEHAVIOUR

Most stallions have an inborn tendency to attempt to dominate their handlers, other horses, and especially mares in season.

Stallions that have been trained to respect their human handlers at all times are easier to work with than those that have been allowed to exert their natural aggressiveness, and also tend to mind their manners with other horses.

Stallion handling requires some special skills that include self-confidence, an understanding of stallion psychology, and the ability to anticipate the stallions' behaviour and make quick decisions.

Stallions are individuals and should be handled only by people that are experienced with horses and readily recognise inappropriate behaviour, which must be corrected before the stallion becomes dangerous. When working with stallions, always be aware that even the most gentle stallion has natural instincts that can go against human training.

In most cases, inexperienced people should not be allowed to handle stallions, especially in breeding circumstances, because of the dangers involved.

For experienced staff working with a stallion, it is important to have the right equipment along with a plan in mind for each step or manoeuvre that will be required of the stallion. Invariably, if a handler is not mentally and physically prepared and tries to make up for a lack of confidence by becoming overbearing or unnecessarily assertive, the stallion will become distrustful and more difficult to manage.

If you are going to be working directly with a stallion, avoid any direct confrontation unless you have the physical restraints in place to guarantee a win on your part. Nothing is more detrimental to the handler/stallion relationship than for the horse to realise that it is physically stronger and has the upper hand, and, therefore, dares to become wilful, unpredictable and potentially dangerous.

TWO STYLES OF BREEDING STALLION MANAGEMENT

Management of breeding stallions usually breaks down into two basic styles: natural or confinement/ isolation management. Sometimes both styles are used depending on the time of year. Natural management essentially allows a stallion to run in a pasture with a herd of mares. Proponents of natural management say that mares are more likely to become pregnant in a natural herd setting.

Drawbacks to natural stallion management include the risk of injury to the stallion or mare in the process of breeding, and problems related to the determination of the breeding date, and hence, the foaling date of the mare.

Other risks in natural management include the fact that stallions may break down fences to fight another stallion, or possibly mate with the wrong mare, thereby putting the pedigree of a foal in question. Also, when a stallion has the run of a pasture, there is a risk that the stallion may be stolen or may escape and wander the nearby roads.

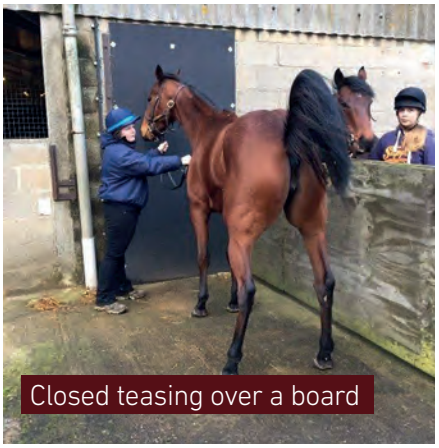
Due to their value, Thoroughbred stallions are confined or isolated to a specially built stallion unit with individual stables. The stallions each have an individual stable along with daily turnout. Ideally the stallions should be able to see each other through the fencing, but from a safe distance. The advantages of confinement include less risk of injury to the stallion and to other horses, a controlled breeding of mares via in-hand covering, and greater certainties of which mares are bred.

Handling a breeding stallion can be a dangerous job. Only a trained and skilled handler should attempt to handle a stallion in a breeding situation.

Lack of sufficient exercise when confined is a drawback to this type of management, as well as the potential for development of aggressive behaviour or stable vices because of pent-up energy. Stallions that are confined require carefully balanced nutrition and exercise for optimal health and fertility.

Some managers make a compromise between the natural and confined types of management by providing stallions with daily turn-out time in a field where they can see, smell and hear other horses. When they are stabled, bars or grills between stalls allow them to look out and see other animals.

When properly trained, stallions can live and work close to mares and other horses, including other stallions. Many racehorses are stallions and many stallions are shown together or with mares at most horse shows. When stallions are trained to focus on their work, they can do very well if properly handled.



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Closed teasing over a board

© The National Stud

Open teasing

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A teaser stallion wearing a correctly fitted cape

Cape laid out on floor

VET CHECKS POST BREEDING SEASON

Prior to the commencement of the Thoroughbred breeding season (15 February), all stallions, including teasers, will be required to undergo a series of blood tests and swabs.

After 1 January and before any breeding activity is commenced, two sets of swabs (see definition) should be taken from all stallions at an interval of no less than seven days.

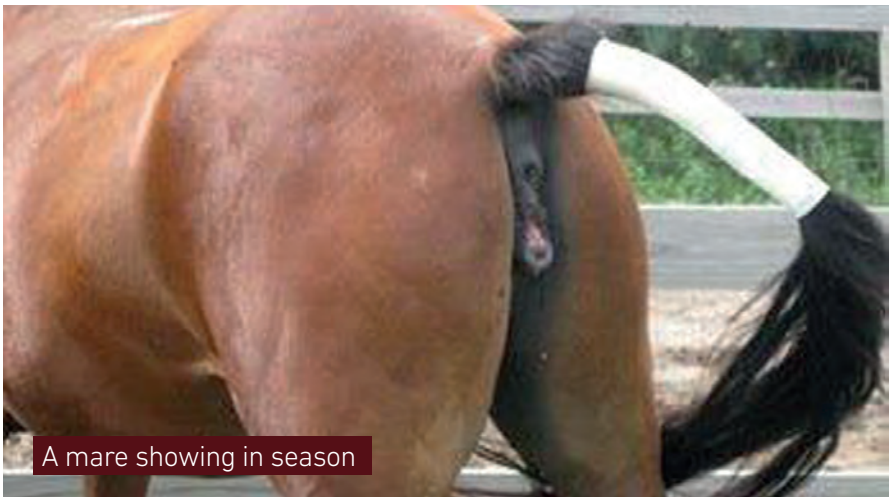
If the results of swab testing are negative, the stallion is free from infection and breeding activities may commence. If they are positive, he is infected and must not be used for mating, teasing or semen collection until he has been treated and cleared under the direction of the attending veterinary surgeon and, in the case of the contagious equine metritis (CEM), in accordance with any Defra requirements.

The following should be carried out during the breeding season to check that the stallion has not become infected:

In stallions, bacterial growth of the CEM is generally more easily recoverable after mating. Swabbing of all stallions after their first few matings in any season should therefore be considered in conjunction with the attending veterinary surgeon. In addition, mid-season swabbing should be considered for all stallions and teasers.

Stallions will also require a negative blood test for EVA before being allowed to commence covering.

For further information on equine venereal diseases, please visit http://codes.hblb.org.uk/ for a copy of the HBLB Codes of Practice.



A mare showing in season

In-hand breeding a stallion to a mare

WAYS AND ORGANISATION OF BREEDING

The three basic methods for breeding horses are: pasture breeding, in-hand breeding and artificial insemination.

PASTURE BREEDING

Pasture breeding, where the stallion is put out with mares in a large natural setting with nature taking its course, is excellent training for young stallions who learn the code of mating through contact with experienced mares. In many cases, the conception rates for marginally fertile stallions are improved in the pasture breeding setting. The space required for pasture breeding for one mare and a stallion requires no more space than a large paddock.

The main disadvantage of pasture breeding is the risk that a stallion will be injured by a kicking mare, although the chances of this happening are small.

IN-HAND BREEDING

In-hand breeding reduces the chances of injury and is generally less stressful to the mare.

This type of breeding allows direct management of the breeding process and provides the opportunity to select breeding individuals for complementary characteristics.

It is safer and injuries to the mare or stallion are less likely to occur. The risk of sexually transmitted disease is lessened and fertility problems can be readily identified early enough to allow time to achieve pregnancy during the season.

In-hand breeding is also known as 'live-cover breeding'. When live-cover breeding is decided upon, the mare is usually boarded at the stud farm. The mare is usually 'teased' several times with a teaser stallion that will not be bred to her, usually with the stallion separated from the mare over a barrier or fence, although 'open teasing' is sometimes used.

If the mare is a maiden or difficult, she will need to be 'bounced' by the teaser stallion to ensure she doesn't have an adverse reaction and kick out which could harm the more expensive covering stallion. Unless the teaser is vasectomised, he should wear an apron which will prevent him penetrating the mare.

A mare that is in heat will generally tolerate the teaser and may present herself to him. Usually a veterinarian will determine if the mare is ready to be bred by use of ultrasound or palpating daily to determine if there is sufficient follicular growth along with other internal signs.

When it is determined that the mare is ready, both the mare and intended stud are cleaned and prepared for mating. The mare is then presented to the stallion with a sufficient number of handlers to manage the behaviour of both the mare and the stallion. Depending on the individual horses, the number of handlers will usually range from three to six, so the mare and stallion can be easily separated if there should be any trouble.

ARTIFICIAL INSEMINATION (AI)

The use of artificial insemination in Thoroughbreds for racing is banned and any offspring born via this method will not be eligible to race anywhere in the world.

'Horse will not be eligible for the Stud Book or Non Thoroughbred Register if it is produced:

- **by any form of artificial breeding, or from a natural covering of a mare by a stallion which in that same covering season was being bred to other mares by artificial insemination (i.e. was a semen donor).**

A horse may not be eligible for the Stud Book or Non Thoroughbred Register if it is produced by a mare which was:

- **the subject of any artificial breeding procedure within 385 days before the birth of such produce, or located on premises where artificial breeding of equines was practised during the covering season in which the foal was conceived or in the foaling season in which the foal was born, or owned by a person, persons or organisation which practices any form of artificial breeding in equines.'**

Artificial insemination is the procedure during which semen is collected from a stallion and introduced into the reproductive tract of the mare. When properly done, it increases the number of mares that become pregnant during the first cycle. It also decreases the risk of spreading reproductive infections and eliminates the chance of breeding injuries.

Artificial insemination has several advantages over live cover and has a very similar conception rate. Breeding accidents and injuries are reduced since the mare and stallion don't have contact with each other. Also, the mare does not have to travel to the stallion so the process is less stressful for her.

Artificial insemination opens up access to semen provided by a stallion that is out of the area, across country, or on another continent without either horse having to travel.

Artificial insemination reduces the chance of spreading sexually transmitted diseases and infections between mare and stallion, and allows mares or stallions with health issues, such as sore hocks to continue to breed.

In addition, semen may be frozen in some cases for later use after a stallion is dead or no longer in service; although some breed registries may not permit the registration of a foal resulting from the use of frozen semen after the stallion's death.

The process of collecting and inseminating is discussed in the section 'Care For and Prepare the Mare for Covering'.

STALLION SELECTION

When selecting a suitable stallion to produce racing stock there are certain factors that need to be taken into account, the first being is the offspring being bred to sell, or to race?

If it is the latter, then none of the following will apply as owner breeders are in the very fortunate position to select a stallion based on his performance as a sire, physical type and/or pedigree, or your personal preference, with no regard to the many individual and frequently unreasonable factors that influence the market values of Thoroughbreds.

In practice however, most northern hemisphere studs and breeders have to be commercial. Very few establishments can afford to ignore the market completely.

If you do plan to sell the offspring bred you must next determine where your mare fits in the marketplace and what kind of stallion best matches her apparent value. Over-mating a moderate mare by sending her to a top-class, expensive stallion is rarely a successful commercial tactic; under-mating a first-rate mare by sending her to a commercially unattractive stallion is also not recommended.

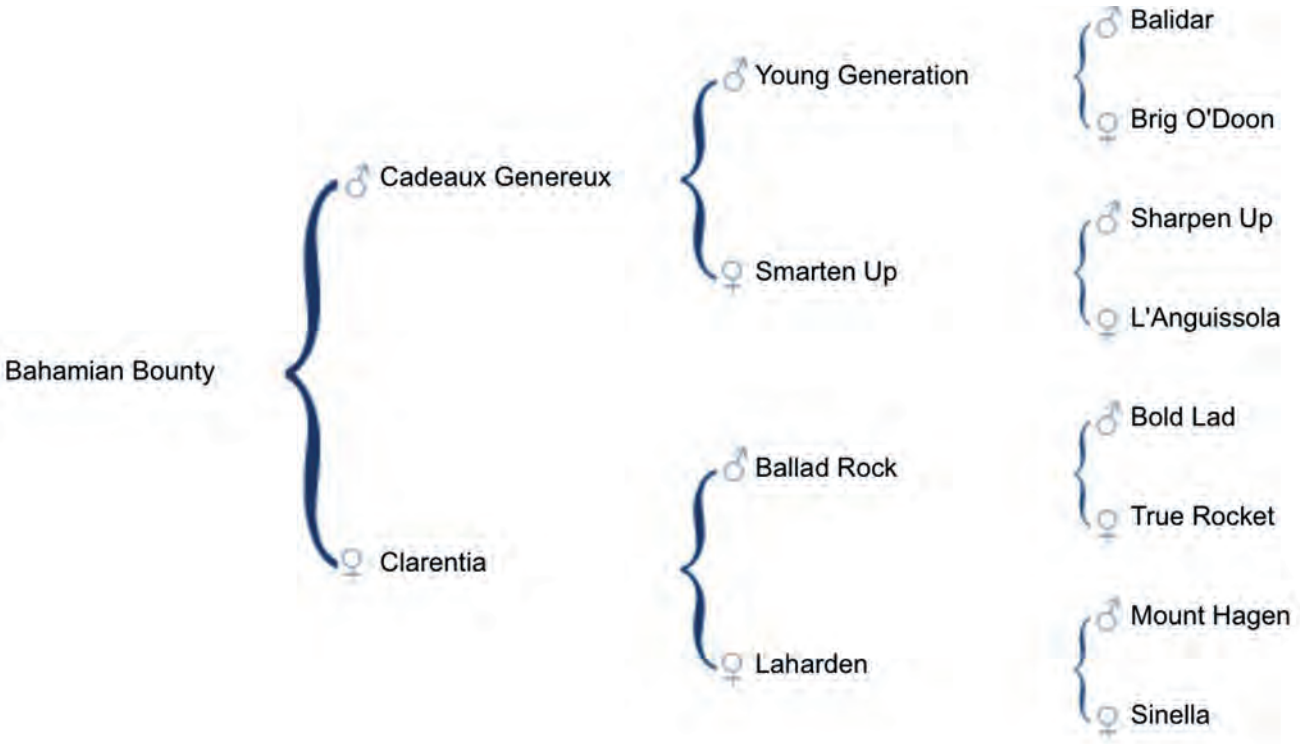
One way of looking objectively at your mare is to obtain a catalogue-style pedigree page for her and compare it with broodmares represented in recent catalogues for sales at which you'd hope to sell her progeny. There are commercial companies that can provide this service, or it can be obtained via sales house websites.

Once you have impartially assessed your mare these are some of the key points you need to consider when selecting a stallion for her:

- The resources, commitment, professional skills, reputation and connections of a stud are absolutely critical in determining whether or not a stallion has a fair chance to leave successful racehorses then to capitalise on that success in the marketplace. The owners, managers and staff all contribute to how a stud is perceived in the marketplace and that perception can work for or against a stallion. Less obvious but equally important are the vets, farriers, and other professionals employed by the stud.
- The connections a stud has, for example, with the racing media or trainers can hugely assist a stallion's profile. A well-credentialed stallion at a poorly managed and under-resourced stud will have a hard time attracting the support of either the owners of quality broodmares or yearling buyers.
- In the case of newer studs, the sheer energy, determination and other personal qualities of their owners and managers can and do make up for lacking some of the advantages of well-established studs.
- A stallion's stud fee can be one indicator of the quality and size of the book he's previously covered. If he's been standing for a low fee (under £5000) he probably won't have received too many well-bred or well-performed mares; if he's still unproven and is expensive (£15,000 or more) he may not have received large numbers of bookings.

  Fertility statistics are published annually by Weatherbys along with lists of mares served by each stallion. Stallions covering large books of mares could end up with fertility issues. Some stallions also shuttle to the southern hemisphere and continue covering. There is currently research being undertaken into the effects of this on the stallion's fertility and mental well-being.

  The size and quality of a stallion's book of mares can determine the competition your yearling will face at sale time. Breeding to a very popular stallion can mean that your horse is one of 50 or more yearlings offered at a particular sale. Faced with such numbers, buyers often become extremely selective, making it difficult to sell profitably unless you have a top-quality yearling in a major sale draft.
- A good opportunity may be presented by a young stallion whose service fee has been reduced. He may well have served mares of very good quality at the previous fee, but the stud, finding it difficult to fill his book in the second, third or fourth season, before he has any or many runners, reduces his fee to boost the number of mares he serves during these critical years.



A very nice conformation of a correctly stood stallion (Bahamian Bounty)

PEDIGREE EVALUATION

Analysing a stallion's pedigree is a very good indicator of whether or not he would suit a certain mare. The following analysis is an example of how they can be laid out and worded.

Below is a brief analysis of the above stallion's pedigree. As Bahamian Bounty is a proven sire, his best progeny have been listed along with a breakdown of his breeding lineage:

'2014 saw Bahamian Bounty reach the milestone of 50 career stakes winners to his name and there's no doubt that he is one of the most consistent sires standing in Britain. Breton Rock's Gr.2 win in the Hungerford Stakes is testament to the speed, toughness and soundness that Bahamian Bounty brings to his offspring, while New Providence's win in the Dick Poole Stakes (Gr.3) sees her join her sire's list of juvenile stakes winners which already includes Gr.2 winners Anjaal and Sendmylovetorose.

'Much of Bahamian Bounty's success can be attributed to mares from the Northern Dancer line. The Gr.1 winning sprinters Pastoral Pursuits and Goodrick are both out of Most Welcome mares, while the Try My Best branch is another source of success. Gr.3 winner Naahy and Listed winner Fig Roll, who is out of an Acclamation (Royal Applause) daughter, are both bred on the cross. Peintre Celebre, a son of Nureyev, is the broodmare-sire of the July Stakes (Gr.2) winner Anjaal, while the very speedy Bahamian Babe (L) is out of a Wolfhound daughter. Pivotal daughters have also worked well for Bahamian Bounty with winners that include the recent Listed winner Mick's Yer Man.

'Danzig will prove to be a strong source of success for Bahamian Bounty. Breton Rock is out of a Rock of Gibraltar daughter and Listed-placed Mukhmal is out of a Danetime mare, so Danehill mares via Dansili, Danehill Dancer and Exceed and Excel look attractive options.

Mares by Danzig's son Emarati are a strong cross for Bahamian Bounty as not only has he produced his recent Listed winner Take Ten on the cross, but Pastoral Pursuits has also shown Stakes success with the cross. The Listed winner Baileys Jubilee is out of a Mujahid (Danzig) daughter, while the Listed-placed Di Stefano is one of many winners to come from a Green Desert line mare.

'Storm Cat line mares are emerging as a strong broodmare source and New Providence is out of a Giant's Causeway daughter, suggesting mares by Shamardal and Footstepsinthesand look like good options to consider.

'The Mr Prospector line has also provided Bahamian Bounty with success via Gulch, whose daughter was the dam of Cherry Hinton Stakes winner Sendmylovetorose, while it was Machiavellian who was the dam-sire of Listed winner Babodana.

'The Nasrullah line via the Never Bend strain has produced Listed winners Berk The Jerk and Paradise Isle, who are out of Reference Point (Mill Reef) and Rousillon (Riverman) mares respectively. The Blushing Groom strain has also proved successful in producing Listed winners via daughters of Pursuit of Love (Groom Dancer) and Rainbow Quest line mares.

'Hail to Reason line mares can be considered as the Listed winner Bogart is out of a daughter of Tagula (Taufan). Red Ransom (Roberto) is proving to be a useful dam-sire and has crossed with Bahamian Bounty to produce Tropical Treat (L).

'The In Reality Line via Warning have had some top-flight runners for Bahamian Bounty as the recent Listed winner Donnerschlag is out of a Diktat daughter, while Gr.3 winner Cay Verde is out of a Piccolo mare. Ahonoora line mares have also given Bahamian Bounty Stakes success with the likes of Gr.2 winner Mr Nappy Tandy, who is out of an Inchinor (Ahonoora) daughter, demonstrating that Bahamian Bounty proves to be very versatile for breeders to gain success with.'

REVISION TEST

1. At what age is a stallion normally considered to be sexually mature?

2. Briefly describe two management factors that are important for the well-being of a stallion.

3. Name the preventative measures for the control of CEMO, Klebsiella pneumonia, Pseudomonas aeruginosa and EVA in the stallion.

ESTABLISH AND MAINTAIN CARE OF THE STALLIONS

This chapter covers caring for stallions and includes:

- preparation for the breeding season
- introducing the stallion to covering
- facility requirements
- stallion nutrition.

A stallion being correctly stood up for viewing


A stallion wearing the correct method of restraint


A stallion being walked in hand

Standing a stallion at stud can be a very commercially viable entity. Many stallions are the pinnacle of many stud's income and therefore should be kept in top condition all year round.

From December onwards, potential mare owners will be scrutinising them as a potential sire of future foals.

How you prepare a stallion for the breeding season will depend on many things, but basically you can break it down into getting new stallions introduced into the breeding routine, and a refresher course for experienced stallions.

With either kind, it's important to remember the basic health aspect of the horse. You want the stallion to go into the season in the best shape possible.

The physical condition of the stallion should be assessed. Is he overweight, or underweight? Is he getting out and getting exercise? It's good for a stallion to get out as much as possible not only for exercise, but for his overall well-being, by having the following things checked:

- Is he up to date with dentist and worming and farrier?
- He should be on a regular vaccination schedule. All of his vaccinations should be given 30–60 days before the breeding season starts (60 days is preferable). That way, if he has a reaction to the vaccination, it won't affect his breeding ability. Stallions should never be vaccinated in the middle of the breeding season because a reaction and high temperature can affect sperm, which takes about 60 days to mature in the stallion.
- Physio checks – one of the highest causes of a stallion losing interest in covering is muscular pain.

Stallions need to be fit but not fat going into the covering season. Overweight stallions will not only suffer from fertility issues, but also could struggle with a large book of mares. Some Thoroughbred stallions are covering books of over 150 mares, via in-hand covering over the season. Some of these mares may require cross covering, so the six-month breeding season will be very hard work and the stallion must be in peak physical and mental fitness.

Many studs will walk their stallions in-hand daily prior to the season commencing. The stallions will be walked in groups for up to two hours or the equivalent of 10 miles per day. This method of achieving peak fitness takes up many man hours and depending on the number of stallions, it could take up valuable staff time.

A stallion being washed down after exercise

A stallion undergoing a testicular scan

A well laid-out stallion unit

Other methods used for obtaining fitness levels in the stallion are daily lunging, and also the use of a horse walker. Daily turnout throughout the season and in all weathers is vital to a stallion's overall well-being along with their mental well-being. Stallions that are mis-managed, not allowed access to turnout, can very quickly become aggressive and dangerous to be around.

For any stallion, a breeding soundness exam prior to the breeding season should be undertaken. This can include collecting the stallion and evaluating the semen. Even though the use of artificial insemination is disallowed in the bloodstock industry, there is no reason why a stallion's semen can't be collected and evaluated. This gives you a baseline to evaluate the stallion, or can help you find problems early and allow you to manage the stallion differently. Then, if there is any problem during the breeding season, you have a baseline to go back to and compare to see where the problem lies.

With a new stallion, whether a young horse or one new to your operation, the people dealing with him need to learn as much about him as possible. During his racing career, try to find out if he was on any medications. There are no drugs that enhance fertility, but many that can cause low fertility.

Learn his personality. Is he aggressive? Is he timid? What are his vices? Then you work with him accordingly. Deal with the horse on an individual basis, and try to ensure that he is sent to the stud that will be standing him in plenty of time to allow the staff to work with him before the season begins.

Many stallions have the same handler who should be an experienced stallion person. They should work with the stallion consistently and not reprimand him for acting like a stallion. The stallion should be eased into his new surroundings and if just retired, his new role. He will have to become accustomed to being stabled in a stallion unit with other entires who may well be dominant.

When young new Thoroughbred stallions are introduced to a mare for first time covering, the studs will generally use one of the nurse mares. These mares are generally older, experienced, mares in good heat that's healthy. Any rough handling of him during his introduction to the role of being a breeding stallion could result in reluctance to cover.

With an older stallion it is just a matter of re-introducing him to his routine. If he is experienced and just new to the stud, try to find out from his previous handlers his idiosyncrasies and routines, and try to adjust your management to help him settle into his new surroundings. Some older stallions have quirks, and it's good to know them before the season starts. Some stallions hate to breed maiden mares. Some stallions don't like certain colour mares or certain size mares. Some don't like or need the breeding apron put on a mare. Learn as much as you can about your stallion before the season starts, and the season will go much smoother.

Stallions will require daily grooming to maintain healthy circulation. A good coat and checks can be made for cuts or injuries that may have been acquired during exercise, turnout or even covering.

STALLION NUTRITION

Outside of the breeding season, most stallions are fed according to their maintenance requirements. However, as breeding season approaches, some stallions will require a rise in feed quality to meet with the demands that will soon be placed upon them, along with helping them maintain fertility. The diet should be planned to take the following nutritional needs into account:

- Energy – a stallion's energy requirements are dependent on breeding frequency. There is no physiological increase in calories directly related to sperm production, but the physical activity associated with breeding does burn calories. Stallions covering mares a few times each week will not need as many calories as a stallion breeding 10–15 times per week.
- Calorie increase – to increase a stallion's calorific intake without drastically increasing the total amount of food consumed, oil can be added to his diet. Not feeding large amounts of concentrate feed could also help to keep the stallion less excitable in the breeding shed. In addition to providing calories, an oil source in the stallion's diet might also benefit sperm quality and motility. Also, research has shown that an increase in omega-3 fatty acids in the diet could be beneficial to some breeding stallions.
- Vitamins and minerals – there is some evidence that certain minerals and vitamins could help improve fertility:
  - Research in horses has shown that selenium is important in sperm motility and structure
  - Selenium and vitamin E work together in an antioxidant capacity to protect cells from oxidative damage
  - Vitamin C has been shown to increase sperm concentration in other species.

BODY CONDITION SCORE

Prior to the breeding season, ensure your stallion has a peak body condition of between 5–9. Since the physical act of breeding does mimic the caloric needs of a horse in light work, owners should be prepared to make changes to their stallion's diet as needed throughout the breeding season.

RISK FACTORS

As with all horses, accidents and injuries can happen. When handling stallions, care must be taken. Some stallions can be very aggressive and for this reason should only be handled by experienced members of staff. The correct personal protective equipment should always be worn in the breeding shed and the stallion must be under control by using the correct equipment to restrain him.

REVISION TEST

1. What factors would you consider before retiring a stallion to stud?

2. List two ways in which semen can be collected from a stallion, and give reasons why this would be performed on a Thoroughbred stallion.

3. List two styles of stallion management and give three pros and cons for each method.

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Your Work

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