All about Foaling
An Equine Science Update special guide.
Introduction
Foaling can be a very traumatic but rewarding experience for mare and owner. These notes are intended to give you the information you need to understand the process, to know what is likely to happen, to know what problems may arise and what to do about them when they do. Nothing written here is intended to replace your veterinarian who is best placed to give you specific advice. If in doubt consult your vet.

Length of pregnancy in the mare
The gestation period of the mare ranges from 315 - 367 days with an average of 340 days. In the Thoroughbred it is usually taken as 11 calendar months from last service i.e. 333-336 days. For practical purposes anything one month either side of the average gestation period of 340 days can be considered normal. Often individual mares are fairly constant in the length of their pregnancies. One per cent of mares go 1 year or longer. There are records of mares carrying foals for 13 months. Mares with very long gestation periods often produce smaller foals. It is unusual for a long pregnancy to produce an oversized foal.

4-6 weeks before foaling
This is a good time to start getting prepared for the foaling. You should consider:

- vaccination
  The foal depends on the transfer of antibodies in the mare's colostrum for its immunity for the first few weeks of its life. It is wise to boost the mare's immunity to ensure a high level of antibodies in the colostrum. It takes about 4 weeks for the mare to respond fully to a vaccine so the best time to give it is about 4-6 weeks before the anticipated foaling date.
• **travel to stud**
If the mare is going to foal away from home this is also the best time to take her to the premises where she will foal. This allows her to become accustomed to the environment and produce antibodies to the bacteria on the premises to pass on to the foal in the colostrum.

• **regular routine**
It is good to get the mare into a regular routine of going in and out to paddocks and having meals at the same time each day.

• **feeding**
The mare's nutritional requirements increase during the last third of pregnancy in line with the needs of the fetus. The mare needs 1.0 - 1.5% of her body weight as forage plus 0.5 - 1.0% as concentrates. The trace element requirements do not differ from those of a non-pregnant mare. The energy requirement does increase slightly.

Condition scoring is useful to assess the adequacy of the feeding regime. On a scale of 1 to 10, 6 would be an ideal score. This is because mares in slightly better than average condition conceive earlier, have higher conception rates and are better able to maintain the subsequent pregnancy. Obese mares tend not to have difficulty foaling. But they do produce smaller foals with an increased likelihood of angular limb deformities.

• **worm treatment**
The mare should be wormed about 4-6 weeks before foaling to reduce the number of worms passed to the foal. Most commonly used wormers claim to be safe to use in pregnant mares:

**2 weeks before foaling.**

Check the mare is not becoming constipated. This is especially likely in mares foaling for the first time, or in older mares. Ensure adequate daily exercise, feed mashies, and succulent foods. Make sure she has free access to water.

If the mare's vulva has been stitched ('Caslick's Operation') the scar should be cut open before she starts to foal. This is usually done by the vet as close as possible to the expected date of foaling. If the scar is not cut open, but allowed to tear during foaling, the resulting wound will be more difficult to repair and will take longer to heal.
Preparations for foaling

It's a good idea to collect together the things that you might need and have them at hand in case the mare starts to foal suddenly. You should have available:

- one or two clean buckets
- towels
- tail bandages
- cotton wool
- antiseptic
- mild soap
- navel antiseptic: 0.5 chlorhexidine, wound powder or antibiotic spray.
- provision for a supply of hot water
- straight sharp scissors (c8-10 cm)
- torch - if light is inadequate
- a telephone to call for help if necessary
- enema for the foal

Larger studs may have an oxygen cylinder and flowmeter connected to rubber tubing (use a flow rate of 5 litres / min. It is only necessary to just move the chest, 25 breaths /min )

Accommodation

It is generally safer for the mare to foal inside, because of ease of observation
no risk of the foal falling under fences or into ditches
no risk of interference by other horses

But, there is more risk of build up of infection, so cleanliness is very important. A large (3m x 3m), warm, dry box with good light is ideal. Straw is the bedding of choice. Shavings tend to stick to the foal and mare. The bed should be deep but compacted to prevent the foal injuring its hocks as it tries to stand up. The bed should be well 'banked up' around the sides of the box. The box should be well ventilated and free from draughts. Ideally it should be possible to observe the mare without disturbing her. (eg window in door, CCTV). A radiant heat lamp might be useful.
Signs of imminent foaling

Even experienced stud grooms can have difficulty predicting when a mare is going to foal. After the 10th month of gestation the mare should be observed daily for signs of impending foaling. Several changes occur to the mare's body as the time for foaling draws near:

- The first indication is usually an increase in udder size. At first the udder may be more swollen only in the mornings and go down during the day. Mammary development starts 1 month before foaling. Most of the increase in size occurs in the last 2 weeks. The size may also vary depending on how many foals the mare has had previously and on the general condition of the mare.

- The teats fill. The composition of the milk changes over the last three weeks before foaling. The mammary secretions change from straw coloured to cloudy amber, then to yellow/white and viscous as foaling approaches. The protein, calcium, magnesium and potassium levels increase; while the sodium and chloride levels fall. The changes in calcium and magnesium levels have been used to help predict the onset/start of foaling.

- Relaxation of the pelvic ligaments is not an obvious sign in mares. Some mares show hollowing and softening of the quarters and or relaxation and lengthening of the vulva. These changes may be difficult to spot.

- "Waxing up". The appearance of a waxy bead of dried colostrum at the end of the teats usually occurs within a few days of foaling.

Foaling Alarms

Various alarm systems are available which can give advance warning of when the mare starts to foal. One type works by detecting when the mare starts sweating. Another type is activated when the mare lies down. (See Appendix: List of useful addresses 2).
Foaling prediction test kit

A simple test using water hardness testing strips ("AQUADUR" See Appendix: List of useful addresses 1) has been described to help predict when foaling will occur. Vets in Newmarket suggested using the dip-sticks to monitor the calcium concentration of the milk, which increases as foaling approaches. High levels of calcium suggest foaling is imminent. Each stick has four zones of decreasing sensitivity which change colour from green to red-violet. The more zones that change the higher the calcium concentration.

Technique:
- Add 0.5ml milk to 3.0ml of distilled water.
- Dip the test stick into the resulting mixture, ensuring that all 4 zones are covered.
- Observe for the colour change after one minute:
  - 0 zone changed  mare unlikely to foal within 4 days
  - 1 -2 zones  mare unlikely to foal within 24 hours
  - 3 zones (first time)  mare unlikely to foal within 24 hours
  - 3 zones (more than twice)  about 1/4 chance of mare foaling within 24hrs
  - 4 zones  about 1/4 chance of mare foaling within 24hrs, and 1/4 chance of mare foaling within 48hrs

Commercial tests based on the same principles are available.
Foaling difficulties - Dystocia

Dystocia is defined as any problem which interferes with the normal birth of the foal. It is life threatening for both mare and foal. This is because of the forceful abdominal contractions and the early separation of the placenta, which deprives the foal of oxygen. The mare continues her expulsive efforts even if the foal is 'stuck'. This forceful, but unproductive, straining may cause damage to the mare's reproductive tract. Uterine damage may lead to peritonitis which can be fatal. Fortunately, dystocia is uncommon in horses, despite the long legs of the foal. Probably the most difficult decision is whether the foaling is proceeding normally; the second most difficult is not interfere unnecessarily.

The three stages of foaling

First stage

This is the stage of initial uterine contractions which leads up to the rupture of the fetal membranes and release of fluids ("breaking water"). As the time nears the mare becomes restless. She may stop and kick at her belly, she may lie down and get up again. She usually carries her tail raised, periodically clamping it down or swishing it. She may paw the ground, look round at her flanks, and partly crouch as if about to lie down. Flehmen (curling the upper lip) is common. Milk may drip from the teats. The mare may rub her hind-quarters against a wall. Most mares sweat when foaling has begun - this is the basis for some of the foaling alarms that are available. Sometimes mares show signs of 1st stage labour, then the signs abate and 2nd stage labour is postponed. Repeated 'false alarms' are common in Thoroughbred mares.

The foal changes position. Previously it has been lying on its back with its limbs and neck flexed. During first stage labour the forelimbs and neck are extended and the foal turns to face the birth canal in an upright position.

Things to do:
- check for excessive loss of colostrum - if so collect it. (This also applies in late pregnancy).
- clean up and bandage the tail. Plait the tail, double it back on itself and wrap with a bandage.
- clean the genital area with cotton wool and antiseptic soap.
- check whether the mare has previously been stitched at the vulva (Caslick's Operation). If so, prepare for an episiotomy if the stitches have not been re-opened already.
Second stage

This is the stage in which the foal passes through the birth canal. It starts with rupture of the placenta (chorio-allantoic membranes or water bag). This usually produces a stream of liquid ("breaking water"), but it may go unnoticed. Visible straining starts soon afterwards. The mare usually lies down, but may rise once or more. If she continues to get up and down, the foal may be in the wrong position.

Five minutes after breaking water the inner sac ("amnion") should appear at the vulva. This is the grey-pink membrane which immediately surrounds the foal. It helps to dilate the cervix and vagina. The foal passes through the birth canal with one foreleg slightly in front of the other. (ie one foot is level with the fetlock of the other leg). The head rests on or between the knees. Once the foal's head is born, the mare will usually continue lying down until the foal is completely out. She will usually stay down for up to 45 minutes after delivery. The second stage lasts between 5-60 mins (average c 20mins).

What you should do:

- If the mare is not already lying down to foal stay away from her to allow her to do so. When she does lie down check her position straight away. Make sure she is not lying with her tail pressed up against the wall. If her buttocks are too close to the wall to allow you to help with the foaling or to allow the foal to come out you should get her up and hope she lies down somewhere more suitable.
- If the mare has been stitched (Caslick's operation) and an episiotomy has not already been done it should be done now. Take a pair of sharp straight scissors and cut vertically in the midline to open the vulva to its original size.
- If the mare will not lie down to foal. Be prepared to support the weight of the foal as it is born and for a few minutes afterwards to prevent premature rupture of the cord.
- 5 minutes after the start of second stage - insert a cleaned arm into the vagina and check that you can feel 2 feet and a nose. If so, leave the mare to get on with it. Allow another ten minutes of straining . If progress is not being made, call the vet, get the mare on her feet and keep her walking.

Do not interfere unless there is:

- premature separation of the allanto-chorion ("afterbirth") - A velvety red membrane appears at the vulva. The fetal membranes have started to separate early rather than rupturing. This is a problem which requires urgent assistance. The foal must be born quickly as its oxygen supply is being compromised. Rupture the membrane and aid delivery.
- meconium within the amnion or on the foal's legs. This brown staining indicates that the foal has been distressed and is at greater than normal risk. If so it is advisable to speed delivery by gentle traction on the foal's legs. The amnion should be cleared from around the foal's mouth.
- a foreleg being pushed up into the roof of the vagina. The position should be corrected to prevent the foot penetrating through to the rectum. Push the foal back far enough into the vagina to allow the foot to be freed from the hole in the vaginal roof. Guide the feet out of the vulva, protecting the roof of the vagina with the back of your hand. If the rectum is already torn and the foot is pushing through the anus, you should concentrate on delivering the foal.
- one foreleg held back (eg foot level with the knee of the opposite leg) - gently pull it forward.
- hip-lock- If the foal gets stuck at the hips it will require assistance.
  try: 1) gentle traction;
  2) rotate the foal 90 degrees one way then in the opposite direction;
  3) insert a hand over the foal's body into the vagina, grab the tail and give it a sharp pull while traction is applied to the legs.
- an abnormally thick cord which does not break. It can be broken by placing one hand on the belly and pulling sharply with the other. However it is important not to break the cord too soon (until it has finished pumping) otherwise you can deprive the foal of a significant amount of blood and cause problems of adjustment.

If any of the following problems occur, the mare will require assistance. Call the vet straight away!

- no progress is made despite vigorous straining
- one foot only is present in the birth canal. If it is a fore leg, the head, and other foreleg will have to be located and brought into the birth canal. If it is a hind leg, the other hind leg will have to be found.
- one foot and the muzzle in the birth canal. The other leg will be bent back at either the knee or the shoulder. If the leg is flexed at the shoulder it may be possible to deliver the foal without bringing the leg forward.
- two feet and no muzzle - this may be:
  1) fore feet without head - if the foal is upside down (ie foot pad upwards; the fetlock cannot flex downwards but can flex upwards or to the side) get the mare back on her feet and make her walk around. Many cases of upside-down foals will correct themselves.
• 2) back feet - feel up the foal's leg and confirm that the joint above the fetlock is a hock - In this case you can deliver the foal quickly but without excessive traction.
• 3) three or more legs presented - This may be twins or three legs of the same foal ("ventral presentation").
• breech presentation. The tail and buttocks are presented This can be difficult to correct, especially in larger breeds. A caesarian operation may be required.
• foot protruding from the anus -" recto-vaginal fistula." When this does occur it is nearly always in maiden mares. If possible push the foot back and redirect the leg out of the vulva. If this is not possible it may be necessary to extend the wound backwards to allow the foal to be born.
• the muzzle only. Both fore legs are flexed. The forelegs will need to be located and brought forward.

Don't delay calling your vet if you are at all concerned.
If your initial check reveals a problem something must be done quickly. There is little space for manoeuvre in the birth canal, and the time available is short. It is usually necessary to push the foal back into the uterus to make room to correct any malposition. Obviously the longer the mare has been straining the more difficult that becomes.

The vet has several options for making it easier to correct foaling problems, including epidural anaesthesia (to reduce straining) and sedation or general anaesthesia. Sometimes lifting the hind legs of the mare while she is anaesthetised can allow for repositioning of the foal. Caesarian section may be required to remove a foal that cannot be delivered otherwise.

**What to do whilst waiting for the vet:**
• Keep the mare on her feet and walking round the box. This will help to reduce straining. Pulling her tongue may also help.

**Third stage**

The expulsion of the fetal membranes ('afterbirth') usually occurs 30-45 minutes after birth. The mare may show colic-like pains with sweating and restlessness.
Care of the mare after foaling.

As soon as the mare stands after foaling, if she has not expelled the afterbirth, tie it up so that it is clear of the floor. Its weight can help encourage its expulsion. Tying up the afterbirth also prevents it slapping on the mare's legs, which some mares, especially maidens, may resent. Once the afterbirth has been passed you should check all of it has been passed, or save it for the vet to check. It is usually expelled with the chorio-allantoic (red) side outwards.

Check the mare's vulva for signs of tearing or bleeding. Get the vet to restitch the vulva or repair any tears. If there is a lot of swelling it may not be possible to repair it until a couple of weeks after the birth.

Exercise is important on the day after foaling. It encourages the loss of fluid from the uterus. If possible turn the mare out with the foal in a small paddock for 15 minutes twice a day. Increase the length of time out gradually until they are outside all day.

Don't mix mares and foals until after the foaling heat to allow bonding.

The mare's nutritional requirements increase once she starts to produce milk. She reaches peak lactation about 6 weeks after the foal was born. At that time her nutritional requirements are approximately double maintenance levels.
Problems that may arise after foaling:

- Retained placenta. The fetal membranes ("cleansing" or "afterbirth") are considered to be retained if they have not been expelled within three hours. This is important especially in heavier breeds as it predisposes to toxaemia and laminitis. (In Thoroughbreds retention up to 10 hours may be considered normal). Retained placenta is common after dystocia because of the resulting uterine inertia, and after caesarian section. It nearly always occurs at the tip of the non-pregnant (non-gravid) horn. It is unlikely that a mare in which the afterbirth was retained for more than three hours will be ready to be covered at the foal heat.

- Post-partum haemorrhage is not common. It is especially a problem in older mares - usually due to rupture of the uterine artery. Initial signs may be mistaken for normal afterpains. But as the blood loss continues, the pulse becomes weaker, and the mare may start to tremble and develop a cold sweat. The mare may stagger and fall at any time so it is wise to remove the foal. Treatment is usually not possible.

- Uterine prolapse. This is rare, but may occur in first 24 hours after foaling. It requires urgent veterinary attention. If the uterus is replaced quickly and without sustaining significant damage the outlook for future breeding is good. Haemorrhage (see above) may occur as well, in which case the outlook is poor.
Care of the new born foal.

As soon as he is born make sure the foal is breathing. Clear his nose and mouth. A piece of straw up his nose will often make him snort and clear the mucus from his nose.

Encourage the mare to remain lying so that the cord doesn't break too soon. Allow the foal to sit with his legs within the birth canal for as long as possible - ie don't move the foal unless it looks likely that the mare may injure him. It is best to let him sit there to allow blood to be pumped from the fetal membranes into the foal. The cord usually breaks when the foal struggles to stand. If the mare is still lying down when the cord has broken, pull the foal round to her head so she can lick him. Generally the longer the mare remains lying down the better.

Check the navel stump - if it is still bleeding it can usually be stopped by squeezing it between your fingers. Dress the navel with antibiotic powder or antiseptic lotion.

Rub the foal dry with a clean towel.

Make sure the foal sucks. A normal foal should stand and nurse within 2 hours. If the foal is having difficulty sucking, or is not interested, call the vet. The vet may administer colostrum by stomach tube.

If you need to milk the mare, a good trick is to make a "milking machine" from a 60ml syringe (ask your vet for one). Cut off the end of the barrel near where the needle attaches. Pull out the plunger and re-introduce it through the newly opened end. Place the open end over the teat. Ensure the seal is airtight by wetting it slightly with a little milk from the teat. Then gently suck back on the plunger until milk is sucked out of the udder to fill the syringe. Tip the milk into a clean jug and repeat the procedure.

Check that the foal is passing meconium. Meconium is the firm dark faeces that has accumulated during the foal's time in the uterus. Colt foals, in particular, can have problems passing the meconium because they have a narrower pelvis. It is a good idea to give all colt foals an enema. The small proprietary enemas (eg Micralax®) work well. These come in a small plastic tube which you squirt into the rectum. Opinions vary as to whether you should use liquid paraffin by mouth. The arguments against its use are that it may interfere with colostrum absorption and it can cause a severe pneumonia if it is inhaled.
**The first day**

It is a good idea to have your vet to check the foal on the first day.

New born foals with any risk factors, (eg mare running milk before foaling; dystocia; unobserved birth ) should be placed on antibiotics for 48-72 hrs. If the mare has not been vaccinated against tetanus in the past 4-6 weeks, the foal should be given tetanus antitoxin.

A blood sample can be taken from the foal to check that adequate antibodies (immunoglobulins: IgG) have been absorbed. A blood sample taken at 8-12 hours of age should have an IgG level of at least 2-4g IgG/ litre. If there is any doubt as to whether the foal has had adequate colostrum, a supplement should be given. There are several possibilities:

- Colostrum bank. If you have more than one mare foaling you can build up a bank of colostrum in case you have a foal that has not received enough ("failure of passive transfer" of immunoglobulins or FPT). You can collect about 60 ml every 2 hours for the first 24 hours after foaling. This does not seem to deprive the mare's own foal of colostrum - ie it does not induce FPT. It is still advisable to take a blood sample from the "robbed" foal to check that it has received adequate colostrum. Colostrum can be frozen. It should be warmed slowly before use. Rapid heating, including using a microwave oven can damage the immunoglobulins.

- Commercial colostrum substitutes. These include concentrated serum products available in paste form, to be given by mouth.

- Colostrum from other species - especially dairy cows (more because of the ease of collection rather than any other beneficial reason.) During the first 16 hours of life the gut is "open" to absorb antibodies from the colostrum. Once closure of the gut has occurred, the foal is no longer able to absorb immunoglobulins, and, if it is necessary to boost the IgG levels at that stage, a plasma transfusion will be required.

Probiotics may be useful in preventing "foal heat scours", which often occur about 10 days of age. The scouring is probably due to adaptational changes in the gut bacteria rather than anything to do with the mare's hormones.
The first few days

Carefully monitor the foal's progress over the first few days. Even those foals which appear normal at birth can develop problems later on.

Check the foal's behaviour. Foals should become brighter and more active over the first few days. One of the first signs of septicaemia (i.e. infection in the bloodstream which is a life threatening condition) is that the foal becomes dull or spends more time sleeping.

Make sure the foal can pass urine. Rupture of the bladder is more common in colts. Affected foals tend to strain and pass small amounts of urine rather than a proper stream.

Check the foal's breathing. This should become more regular. A new born foal has very variable heart and respiratory rates. Within the first few hours they should become more stable. (Normal values: respiration - less than 40 breaths /min; heart rate - less than 40 beats /min)

Lameness and / or swelling of joints. Assume this is caused by infection until proven otherwise.

When to allow mare and foal out of the stable

If the foal is normal size and has normal limb conformation it should receive paddock exercise starting on the second day.
Useful Addresses

1 Water hardness test kits

Aquadur water hardness test strips (about £20 for 100) (April 2001) are available from
MACHEREY-NAGEL Ltd
27a High Street Tel: 01295 713712
Middleton Cheney Fax: 01295 713667
Oxon OX172PA Email: sales-uk@macherey-nagel.com

Foaling Alarms
examples are (prices as advertised May 2004):

Wyke Foaling alarm
This system works by detecting increased sweating.
The basic system costs about £383 + VAT but can be hired for about £21+ VAT / week.
for more details contact: 01952 460560 or see: www.wyke-equine.co.uk/foaling_alarm.htm

EquiPage Foaling Alarm
This alarm detects the mare lying flat out. It costs $695.00.
For more details contact: 00 1 360 653-7928 or see www.foalingalarm.com
Kee-Port Data Systems Inc, 9219, 99th Ave NE, Arlington, WA 98223, USA

Breeder Alert Foaling monitor and alarm.
A transmitter on the halter detects when the mare is lying flat out.$690-00 see http://www.breendedoralert.com

Crescent Moon Foaling Alarm
This also detects the mare lying flat out. It costs $979.00 Canadian.
see www.angelfire.com/mi/crescentmoon/alarms.html

Foalert Inc Birth Monitoring Systems
Features a transmitter sutured to the vulva. Separation of the vulval lips at birth activates the
alarm. See www.foalert.com

Foaling Cameras
Standard wireless foaling camera system $399-00
See www.foalingcamera.com
Post Script

We hope you have found this report helpful and useful. We welcome your comments and suggestions.

If you have any foaling tips we would be delighted to hear about them and might even include them in the next edition of these notes.

Please send any comments to:

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Or

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