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# Breeding the mare - first steps

By Jos Mottershead & Kathy St. Martin

"I want to breed my mare!" It's an expression often heard early in the breeding season and is then followed by the question "what do I need to do?". Theoretically, the answer should be simple, but in practice that often proves to not be the case.

Without getting into the actual selection procedure for the type of mare to be bred - which is a separate subject entirely and will vary from breed to breed - we can certainly look at different age groups as an initial consideration:

## Age

The younger mare - younger meaning under the age of 12 - is likely to present the least number of issues in establishment and maintenance of pregnancy. It must be kept in mind that at the younger end of the spectrum, the filly must have started cycling regularly and be showing adequate maturity for motherhood. If it is felt that the filly is not yet adequately mature to maintain her own pregnancy, one can always consider flushing an embryo for transfer to an appropriate recipient mare. When dealing with a mare closer to the 12 year-old end, one should consider the prior parental status. If this is a maiden mare - with the caveat that some of the issues relating to older mares discussed below may start to be seen - she is going to more likely be an easier mare in which to establish pregnancy. If however she has had multiple pregnancies, it may be worth considering that she may possibly have some "wear and tear" on her reproductive tract which could cause problems. I liken the mare's reproductive tract to tires on your car. If the car is 10 years old but has only 5,000 miles on it, then the tires may well still be in good condition; on the other hand if the car is 6 years old but has 150,000 miles on it, the tires are likely to be worn out. The same therefore may be the case with a mare - she can be a younger mare that's had multiple foals and has more "wear" than a slightly older mare that's had no foals. The optimal age group for easy breeding will be found with mares between the ages of about 4 and 12.



Once the mare surpasses the age of 12 - and particularly if a maiden - it is generally agreed that issues are more likely to be present which can make conception and/or pregnancy maintenance more difficult. One of these issues can be related to the ability of the cervix to open adequately to allow clearance of breeding-related fluids - discussed in greater detail below as it may also be seen in other age groups. We present an outline of other problems which may be encountered when breeding mares in this age group in our article entitled

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"breeding the older maiden mare".

When the mare reaches her 20s, both the safety (for her) and ease of breeding are often debated. As a general rule, for a mare with no obvious significant problems, the answer to the question "when should I stop breeding her" is "when she will no longer get pregnant". Clearly if there are physical problems present, then they should be taken into account. The answer may be different and obvious, but in the absence of problems, anthropomorphism should not become a factor. It should be remembered that in the wild mares continue to breed until they no longer conceive. In fairness, it must be noted that there is a very slight increased risk of a uterine artery rupture in the older mare, but it should be underlined that it is slight. Certainly the decision to not breed an older mare may be made if she has experienced a difficult foaling which "takes a lot out of her" - but conversely some older mares who have been life-long broodmares can be distinctly unhappy if they don't have a foal of their own!

## Evaluations

### Basic - and Cheap

"Cheap and easy" evaluations are always a favoured starting point, and a very simple one is to look at the mare's overall physical condition. An excessively fat (obese) mare will be more likely to be suffering from metabolic issues such as PPID (pituitary pars intermedia dysfunction, also known as "Cushing's syndrome") or a precursor thereof. These conditions may also affect the mare hormonally, with lower pregnancy rates as a result. The opposite end of the scale - the excessively thin mare - is also more likely to present a challenge, as often these mares fail to cycle (especially if they already have a foal at foot) and have a higher incidence of early embryonic death ("EED"). Rectifying these two ends of the physical spectrum prior to attempting to breed the mare will result in higher success rates and less frustration. If dealing with a mare that has not been bred repeatedly unsuccessfully in the previous season, another good starting point is to consider her reproductive conformation - lift her tail! An external perineal conformation has been shown to have an effect on likelihood of pregnancy establishment [1]. If the perineal region is angled significantly off the vertical, it may suggest this could be a mare who is going to have problems getting and/or maintaining a pregnancy. It is important to understand that the "tipped" mare is not only more likely to be contaminated externally with feces, but that her internal reproductive tract may also have changed position, predisposing and leading to greater internal problems. It may be a money-saving decision to not breed the mare with very poor reproductive conformation - however, this decision would also rule out a significant number of mares, so it is often not considered an eliminating factor, but merely a warning of possible problems.

### Cytology, Culture and Biopsy



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If it is decided the mare is to be bred, the next aspect to consider is uterine hygiene and health. There

are several options here, which produce varying degrees of diagnostics. The basic evaluation is the culture and cytology - note the cytology, the significance of which we discuss in our article about [the importance of a cytology smear](#). These two combined evaluations determine with variable accuracy the presence (or absence) of an organism, and whether an organism, if present, is pathogenic in nature. An endometrial swab culture alone will not reliably produce this information, resulting in a high incidence of either missed organisms or organisms identified as being pathogenic, when that is not the case. Indeed, even the sampling device can have an impact on results! A double-guarded device is preferable [2], and a cytology brush has been found to be superior to a swab for the harvesting of cells for a cytology smear [3], [4]. These devices are the most likely to be found in general practice, but it has been determined that a low-volume lavage has superior qualities for identification of mares suffering from endometritis [5]. This latter technique involves introduction of 60 ml of sterile physiological saline into the uterus, then the capture of same with evaluation of the sediment after either centrifugation or settlement. An alternative lavage method involves introduction of 250 ml of Lactated Ringer's Solution, with capture of a minimum of 150 ml [6]. A more advanced diagnostic is the combination of an endometrial biopsy and culture - the culture sample being taken from the biopsy sample itself. This will produce not only the same degree of accuracy regarding surface cells from the uterus as with the culture and cytology [7], but also an evaluation of the cellular condition of the endometrium, allowing an estimation of likelihood of production of a live foal [8].

Confusion may arise when faced with such an array of diagnostic possibilities as to which to use, but basic common sense answers the question well. The large breeding operation with many of their own mares will statistically see, on average, 60% become pregnant on the first cycle with no diagnostic involvement. Clearly, performing these diagnostics on all mares pre-breeding in a large herd will result in a significant waste of funds. With the large operation therefore, it is common that mares are bred on the first cycle with no or minimal diagnostics. Diagnostics only being introduced on subsequent cycles for mares which either did not get pregnant or lost the pregnancy. For the single (or low number) mare-owner however, it makes good financial sense to perform the diagnostics right from the start, before attempting to breed. So which to start with? The fastest and simplest diagnostic is the cytology smear. If inflammatory cells are identified, that indicates there is an issue within the uterine environment which requires attention prior to breeding. Most will



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couple the cytology smear with a swab for culture (swab first, smear second if two different samples are used). Treatment can then be initiated based upon the results. Another advantage of a cytology smear is that it may identify yeast presence - something which may not show up in a bacterial culture. If a mare is unsuccessfully bred for several cycles, having first been evaluated using a culture and cytology, it may be worth considering the use of the low-volume lavage as the next diagnostic tool, although more experienced reproductive veterinarians may have used it initially. The ultimate diagnostic in this category is the endometrial biopsy and culture. One could argue that it might be worth using the biopsy initially, however the majority of mares will not require it and the cost is greater than the other methods. The pre-breeding situations most likely to warrant a biopsy and culture are mares who have not become pregnant after several breeding cycles; the older barren mares; or mares that have lost a pregnancy after 40 days. Other situations exist where a biopsy and culture are recommended (for example when dealing with a mare post-pyometra), however these are outside the scope of this article. As the endometrial biopsy evaluates the cellular condition, it can be a very valuable diagnostic with mares which have failed to become pregnant or which have repeatedly lost their pregnancies at certain stages. The equine placenta does not start to form until around 40 days of pregnancy, so prior to that formation, nutritional transfer cannot be through the placenta. Between about 40 and 140 days of gestation, the placental formation occurs, and nutritional transfer gradually changes to a route via the placenta. If pregnancy loss occurs during this time frame, it may indicate a problem with placental nutrient transfer, suggesting possible endometrial problems. One such group of problems is related to fibrotic changes of the endometrium or its glands. Those changes can be identified in the biopsy sample. If such a problem is identified, improvement of biopsy score and pregnancy rates may be achieved with the use of an intra-uterine lavage of dimethyl-sulfoxide ("DMSO") [9].

## Cervix

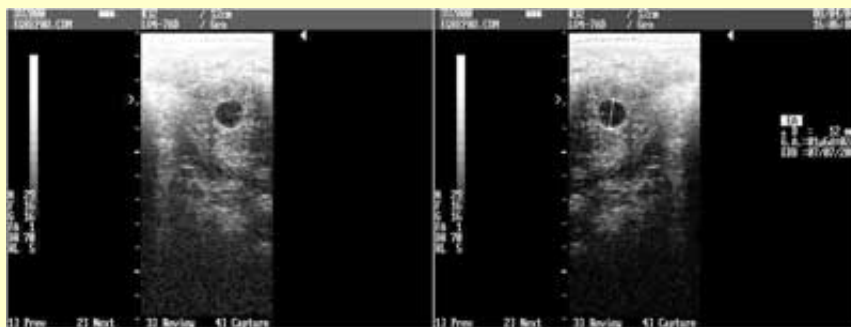
An evaluation which is of importance particularly in multiparous mares (those having had foals previously) is a manual evaluation of the cervix. This is best carried out during diestrus, when the cervix should be tightly closed and any damage such as tears or scarring can be more easily identified [10]. The cervix however needs to relax when the mare is in estrus and a failure to do so can result in failed pregnancy establishment or a higher incidence of EED due to accumulated uterine fluid. We discuss this later in the article.

The suggestion that the cervix be evaluated for damage during diestrus raises the question of when to perform other diagnostics such as swabs or biopsy. With regard to swabs, there are two schools of thought, both of which present valid arguments. The first argument suggests that sampling should be performed during diestrus, as any bacterial presence in the uterus when the cervix is closed suggests a problem; the second suggests that sampling performed during estrus when the cervix is relaxed is mechanically easier, and

that a significant bacterial presence at that stage suggests that the mare's own uterine defense mechanisms - which are elevated during estrus - are unable to deal with the issue. This second thought process also argues that in the event of uterine contamination during sampling - as the uterine defense mechanisms are elevated owing to estrus - any accidentally-introduced organism will be dealt with by the mare's own response. From a practical perspective, the visiting practitioner has a 1-in-3 chance of arriving during estrus if the mare's cycles are unknown so commonly sampling is performed regardless of cycle stage. If the sample is taken during diestrus, it should be followed with prostaglandin treatment to induce estrus and elevate uterine immune function in case of contamination during sampling. The timing of biopsy sampling presents a slightly different picture, as ideally the retrieved sample should most closely mimic that which would be found during pregnancy. This would be during diestrus in the non-pregnant mare, when progesterone levels are elevated. A good pathologist however will be able to differentiate and offer results regardless of sampling timing. It is often asked if the sampling should be performed before the start of the cyclical breeding season - in some cases at the end of the previous year's breeding season before the onset of winter anestrus. While a biopsy sample is less likely to change during the winter period - although not impossible - a culture and cytology most certainly could have results differing from the prior season. Consequently, it is typically recommended that diagnostic work be related to year in which the intended breeding is to take place. Concern is periodically voiced over the prospect of performing an endometrial biopsy in close conjunction to breeding. Research has actually demonstrated that performing a biopsy within as few as 6 days prior to breeding has no impact on pregnancy rates [11]. A biopsy performed at the very beginning of the breeding estrus period, or on the prior estrus, should therefore not be a matter for concern. The only issue with breeding on the same cycle as that which a biopsy sample is taken is that the results may not be received prior to the breeding.

## Ultrasound

Something else commonly identified during a pre-breeding or breeding-soundness examination is the presence of



uterine or endometrial cysts. These are typically identified with the use of ultrasound although if large enough may be identified during palpation. While some research [12], [13] has suggested a lower pregnancy rate in mares with cysts, it is important to consider that other contributory factors may also be present. Those other factors may be a greater cause for lower pregnancy rates

than the cysts. There is no doubt that there are some cysts which will reduce pregnancy rates. These will typically include cysts which are large enough or positioned in such a manner as to prevent adequate closure of the cervix, sufficient movement of the conceptus throughout uterus (particularly between days 10-14 post-ovulation), cysts which are so numerous as to cause interference with placental ability later in the pregnancy, or which are located in the region of the corpus-cornual junction. This latter instance may cause interference with "fixation" of the conceptus around day 16. Older mares will be more likely to have cysts, but it is important to remember that older mares are also prone to other issues likely to reduce pregnancy rates. Failure to establish pregnancy in this group should not immediately be blamed upon cysts presence - indeed, the cysts may be a harbinger of underlying problems and not an issue themselves. Cysts, unless sized or placed as above, should not be an immediate cause for concern, and a good rule for cysts is "if they are not bothering you, don't bother them". It is not uncommon for mares with sections of uterus that per ultrasound look almost like Swiss Cheese, to achieve and maintain pregnancies with no problem! In the event that removal is deemed necessary, this can be achieved by various means, including manual ablation, snare electrocoagulation via hysteroscopy, endometrial curettage, puncture by uterine biopsy punch, puncture or aspiration during hysteroscopic examination, repeated lavage with warm saline, or laser surgery [14], [15], [16], [17], [18]. One issue that is distinctly related to cyst presence is a potential inability to identify a pregnancy. In many cases there are no features with which to differentiate between some cysts and an early pregnancy, save that the pregnancy will grow over the course of several days and develop a heartbeat, whereas the cyst will not. Owing to this annoying similarity, it is essential to map and record the position and size of cysts during the pre-breeding evaluation. In some instances cysts may not be similar in shape to a pregnancy, but so numerous as to be impossible to clearly identify an early (12-14 days) pregnancy and definitive identification can only be achieved at a point slightly later - typically >19 days when a heartbeat is visualized - by which point the success of twin reduction will be lowered.



Another important problem sometimes found during a pre-breeding or breeding soundness evaluation is free fluid presence in the uterus. This can be indicative of a variety of problems, including pathogenic presence, delayed uterine clearance issues and/or failure of cervical relaxation. It may also be related to endometrial changes such as fibrosis [19], particularly in older mares. Uterine fluid presence is something which requires further investigation, and it is recommended that mares not be bred without suitable treatment to either resolve the cause (if pathogenic or cervical in nature) or the presence itself (if related to clearance issues). There are

a couple of very rough but useful "rules of thumb" regarding uterine fluid when it is identified per ultrasound: the first is that a clear "black" fluid suggests a lack of irritant (pathogen or other), while white specks in the fluid suggest inflammatory cell presence (and hence an irritant). While this is not an absolute, it is a useful starting point. If the fluid is identified early in the breeding process, use of the uterine sample culture and cytology or biopsy and culture as described above may be of assistance in identifying the cause; the second rule relates to depth of fluid: if less than 2 cm in depth, use of an ecboic (oxytocin or prostaglandin) is likely to be adequate to achieve clearance, whereas if it is greater than 2 cm in depth additional treatment with a uterine lavage is likely to be required [20], [21]. We discuss uterine fluid and the use of ecboics in our article about [oxytocin use during breeding](#). Lack of cervical relaxation during estrus may also be a cause or contributory factor relating to free uterine fluid and requires attention. Causes for this may include adhesions, fibrotic or scar tissue presence, or low estrogenic levels in the mare. There are various methods available to encourage relaxation, which may prove more or less effective depending upon cause. Techniques include manually dilating the cervix [22]; systemic treatment with exogenous estrogens; topical treatment with prostaglandin E1 cream ("Misoprostol") [23] or Buscopan [24]; or acupuncture [24].

## Other Issues

### Pooling, Windsucking and Caslick's

Other problems which might be identified during the pre-breeding evaluation and which should be considered more serious - potentially to the point of not being desirous of breeding the mare - include urovagina (urine "pooling") and pneumovagina ("windsucking"). While these conditions may be resolved in

some cases with the use of a urethral extension in the former or a Caslick's procedure in the latter, the added expense and reduced rate of successful outcome may make a decision not to breed the mare a wise investment. Of the two, the latter (pneumovagina), if not too serious, is the one most likely to respond favourably to the cheaper Caslick's procedure. Ensuring absence of uterine pathogens in these mares prior to breeding is of increased importance owing to the predisposition of such presence due to the problems.

## Choice of Facility

A final point which is worthy of consideration is the selection of a suitable facility to perform the breeding work. In this, the internet and fellow local-breeders can be of assistance for references, as well as some of the following "markers". It is important to consider that there have been many advances in the field of equine reproduction, particularly in the last 20 years, however it is a very small - and only seasonal - part of a veterinary business' work. Consequently updating the knowledge level may be overlooked in favour of another field which could produce year-round income, such as lameness. This of course can lead - particularly in situations where one is dealing with a problem mare or a more intricate breeding situation such as with frozen semen - to a disappointing and expensive outcome for the mare owner if pregnancy establishment is not achieved due to lack of knowledge or ability. Some practices which suggest a lack of updated knowledge include the use - without reason - of a full dose of prostaglandin to short-cycle a mare, rather than a micro-dose which prevents unpleasant side-effects for the mare (sweating, cramping etc.); an inability or reluctance to perform a cytology smear in conjunction with a uterine swab culture; lack of adequate sanitary practices regarding insemination; or use of a "regular" rubber-plungered syringe for insemination. While pregnancies may be established even if these situations do occur, they are strongly suggestive of a lack of updated knowledge of the field, and consequently a greater risk of lower pregnancy rates. While any one of those practices may not negatively impact the pregnancy rate of a young, healthy mare, in the instance in particular of dealing with problem mares, attention to detail is critical for success.

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