REPRODUCTIVE PHYSIOLOGY OF THE MARE

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PREPARED FOR THE CONFERENCE ON
INFERTILITY IN THE MARE

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* This handout is to be used in conjunction with a slide presentation:

I. A great deal of care must be taken in transposing information from one species to another. A mare is endocrinologically and physiologically not identical to other species.

II. Environmental influences have a tremendous effect on reproduction. This is especially true in the mare where social adaptation, light changes, season of the year, temperature, nutrition and other factors have considerable influence on the reproductive cycle.

III. The mare is classified as a seasonally polyestrus cyclic animal. There is much variation from one mare to another. The largest percentage of ovulation occur in the month of July. This is not the peak time when most people would like to breed their mares. During February when most race horse owners would like to settle their mares, only 18 1/2% of the mares ovulate normally.
IV. The mares reproductive cycle can be regulated by manipulating light in the stable. By gradually increasing the amount of exposure to light by 30-60 minutes each week, starting in December, most mares will be cycling and ovulate normally within 40-100 days or when the total daily exposure of light reaches 15-19 hours. Any kind of light works - example is 200 watt bulb in box stall. Moving the light cycle ahead by several months does nothing to increase the fertility of a band of mares.

V. In regard to the onset of puberty in the mare, most textbooks use the figure 18 months as that time when a young mare reaches puberty. This is a dangerous figure to use since a mare that is 18 months old and going into the anestrus period of the year, of course, will not begin to cycle and may not then achieve puberty until 24 months of age.

VI. We have four periods in the reproductive calendar of the mare. November through January are regarded as the period of deep anestrus. The period of May through August is regarded as the ovulatory and receptive period. On each side of these periods are a period of adjustment where the mares exhibit anovulatory receptivity.
VII. The estrous cycle of the mare is extremely variable. "The only regular thing about a mare's estrous cycle is its irregularity." The length of cycle is approximately 21 days. There is considerable variation in range involving this figure. The most consistent guideline to use in measuring the length of the estrous cycle is the period between estrus which is not in most mares from 14-16 days. The life of the corpus luteum is shorter in the mare than in other species and reaches a peak of progesterone production much quicker than other species. It is therefore important to tease and predict for the next cycle.

VIII. The mare demonstrates a foal heat which is an ovulatory heat and when a normally foaled mare is bred to this heat, will terminate in a pregnancy and birth in approximately 50% of the cases. Uterine involution is not complete in most cases of foal heat and the endometrium has not been completely restored by foal heat. Foal heat occurs between 4-16 days following parturition.

IX. There are certain peculiarities of the mare that influence the estrous cycle.
1. There is an over-production of FSH and many times a deficiency of LH production.
2. The mare is a tremendous producer of estrogen and estrogen derivatives.
3. The mare produces uterine hormones (mainly pregnant mare serum) which has FSH activity.
4. The mare's endocrinological system responds dramatically to the influences of light.
X. The equine ovary is similar to other species in some respects but in many other respects it is very different from the ovary of other domestic animals. Estrogens are produced in the theca interna cells and diffuse into the granulosa cells and the graffian follicle. Progesterone is produced by the corpus luteum. In contrast to other species the equine ovary has an overabundance of interstitial cells. These cells are capable of producing androgens. Androgens are the precursor of the estrogen molecule; however, if produced in overabundance, could account for some of the bizarre behavioral characteristics of the irregular cycling mare.

XI. There are basic physiological and anatomical differences in the mare's ovary. The mare's ovary develops a very large follicle which is a normal development. Secondly, the follicle does not rupture to the periphery but rather ovulates to the ovulation bursa on the medial portion of the ovary. The infundibulum does not cover the entire ovary. There is tremendous variation in the size of the equine ovary.

XII. Follicular cysts, common in the bovine, do not occur in the mare. Some people gauge the size of the follicle in reference to F1, F2 and F3 which represents 1, 2 or 3 fingers in width. Others record the sizes in centimeters. The size of the follicle is not necessarily correlated to the degree of intensity of estrous behavior.
XIII. Twin ovulations occur very frequently in the mare. An average of 14-18% of ovulations are, in fact, twin ovulations. This increases tremendously during the summer and reaches 33-38%. The fact that only 1/2-1 1/2% of terminal pregnancies are twin indicates that most twin ovulations and fertilizations result in early absorption or abortion. Recent studies indicate that in some areas (California and Australia) multiple ovulations are more common early in summer. It is very important to know what may be happening in your area.

XIV. Ovulation usually takes place toward the end of estrus or about 24-48 hours prior to the end of estrus.

XV. There is a tremendous amount of hemorrhage into the follicle at the time of ovulation. This hemorrhage results in a very large corpora hemorrhagica and if palpated within 24 hours after ovulation, resembles a soft spongy snowball when rectally palpated. Within 48 hours the size of the corpora hemorrhagica is reduced and it is impossible to palpate the corpus of the equine ovary and be certain that that is what you feel.

XVI. It has been stated that if ovarian tissue can be felt that is would be unwise to classify a mare as infertile. We have, on occasion, seen follicular development occur where a mare's ovaries were hypoplastic and these mares were then bred following ovulation and conception occurred.
XVII. The true nymphomania mare is usually represented by small static ovaries; however, as mentioned earlier, these ovaries often have a predominance of interstitial tissue which is capable of producing androgens. These male type hormones may be responsible for the unruly behavior of the nymphomania mare.

XVIII. Due to the tremendous hemorrhage during ovulation in the equine ovary, hemorrhage occurs around the ovulation bursa and may result in adhesions.

XIX. A very obvious venous plexis is found covering the equine ovary. This venous plexis may become vericose and give the surface of the ovary an abnormal palpable characteristic.

XX. Paraovarian cysts may occur in the mare and can contribute to the confusion upon palpation of the equine ovary.
XXI. Fertilization occurs in the oviduct of the mare as in other species. The ovum stays in the oviduct for 4-5 days - a longer period of time than most species. Also, only the fertilized ova pass on down into the uterus. Examination of oviduct fluids often times reveal unfertilized ova from previous cycles.

XXII. The cervix of a mare is very elastic compared to most species. Observation of the cervix can be used as an indicator to the stage of the estrous cycle. A correlation between the firmness and character of the cervix on rectal palpation and ovarian development is very useful in pinpointing the time of ovulation in the mare.

XXIII. Because the mare's cervix is very elastic and easily dilated, extreme care should be taken during reproductive examination to prevent pneumouterus and the introduction of pathogenic bacteria into the uterus.

XXIV. The mare's uterus is T-shaped. It has a diffuse placentation similar to the pig and has remarkable involution capabilities. Internally, it appears to be very much bicaronte.
XXV. The endometrium of a mare is not completely restored in its normal integrity during foal heat. At about 40 days or slightly prior to this time, endometrial cups begin to secrete PMS.

XXVI. There are at least four critical times in gestation in regard to maintenance of pregnancy. 1) 17-30 days – a new wave of follicular development, 2) 40 days – endometrial cup development and secretion, 3) 56 days – the beginning of implantation, 4) 3-5 months – shift of steroid production from ovary to uterus.

XXVII. There is luteolytic substance produced in the endometrium which causes regression of the corpus luteum. This material is not produced in a pregnant animal, nor in the pyometria mare. It can be released by uterine manipulation of the healthy diestrus uterus.

XXVIII. Endometrial cups form at 37 days – If fetus is lost they remain and mare does not return to estrus.
XXVII. Sperm transport occurs very rapidly in the mare. Semen, upon copulation is deposited into the uterus in its majority. The life of the spermatozoa in the mare is said to be up to 5 days.

XXX. The gestation period in the mare is variable from 11-11 1/2 months. Tight breeds are somewhat longer than draft breeds. Horse colts shorter than female. Twin will be shorter.

XXXI. The amnionic vessel of the pregnant mare is characteristically round.

XXXII. The ovaries of the mare may be removed in the latter half of gestation. Corticosteroids do not produce abortion in the mare except with high dosages.
Irregularities of the Mare's Estrous Cycle

Edward C. Mather, D.V.M., Ph.D.

It has been stated that the three chief reasons for infertility in the mare are shortness of the breeding season, genital infection and irregularities of the estrous cycle. Caslick stated that irregularities of the estrous cycle was the most important of the three.

That is not to imply that all mares have a fertility problem, but the fact remains that of all our domestic animals, the mare has to be considered to have the highest rate of infertility.

Each mare must be considered as an individual case and treated as such. Several authors have attempted to classify irregularities in an effort to better understand the problem.

A. Robert's classification includes:
   I. Those mares which show signs of estrus toward a teaser.
   II. Mares in anestrus (fail to show).

B. Caslick originated another classification as follows:
   I. Long period of estrus
   II. Long diestrous periods
   III. Irregular periods of time
   IV. No estrus (anestrus)

As can be seen, there is confusion in regard to the term "anestrus."
Most authors now use estrus, diestrus, and anestrus with the understanding that anestrus mares do not have cyclic ovarian activity, whereby diestrus mares have active luteal tissue on the ovaries. With this definition in mind, and newer knowledge of reproductive physiology, we can better understand the clinical signs which have been very capably described by Roberts and Caslick.
Long Periods of Estrus

1. Higher incidence in barren mares than foaling mares.
2. Estrus 10 to 12 days up to 60 days.
3. Usually seen early in breeding season.
4. Seen in thin maiden mares preceding shedding.
   (Shedding coincides with the onset of the breeding season).
5. Usually accept stallion throughout and eventually ovulate.
6. These are not "true nymphomaniac mares."

Long Diestrous Periods

1. When estrus finally occurs, it is true estrus.
2. May have had unobserved estrus and confused with silent heat or subestral heat.
3. Mares occasionally fail to regress the corpus luteum at the expected time.
   The prolongation of the luteal function can last a variable period of time--up to as long as two months. The condition arises spontaneously and is probably the most important cause of unobserved estrus during the physiological breeding season (April to July). The reason for the prolongation is probably a malfunction of the uterus and a result of the failure of the uterus to release a luteolytic substance (probably prostaglandin). Most of these mares have a macroscopically and histologically normal uteri and the nature of the defect appears, therefore, to be functional. Prolonged luteal activity in the mare can be suspected in the following mare categories:
   a) Foaling mares which are not bred at the foal estrus and subsequently fail to return to estrus.
   b) Barren, maiden or foaling mares which have been bred and have not returned to estrus but are found not pregnant when examined six to eight weeks after breeding.
c) Barren and maiden mares which are not bred at the estrus at the beginning of the breeding season (February to March) and which, subsequently, do not return to estrus.

d) Mares diagnosed pregnant but later found to be open.

Clinically, one finds ovaries of a moderate size usually containing one or two follicles up to 3 cm. in size. The uterus is normal size and has, in most cases, a moderate or strong tone. As the corpus luteum cannot be easily palpated in the mare, the determination of blood plasma progesterone is an important aid to the diagnosis.

The prolonged luteal phase can be terminated through parenterally administered prostaglandin $F_2\alpha$.

**Silent Estrus**

This type of mare does not exhibit estrus even though she has normal cyclic ovarian activity. The cause of the syndrome is not known but it is likely to be due to basic changes of the sensitivity of certain neurons (receptors) of the central nervous system rather than inadequate production of estrogen by the developing follicles. Some of these mares are phlegmatic, overly fat mares that fail to respond to a teaser. Some mares may also be highly nervous, protective mares following foaling which do not respond well to teasing. The diagnosis must be differentiated from prolonged luteal function (as described above). The main difference is that mares with "silent estrus" show cyclic changes and cyclic uterine tone whereas mares with prolonged luteal activity do not show pronounced changes in regard to uterine tone or ovarian activity.

Management of these cases include such procedures as frequent rectal examinations and A.I. at the appropriate time, estrogens, releasing hormones, variation in teasing procedures and teasers, environment, etc.
Anestrus in Racing Mares Coming Direct from the Race Track for Breeding

Mares at the race tracks have often been treated for a long time with different drugs; so-called anabolic steroids, progestins, corticosteroids, e.g. for lameness, muscle stiffness, "nymphomania," infections, or for other reasons. It appears that it takes a long time following withdrawal of the medicines for such mares to establish a normal ovarian activity. Since the mechanism for this syndrome is unknown, it is difficult to suggest an adequate medical treatment. Some of these mares have, apparently, received so much medication already that what they need most is time to recover from the previous "treatments." Turn the mares out and let them rest. It may take several months or the whole breeding season for normal cyclic activity to return.

Anestrus Due to Seasonal Variation

This subject was discussed earlier and the management problem will not be remedied without changes in breeding regulations. Artificial lights, of course, can be used to help circumvent the problem.

Miscellaneous Causes of Anestrus

1. Ovarian Hypoplasia
2. Gonadal Dysgenesis
3. Neoplasms of Ovary
4. Neoplasms of Pituitary

Irregular Estrus

This is a small group of mares and more often associated with maiden mares and mares early in the breeding season. They may include mares with "split heat" and false heat not based on genital tract signs consistent with estrus. There may be some overlap with the occurrence of twin ovulations.
SUMMATION

Most irregularities occur during the "transitional phase" and again at the end of the breeding season, but due to the general lack of desirability in breeding the mare after August, that time goes unnoticed.

INDIVIDUAL MARE PROBLEM?

1. Fight or resist even when in estrus
2. Selectivity to teaser (color, size)
3. Phlegmatic mares
   (A) No resistance any time
   (B) Overconditioned mare

We still must face the problem of the individual mare and all mares just won't fit our classification, thus, we must know the mare.

PROGNOSIS--IRREGULARITIES OF THE ESTROUS CYCLE

A. Usually favorable if:
   1. Regular teasing
   2. Periodic vaginal and rectal exam
   3. Begin early in season
   4. Use of lights?

TREATMENT CONSIDERATIONS

1. Each mare is an individual problem
2. Size of operation must be considered
   (A) 1-3 mares
   (B) Band of brood mares
The owner with a mare or two without a male on the premises is faced with a different problem than the owner with a band of brood mares that has an adequate teasing program. Some mares will not exhibit external signs of heat when not in the presence of a virile male.

**TREATMENT has to be Based on Diagnosis of Cause**

1. Regular teasing
2. Accurate records
3. Periodic rectal-vaginal exam
4. Season of year
5. Pneumovagina and other systemic factors
6. Evaluation of environment, nutrition, and management
ARTIFICIAL INSEMINATION IN HORSES

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Artificial insemination of horses has been practiced for many centuries. The horse was one of the first animals in which artificial insemination was used. It probably has been utilized most extensively in Russia, China and Japan. Because of the decreased use of the horse for work purposes and their increased use for pleasure, artificial insemination has not played a major role in the horse industry in the U.S. The reluctance of breed organizations and horsemen to accept and promote the technology and benefits derived from extensive efforts in the areas of artificial insemination, in general, has been obvious.

Advantages of AI in the Horse:

1. Many mares may be bred to the same stallion on a given day from one ejaculate.

2. Care of a stallion is usually not entrusted to inexperienced persons.

3. Mares with low resistance to infection are not contaminated at the time of natural service.

4. Semen from stallions harboring pathogenic organisms in their reproductive tracts could be used for artificial insemination with the addition of antimicrobial agents to the semen extender.
5. Mares that fail to show psychic estrus but do ovulate regularly (also nervous mares) can be inseminated at the proper time without undue restraint of the mare and danger to the stallion.

6. Mares with physical problems (extensive vulvar suturing, recent rectovaginal fistula or laceration repair), disease (coital exanthema, arthritis, dermatitis, etc.), or injury can be successfully serviced.

7. Stallions of outstanding, known genetic potential can be used, even on the grade mare, to upgrade the different breeds.

8. Management practices and reproductive records are generally much improved.

9. Each ejaculate can and should be evaluated prior to servicing mares therefore stallion seminal quality can be monitored.

Collecting, Handling, Extending and Storing Stallion Semen (Refer to the booklet, Procedures for Preparation, Collection, Evaluation and Insemination of Stallion Semen.)

Semen Collection

Semen is collected from stallions using an artificial vagina after the stallion's penis and prepuce have been thoroughly cleansed, rinsed and dried. Only a mare in standing heat should be used for a mount. The mount animal's tail should be wrapped and the perineal region thoroughly cleansed, rinsed and dried. A volume of 30-150 mls. of gel-free semen is usually collected during the breeding season but will vary during the year.
Processing and Evaluating Quality of Horse Semen

The gel-free semen is obtained by filtering the semen through a gauze filter during (preferable) or after collection. The semen is then placed in an incubator or water bath at 37°C. At this time semen quality is evaluated. Some indications of semen quality are volume of gel-free semen, sperm concentration, total sperm numbers, percent motility, presence or absence of extraneous cells (red cells, white blood cells, spheroids, etc) in the ejaculate and the percentage of primary and secondary abnormal sperm cell types as viewed on the stained morphology slide, and others. Results of the semen evaluation allow one to determine the stallion's ability to produce and deliver normal, healthy sperm cells and aid in determining the rate of extension of the gel-free semen (if extension of the raw semen is desired).

Insemination Techniques

Artificial insemination of mares may be carried out using raw, extended or frozen semen. If raw semen is to be used, insemination should begin immediately after semen collection and evaluation and should be completed within 30 minutes. (Prior to semen collection, mares have been teased and estrus mares have had their tails wrapped and tied out of the way and their perineal regions thoroughly washed). Semen is held at 37°C and out of sunlight. All equipment (pipettes, syringes, lubricant, plastic or rubber sleeves, etc.) to be used in the inseminating procedure are also pre-warmed at 37°C. Insemination is performed using the vaginal method (to be demonstrated in the laboratory) with the semen being deposited deep into the
uterine body. The recommended inseminating dose is 500 million live motile sperm cells (determined by the percent motility estimation and concentration mentioned above.) This usually results in 2-10 mls. of raw gel-free semen being inseminated.

Extending - Horse Semen

To preserve sperm life and obtain a larger inseminating dose, one may extend the raw gel-free semen. The two most common extenders for fresh semen are isotonic sugar solutions with heated skim milk and cream gelatin extender. To make the first extender, 85 ml. of 5.6 percent glucose or 11 percent lactose are added to 15 ml. of skim milk that has been heated to 85° C for 10 minutes. Five hundred I.U. penicillin and 0.5 mg. dihydrostreptomycin are added for each milliliter of extender prepared. To prepare the cream gelatin extender 1.3 gms. Knox gelatin are dissolved in 10 ml. distilled water and added to 90 ml. of half and half cream that has been heated to 95° C for 5 minutes. Heating the skim milk or cream is necessary to inactivate a spermicidal factor found in milk products. Antibiotics can also be added to the cream gelatin extender. Equine semen is usually extended at the rate of 1:1 to 1:8. Extended semen will remain fertile up to 96 hours if cooled gradually and held at refrigerator temperature (4-5° C). Raw semen is extended 1:1 immediately after collection with 37° C extender and slowly cooled over a 90 minute period to 5° C. If further extension is desired, extender should be added at the same temperature as the cooled semen. The usual insemination volume for extended semen is 25-50 ml. The total number of live motile per sperm cells should still be 500 million per service.
Heat Detection and Timing of Service

The biggest problem associated with artificial insemination in the horse, whether fresh, extended or frozen semen is used, is that of heat detection and proper timing of service. The normal estrous cycle of the mare is 18-24 days in duration. The estrus period is usually 5-8 days in duration. Ovulation usually occurs 1-2 days prior to the end of standing heat. Variations in the length of the estrous cycle, estrus period and time of ovulation are frequent observations in the horse. Recommendations for artificial insemination are the same as for natural service: mares are to be serviced every other day while in standing heat beginning on the second day of estrus.

Conception rates using artificial insemination of raw semen are comparable to those attained using natural service. There are some indications that conception rates are higher when artificial insemination is practiced.

Suggested Reading:

I. Preparation of the Mare

The possibility of objection to rectal examination should always be considered in the mare, so precautions should be taken to protect the examiner as well as the animal. Some methods of restraint are listed as follows:

**RESTRAINT OF MARE**

1. Restraint Stock
2. Breeding Hobbles
3. Twitch
4. Hobbling Front Leg
5. Sedatives and Tranquilizers

The tail should be bandaged, wrapped or contained in a plastic sleeve to prevent the tail hair from interfering with the examination.

**PREGNANCY EXAMINATION**

1. Examine All Mares Regardless of Complaint
2. How Soon? Accurate 30-35 days
3. Dangerous? - Depends on Veterinarian and Mare

Regardless of complaint or type of service requested by client--any form of therapy should be preceded by a pregnancy examination.

With experience, an accurate pregnancy examination can be made as early as 30-35 days. In spite of many accusations, a carefully performed rectal examination is not dangerous to the mare or conception, but one must always be aware of the fact that embryonic death occurs at a greater rate during the first 35-40 days of pregnancy and should the animal return to heat after being diagnosed pregnant--the veterinarian may be wrongfully accused. An owner should always be warned of the possibility of embryonic or early fetal death.
芯片的生产与封装技术是半导体制造的关键环节。这一步骤包括将硅片上的晶体管、电阻和电容等元件按照设计要求精准放置在电路板上，并通过各种工艺手段确保这些元件之间的连接稳定可靠。由于电子设备的性能和可靠性在很大程度上取决于封装质量，因此封装工艺在半导体生产中占据了重要的地位。

封装工艺通常包括以下步骤：
1. 割断芯片
2. 预处理
3. 焊接

封装过程中的每一环节都需要严格的质量控制，以确保最终产品的性能和稳定性。随着技术的不断进步，封装技术也在不断发展，以适应越来越复杂和高性能的电子设备需求。
ORIENTATION AND LANDMARKS

1. Outline Pelvic Girdle

2. Ovaries - Sublumbar Arc
   (A) 5 to 10 cm Anterior to Iliac Shaft
   (B) Left Ovary - Larger
   (C) Advanced Pregnancy
   (D) Detailed Exam Nonsignificant in Advance Pregnancy

I'm sure little time needs to be taken in explaining the orientation of the pelvic area of the mare. The ovaries are quite distinctly characteristic and have a more constant site in the mare and are usually utilized as a starting point or landmark on which to base the examination of the genital tract of this species in our laboratory and clinic.

During a pregnancy examination, detailed examination of the ovaries is not performed until after the examination of the uterus has been completed and the animal found to be non-pregnant.

UTERUS

1. Relatively Large Body - Small Horn

2. T-Shaped - Slightly Flattened

CERVIX

1. 6-8 cm long - Flattened Semicone

2. Relatively Thin - Little Connective Tissue

The importance of rectal examination of the cervix has not been emphasized in the mare until recently. As we progress, its importance will be further explained. In comparison to the cow the mare's cervix is shorter--2 1/2 to 3 inches in length. The vaginal portion is quite well outlined and the uterine portion joins the body of the uterus with little delineation.
PREGNANCY

1. Circumscribed in Early Pregnancy

2. Fluctuation of Amnion and "Rope-Like" Feel to Uterus in Early Pregnancy

3. Fetal Membrane Slip Absent

4. Hypertrophy of Arteries
   (A) Fremitis after 5th Month

5. Position of Uterus
   (A) 1st 60 Days of Intrapelvic
   (B) 90 Days Descending
   (C) Continues Descent 6th to 7th Month

6. Position of Ovaries
   (A) Tension on Broad Ligaments
   (B) Ovaries - Descent, More Cranial and Become More Medial

As previously stated, the ovaries are often used as a starting point for examination of the tubular genitalia. In advanced pregnancy as the uterus descends, tension is exerted on the broad ligaments and on the position of the ovaries. Toward the 6th and 7th month of pregnancy, the ovaries are often found as low as the level of the pelvic brim.

PREGNANCY EXAM

1. Location of Ovary

2. Grasp Utero-Ovarian Ligament Following In Medial Direction, Trace to Abrupt Ovarian End of Horn

3. Uterus - Examined for:
   (A) Difference in Size, Shape and Consistency
   (B) Retraction - Grasp Near Bifurcation
   (C) Dissimilarity to Non-Pregnancy
Retraction of the uterus in the mare is used primarily to bring the uterus toward the examiner to facilitate easier examination and must be carefully performed in the non-gravid and early gestational stage. It is gently grasped at the bifurcation with the cupped fingers and gently lifted in a dorsocaudal direction. Its movement is more restricted in the mare than the cow.

To accurately determine or diagnose early pregnancy, it is absolutely essential one become thoroughly familiar with the examination of the normal non-gravid mare. When one becomes proficient on the non-pregnant—the diagnosis of pregnancy is easier than in the cow.

II. Estimation of Stage of Pregnancy

**ESTIMATION OF STAGE OF PREGNANCY**

1. 18-20 Days - Suggestive

(A) Cervix - Well-Defined, Cone-Shaped
(B) Uterus - Firm, Quite Contracted

Although an 18-20 day post service is not diagnostic it is highly suggestive. The use of such early examination is primarily on problem mares. Some resident veterinarians perform this early examination routinely. The cervix at this stage is firm, well-defined, cone-shaped and more pointed at the vaginal portion. The uterus is also usually well-defined, quite high in tonus. In contrast, the mare which is returning to heat, the cervix is becoming relaxed often poorly delineated and though in some mares the uterus is felt to have tonus, it is usually not as marked.

30 Days - Confirm Pregnancy

(1) Circumscribed Spherical
2-3 cm Diameter

(2) Cup Fingers to Feel Ventral Uterus

(3) Uterine Tone - High
Slight Bulging in Some Mares

(4) Cervix - Firm
35 Days Pregnancy

(1) Circumscribed - Golf Ball - 3-4 cm
(2) Beginning Fluctuation
(3) Cervix

Once again, don't forget to include cervix in your examination. Its firmness, well-delineated, is an additive sign of pregnancy.

42-45 Days Pregnancy

(1) Circumscribed 5-7 cm
   But More Oval
(2) Cervix

50 Days Pregnancy

(1) 7-8 cm Long, 6-7 cm Diameter
(2) More Oval Involving Uterine Body

60 Days Pregnancy

(1) Form of Football
   12-15 cm Long
   8-10 cm Diameter
(2) 1/2 Located in Body

90-100 Days Pregnancy

(1) Oval; Entire Body of Uterus Involved
(2) Begins Descent
(3) No Retraction
(4) Ballot Fetus?
(5) Cervix Important Landmark
At times, to me, this can be a most difficult time in the mare, as the size of the enlarged uterus can be similar to that of a filled urinary bladder; but here again if the cervix is palpated and the enlargement traced from the cervix, or to the cervix, this will cease to be a point of confusion.

Some texts state the fetus can be easily balloted as early as 90 days, and yet others state 90 to 120 days. In my experience, ballotment of the fetus is most readily detected after the 100th day.

3-5 Months Pregnancy

(1) Broad Ligament Tense, Directed Downward and Medially

(2) Ovaries Change Position

(3) Ballot Fetus

The technique of ballotment is by gently and quickly depressing the enlarged fluctuating portion of the uterus with extended joined fingers. The fetus at this time is quite free floating and is often felt as a small, heavy submerged object that is felt gently bumping the flattened fingers. Of course, the later in this stage ballotment is performed, the more distinct the fetus becomes.

5-7 Months Pregnancy

(1) Uterus Continues Descent

(2) Tension on Broad Ligaments

(3) Displacement of Ovaries

(4) Ballot Fetus

Although in most cases the fetus is usually easily detected, in an exceptionally deep bodied mare at times the fetus itself may not be detected.

7th Month of Pregnancy to Parturition

(1) Ascent of Uterus Begins 7th Month of Pregnancy

(2) Palpate Fetus
The content of the image is not legible due to the quality of the scan. It appears to be a document page with text, but the text is not clearly visible. Therefore, it is not possible to transcribe the content accurately.
DIFFERENTIAL DIAGNOSIS AND FAILURE OF PREGNANCY DIAGNOSIS

**Pregnancy Diagnosis**

(1) Mistaken Organ
   (a) Pelvic Flexure of Colon
   (b) Filled Bladder

(2) Too Early for Experience

(3) Mare Herself Resists
   (a) Re-Examine

(4) Pyometra, - Absence of Fetus, Size, and Lack of Circumscribed Enlargement

(5) Tumors of Ovary

**ALWAYS**

(1) Examine for Pregnancy Before Treating

(2) Complete Exam of Both Horns

(3) Re-Examine in Case of Doubt

(4) Diagnoses and Findings Always Recorded
ABORTION IN MAIRES

H. Whitmore, D.V.M., Ph.D.
College of Veterinary Medicine
University of Minnesota

Four Common Infectious Causes of Abortion

1. Rhinopneumonitis virus

Symptoms: Abortions occur 18-90 days after infection
(20-30 most common) 90% of abortions occur 8-11 months gestation.

Diagnosis: Focal necrosis liver
Intranuclear inclusion bodies
SN or FA tests. Virus isolation

Prevention: Vaccination
Management

2. Streptococcus zooepidemicus

Symptoms: Abort at any stage of gestation (2-6 months most common)

Found on external genitalia of mares and stallion. Ninety per­
cent mares infected at parturition. Placentitis??

Diagnosis: Pure culture from stomach and liver
No tests for antibodies
Gross exam of placenta??

Preventive: Management

3. Mycotic abortion

Symptoms: Severe placentitis

Diagnosis: Gross exam of placenta
Microscopic exam of hyphae

Prevention:
4. Miscellaneous bacteria

Symptoms: Sporadic abortions
   Placentitis??

Diagnosis: Pure culture from stomach and liver
   Gross exam of placenta?

Prevention: Management

Four Uncommon Infectious Causes of Abortion

1. Leptospirosis

Symptoms:

Diagnosis:

Prevention:

2. Salmonella abortus equi

Symptoms:

Diagnosis:

Prevention:

3. Equine arteritis

Symptoms:

Diagnosis:

Prevention:

4. Equine Infectious Anemia

Symptoms:

Diagnosis:

Prevention:
Four Common Non-infectious Causes of Abortion

1. Hormonal and Stress

   Incidence: Progesterone deficiency between 100-150 days of pregnancy.

   Critical period, placenta takes over progesterone production. 1962-66, 51 outbreaks of abortion on 42 farms, 244 of 1870 pregnant mares aborted (12%) of 224 aborted during October and November.

   Associated with handling, stabling, stage of pregnancy, humidity, season, etc.

   Diagnosis:

   Prevention:

2. Twinning

   Incidence: Very common, from 9 to 12% of all abortions. Maybe 10% double ovulation and only 1% birth of twins.

   Cause: Crowding
   Lacking of placental area, nutrition
   One fetus dies, progesterone drop

   Prevention:

3. Early Embryonic Death

   Incidence: From 2 to 10% loss from pregnancy diagnosis day 40 to day 110.

   Pseudo or "spurious" conception??

   Cause: Bred at foal heat
   Nurse foals
   Chromosome defect
   Infections

   Prevention:

4. Torsion of Umbilical Cord

   Incidence: Maybe causes 1% of all abortions - one to 3 rotations may be normal.

   Cause: Why does cord twist in mare and not in cow?

   Prevention:
Four Uncommon Non-infectious Causes of Abortion

1. Nutrition
2. Drugs
3. Toxins
4. Physical

Conclusions on Diagnosis of Abortion in Mares

1. Test for most common known cause of infectious (4) and non-infectious (4) abortion but do not overlook other causes.
2. Diagnosis is not complete until the placenta is examined.
3. Realize that there are more than 100 known causes of abortion and probably many more that are unknown. Therefore, diagnosis is difficult.
Indications

1. Evidence from rectal or vaginal examination suggestive of uterine infection.

2. Mares being brought to the stud for breeding.

3. Problem breeder mares.

Organisms which have been isolated from the equine uterus:

- Streptococcus - beta hemolytic - major cause.
- Staphylococcus
- Pseudomonas
- Corynebacterium
- Klebsiella
- E. coli
- Proteus
- Yeast and fungi
- Many others

Techniques of sampling

Wrap the mare's tail.

Wash the vulvar area with phisohex and warm water.

Methods employing the vaginoscope:

1. Culture loop. This is the old method. A sample of cervical mucous from the external os is obtained.

2. Sterile swab attached to an insemination pipette. The swab is introduced into the external os to obtain a sample.
3. Uterine swab (plastic disposable uterine swabs). The instrument is passed through the cervix into the uterus. Once in the uterus, the protected swab is protruded from its outer case and an uterine sample obtained. The swab is withdrawn back into its protective case prior to withdrawal from the uterus.

When to culture - estrus vs. luteal phase

There is considerable disagreement as to when is the best time to culture a mare. Some workers have favored estrus as being the best time, some favor proestrus, and others believe that the stage of the estrous cycle is not important.

The following points should be considered:

1. The uterus is more resistant to bacterial infection during estrus than it is during the luteal phase. This bacteriostatic and bacteriocidal effect will reduce the number of organisms present.

2. The production of uterine fluid and cervical mucous during estrus supposedly "washes" organisms out of the uterus, and thus makes them more readily obtainable at the external os.

3. We are primarily concerned with the ability of the uterus to withstand infection during the luteal phase.

4. As a matter of practicality, it is not always possible to delay taking a culture until a specified time in the cycle.

Argument for obtaining uterine cultures:

1. The external os is in contact with the anterior vagina.

2. Organisms in the vagina are not indicative of organisms in the uterus.

3. We want to know what is happening in the uterus.

Growing the organisms

1. Place directly on blood agar.

2. Incubate at 37°C for a minimum of 72 hours. With the more common organisms (streptococcus, staphylococcus) you will have growth in 18 hours. Organisms such as corynebacterium will require longer incubation.
3. If you suspect a fungal infection, plate on Sabouraud's media.

4. There may be an indication for anaerobic incubation.

5. The use of liquid media such as thioglycolate broth allows the overgrowth by contaminants and does not allow an evaluation of the "strength" of the original culture.

6. Reculture appropriate colonies and sensitivity test.

What can you tell from a blood plate and gram stain?

1. Presence or absence of hemolysis.

2. Number of colonies present (strength of the culture). Count only those colonies that are on the initial streak line.

3. Gram stain - positive or negative, rods or cocci.

4. Gram + cocci = streptococci
   staphylococci (micrococci)

   Gram + rods = corynebacterium

   Gram - rods = Proteus
   E. coli
   Pseudomonas
   Klebsiella

Interpretation of results - main points to consider:

1. The manner in which the culture is obtained. The results are only as good as the sampling technique employed. If a sample is known to have been contaminated, discard it and take another one.

2. Method used to grow organism. Direct plating on blood agar is best.

3. The "strength" of the culture, that is, the number of colonies obtained in primary isolation.

4. Organism isolated. How common and severe a pathogen is it?

5. Clinical condition of the mare's reproductive tract, vulvar area, and ovaries should be closely evaluated.
6. Reproductive history of the mare. Maiden, foaling, barren, age, etc.

Concluding points

1. Obtain cultures not contaminated by nonuterine material.
2. Make initial isolation on blood agar.
3. Evaluate "strength" of the culture and organism isolated.
4. Always couple cultural results with the findings of the clinical examination and history of the case in question.

Treatment

1. Use the appropriate antibiotic as determined by sensitivity test.
2. Control the volume - 100-150 ml. and repeat 3 or 4 times.
3. Pass pipette or tube manually and run in drug by gravity flow.

General discussion:

Consideration should be given to the cause and effect relationship between microorganisms and the equine uterus. Bacteria and fungi have been definitely shown to be pathogenic to the uterus, but there is little or no evidence to accept or exclude viruses and PPLOs. Unfortunately, the techniques for virus and PPLO isolation are not readily available to the practitioner.

Limiting the consideration to bacteria, it should be obvious that these organisms vary in their ability to infect and cause detrimental changes in the uterine endometrium. The second factor, is the state of health of the endometrium. The healthy uterus is much more capable of warding off infection by a pathogenic organism than is a debilitated uterus. Along this same line, if the uterus is debilitated, organisms that are normally not pathogenic to the uterus could establish an infection and cause a detrimental response.

Another point to consider is the significance of a negative (sterile) culture. If such a culture is obtained from a palpably normal uterus it is probably significant. On the other hand, if the uterus shows signs of abnormality on rectal or vaginal examination, a repeat culture should be obtained.

Bear in mind, though, that the changes in the uterus could be caused by microorganisms not demonstrable by ordinary culture techniques as well as endocrine imbalances and other non-infectious alterations of the uterus.
CULTURING STALLIONS

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University of Minnesota

Indications

1. Presence of pus cells in the semen.
2. Vaginal discharge from mare post breeding.
3. Infertility problems.
4. When rectal examination reveals signs of genital tract abnormalities.

Organisms which have been isolated from the urethra of stallions.

- E. coli
- Streptococci
- Staphylococci
- Proteus
- Pseudomonas
- Klebsiella
- Corynebacterium
- Others

Technique of sampling

1. Thoroughly wash the stallion's penis with phisohex and lukewarm water paying particular attention to the glans penis.

2. With the stallion's penis fully erect, pass a nasal swab or a uterine swab approximately four inches into the urethra. Extrude the swab gently to obtain sample. Pull the swab back into its protective case and remove from urethra.

3. If semen is being collected from the stallion by artificial vagina, a urethral culture should be taken immediately prior to collection and also immediately following collection. The semen collected can also be cultured.
Growing the organisms

Same as for mare.

Interpretation of results

Very difficult if pathology of the accessory sex glands is not demonstrable. Valid evidence can be obtained if it is demonstrated that the organism present in the stallion's urethra is the same as the one causing breeding problems in the mares to which he was bred.

The true impact of the presence of a pathogenic organism in the semen is probably related to the health of the endometrium of the mare to which he is bred. The more capable the uterus is of throwing off the infection, the less effect the organism will have. It should also be remembered that the presence of bacteria in the semen may have an adverse effect on the sperm cells.

Treatment

Difficult if not impossible. High levels of systemic antibiotics do not appear to reach the urethra and accessory sex glands in sufficient levels to rid the stallion of the infection.

If A.I. is being used, one could try holding the semen in an extender with appropriate antibiotics before insemination.
Introduction

Preparing a mare for breeding must begin long before the mare is led to the breeding barn or loaded into a trailer for a ride to the stud farm. Foaling mares, barren mares and maiden mares involve variable considerations and variable degrees of attention. The time and effort requirements per mare for an owner with two or three mares is going to be vastly different than for the breeding farm with forty to 200 mares. Therefore, it would be an oversimplification to try to outline a single procedure that would fit all needs and farms who seek advice on how to prepare their mare for breeding. We can, however, discuss some of the problems that lead to breeding difficulties and some of the solutions for those problems. Most mares fall into one of several categories in regard to their consideration as a mare to be bred and also in regard to their potential as a breeding mare.

The first category of mares we will consider is the foaling mares or wet mares. The subject of whether mares should be bred on foal heat of course is a controversial subject. Evidence would indicate that breeding mares at the first postpartum estrus do yield a greater rate of infertility as well as early embryonic loss than animals bred at subsequent heat periods. This problem is understandable in light of the fact that the uterus has not fully recovered from the previous pregnancy and that the uterine epithelium is not completely repaired by the onset of foal heat. California studies have indicated that 40% of the mares bred at foal heat were found to be pregnant and 33% foaled as compared to a conception rate of 51% in mares bred on the second heat post-foaling and 43% that foaled. With this apparent decreased fertility, the study also demonstrated, however, that the overall conception rate for the season was no lower in those mares bred initially on foal heat when compared to the overall seasonal conception rate of mares bred on subsequent heat periods! The advantages of breeding on foal heat are obvious to those of you who are attempting to deliver early foals. It is also obvious that the foal heat is a rather consistent period when a mare can be detected in estrus. In this regard, it is important to remember that although many mares show foal heat on the 9th day post-foaling, the range may extend from 4 to 16 days post-foaling.

In summary, I think it is safe to say that several criteria should be met to qualify a mare for foal heat breeding: a) the foal should be live, healthy and strong following delivery; b) the foal should be delivered without significant difficulty or assistance; c) the placenta should be passed within three hours postpartum; d) examination of the mare at 7 days postpartum should reveal no abnormal discharges and a cervix and vagina free of bruises and trauma; e) the uterus on rectal palpation should be involuting normally.

*This paper was presented at the VPI&SU Horse Short Course, March 10, 1978, Blacksburg, Virginia.
Although bacterial cultures of foaling mares are often made, our findings reveal that most cultures are positive but are probably only significant if the mare is showing other clinical signs which would lead to infertility.

A management procedure which we have used with reasonable success to allow more time for uterine involution and endometrial repair is to allow mares to ovulate at the foal heat, wait five days and then administer prostaglandins. Mares administered in such a manner usually return to heat within 3 to 6 days and ovulate about 4 days after coming into estrus. The fertility of this induced ovulation approaches that of subsequent ovulations. This procedure alleviates waiting until the second heat postpartum, provides about nine more days for uterine repair, and also provides the owner with a more consistent and predictable estrus for the anticipated breeding.

There are several considerations one should make in regard to foaling which will help ensure that the mare is prepared for breeding. A small percentage of mares have problems if allowed to foal on pasture and because of this, most mares in our area are brought into foaling stalls or small paddocks. If paddocks are used, they should be clean grass paddocks where close observation can be ensured. The majority of the mares in our area are foaled in stalls and straw is the most commonly used bedding. Tartan-like floors are sometimes used and the advantages are that they are easily cleaned and disinfected between mares. Sometimes mares are reluctant to lay down on Tartan, but eventually do and have been no major problem. The cleaner the foaling environment, whether it be a composition floor, straw, or a clean grass paddock, the less likelihood there is of having infectious agents gain entrance to a susceptible reproductive tract. It must be remembered that an infectious problem that is initiated at this time will probably not be manifested as a clinical problem until breeding time.

As the mare prepares for foaling, any sutures which have been placed in the vulva should be removed as torn sutures and vulvular lips are detrimental to the maintenance of a clean and healthy reproductive tract. Some guidelines to use during foaling are as follows:

a. If 3/4 to 1 hour has elapsed after the presentation of a water bag and the foal is not born, assistance is needed and you should call your veterinarian.

b. A foal should be born within 15 minutes after presentation of the feet. There is no need in most mares to pull on the foal if it is in a normal presentation.

c. If you can determine that the foal is in a malposition, you should call your veterinarian immediately.

d. Many mares will show some colic following foaling and it is due to normal involution of the uterus. This is a normal physiological process and should not be cause for alarm unless the signs persist.
The next category of mares are those individuals which have passed through one breeding season and have been accompanied by unsuccessful breeding attempts. When preparing these mares for the onset of the breeding season, several considerations should be made. Most owners are interested in taking advantage of the full breeding season and starting with the breeding procedure as early in the season as possible. If this is true in your situation, it becomes imperative that an evaluation of your mare be made prior to the onset of the breeding season. If abnormalities are found, they can oftentimes be corrected and alleviated prior to the breeding season and you have not lost valuable time. A rectal examination of a mare at this time will usually reveal the presence of uterine and ovarine pathology and a culture of the uterus should reveal the presence of uterine infection.

Once the breeding season has begun, the cyclic activity of the mare becomes very important. Without adequate records and a good teasing program, it is almost impossible to assess a mare's potential as a breeding candidate. Many workers have stated that the most common causes of infertility in the mare are irregularities of the estrus cycle. I believe this to be true—an assessment of the ovarian cycle is therefore mandatory in the preparation of your mare for breeding.

The influence of light on cyclic activity in the mare has been demonstrated and used in many parts of the world to initiate and renew ovarian activity. If lights are not used and the mares are in true anestrus (lack of cyclic activity), there is little one can do except to await the advancing season. If there appears to be irregular cyclic activity as judged by teasing, palpation of the ovaries is often helpful in determining the status of the mare. Depending upon the palpation findings, a decision must be made in regard to the mare's problem and the manner in which she should be managed.

The next category to be discussed will be referred to that of the maiden mare. The maiden mare is usually defined as a mare that has never been bred. Many maidens do not conceive during their first breeding season and the latter are erroneously called maiden mares again the following year. The preparation of a maiden mare for breeding can be subdivided into two categories. You may have a young mare used for pleasure and you are simply waiting for her to reach puberty to establish normal cyclic activity and to be bred. On the other hand, we may be dealing with an individual that is undergoing a major transition from an athlete to a brood mare, from race track to farm, from individual attention to group attention. The above mentioned transition surely must be a major psychological and physiological change.

In regard to the first category, there is considerable difference between mares as to when they reach puberty. In addition, their chronological age may not coincide well with their legal age. If a filly is sent to a breeding farm in the spring as a 3 year old, it may have been a late foal which means that it may only be a bit over 2½ years old when the breeding season starts on February 15th. There appear to be some fillies which are not sexually mature at this age. We will find an occasional filly which has a rather juvenile reproductive tract at this time and these individuals usually fail to conceive during their first breeding season. They may cycle regularly and
do everything right, but the ova are apparently not being released properly or the reproductive tract is not receiving the fertilized egg and conception is not being maintained. Assuming this type of mare is anatomically normal, the best procedure to exercise is that of patience.

The racing mare who goes into a brood mare band for the first time poses a new set of problems. Not too dissimilar is the pleasure horse which has been strenuously and consistently shown and fitted. The behavior of such a mare upon entering a brood mare band is often erratic. If this type of mare can be sent to the breeding farm several months before the breeding season starts, there seems to be less problem with adjustment. The type of medication or administrations a mare may have received during training or racing is usually unknown; however, I know of very few medications which enhance future breeding potential and I know of a considerable number which are detrimental to future breeding potential. Again, the most useful treatment during the "let-down" appears to be patience!

To prepare the maiden mare for breeding should involve a physical examination of the external genitalia. If the mare is new to you, you should ascertain whether or not she has been sutured and if she is sutured we believe she should be opened far enough to insert a speculum for a vaginal examination. The presence of a hymen can be determined and eliminated as a potential problem in breeding or foaling. The cervix should then be examined to see if it is patent and normal. Discharges and inflammations of the vagina and cervix can be determined and treated if necessary. If the mare is a true maiden, there appears to be little indication for culturing unless there is an obvious discharge or inflammation. Palpation of the reproductive tract will reveal abnormalities; however, a word of caution is in order. The finding of small inactive ovaries, a flaccid uterus and a cervix not well-defined should be of concern--however it is surprising how the reproductive tract can enlarge and change in a short time in an immature but growing mare.

The teasing program is just as important in preparing the maiden mare for breeding as with older mares, but may be very different. Many maiden mares are very timid or conversely very vicious in response to the teaser. On the other hand, many are just plain ignorant and unaware of what is going on. If after a month a maiden has not shown estrus, periodic palpation and speculum examination may be indicated.

Very limited experience indicates that prostaglandins may be somewhat less predictable in maiden mares than older mares in regulating cyclic activity. Other hormones are even less predictive.

In summary, I would like to emphasize that the difficulties in breeding often involve problems associated with foaling in the case of the aged mare and that these problems may not be apparent at the time of foaling, but will be manifested at a later time. In regard to the young mare, variability between breeds and between individuals and in the method in which they are handled prior to breeding greatly influences the results obtained at breeding. The preparation of a mare for breeding therefore relies more upon common sense and good management than on miracle drugs and heroic treatments. Much has been learned about the mare in recent years and there is much than can be done to aid the problem mare. Perhaps a better understanding is the best preparation we can make.
RULES RELATIVE TO REGISTERING FOALS PRODUCED FROM A.I.

Artificial insemination in horses is slowly gaining more acceptance among the various breeds. Attached is a list of current policies adopted by breed registries toward the registration of foals produced by artificial insemination. These statements are only basic policies, and if you are in a situation of advising a client on managing a breeding program, it would be wise to make inquiries to the registries as to specific definition of statements such as "on the same premises" or "immediately after collection." With such information, a breeding program may be utilized that prevents minimal contact of valuable stallions with a continuous turnover of outside mares.
<table>
<thead>
<tr>
<th>BREED</th>
<th>ORGANIZATION</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Albino</td>
<td>American Albino Assoc.</td>
<td>A.I. is discouraged,</td>
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<tr>
<td></td>
<td>Crabtree</td>
<td>but still accepted.</td>
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<tr>
<td></td>
<td>Oregon 97335</td>
<td>The association must be contacted for specific</td>
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<td></td>
<td></td>
<td>rules.</td>
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<tr>
<td>American Indian Horse</td>
<td>American Indian Horse Registry</td>
<td>Will accept for registration as long as the</td>
</tr>
<tr>
<td></td>
<td>Apache Junction</td>
<td>foal meets the requirements of the registry.</td>
</tr>
<tr>
<td>American Saddle Horse</td>
<td>American Saddle Horse Breeders' Association, Inc.</td>
<td>Insemination must take place on the premises</td>
</tr>
<tr>
<td></td>
<td>Lexington, Kentucky 40203</td>
<td>where the stallion is standing, and in the</td>
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<td></td>
<td></td>
<td>presence of a party authorized to sign</td>
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<td>certificates of breeding for the stallion used.</td>
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<tr>
<td>Appaloosa</td>
<td>Appaloosa Horse Club</td>
<td>Foals are eligible only if A.I. is accompanied</td>
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<td></td>
<td>Moscoe</td>
<td>by natural insemination during the same estrous</td>
</tr>
<tr>
<td></td>
<td>Idaho 83543</td>
<td>period and on the farm where the stallion is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>standing; semen may not be shipped or transported.</td>
</tr>
<tr>
<td>Arabian</td>
<td>Arabian Horse Registry</td>
<td>Stallion must be collected and mare inseminated</td>
</tr>
<tr>
<td></td>
<td>Denver</td>
<td>on the same premises. A.I. is open to all owners</td>
</tr>
<tr>
<td></td>
<td>Colorado 80231</td>
<td>with no limit on mares inseminated per stallion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All stallions must be blood typed.</td>
</tr>
<tr>
<td>Bashkir Curly</td>
<td>American Bashkir Curly Registry</td>
<td>No policy has been established by the registry</td>
</tr>
<tr>
<td></td>
<td>Ely</td>
<td>at this time.</td>
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<tr>
<td></td>
<td>Nevada 89301</td>
<td></td>
</tr>
<tr>
<td>Buckskin</td>
<td>American Buckskin Registry</td>
<td>Insemination must be done immediately after</td>
</tr>
<tr>
<td></td>
<td>Anderson</td>
<td>collection at the place or premises of</td>
</tr>
<tr>
<td></td>
<td>California 96007</td>
<td>collection.</td>
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<tr>
<td>BREED</td>
<td>ORGANIZATION</td>
<td>COMMENT</td>
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<tr>
<td>Galiceno</td>
<td>Galiceno Horse Breeders' Association, Inc. Tyler, Texas 75701</td>
<td>No rules have been established by the registry.</td>
</tr>
<tr>
<td>Gotland *</td>
<td>American Gotland Horse Association Elkland, Missouri 65644</td>
<td>No rules regarding use of A.I.</td>
</tr>
<tr>
<td>Hackney</td>
<td>American Hackney Horse Society Peekskill, New York 10566</td>
<td>Allowed if insemination takes place on the premises where the stallion is standing and in the presence of owner or party authorized to sign breeding certificates for such stallion.</td>
</tr>
<tr>
<td>Half-Arabian</td>
<td>Half-Arab and Anglo-Arab Registries Burbank, California 91503</td>
<td>Acceptable if the stallion is licensed by the Arabian Horse Registry.</td>
</tr>
<tr>
<td>Half-Saddlebred</td>
<td>Half-Saddlebred Registry of America Coshocton, Ohio 43812</td>
<td>A.I. must take place on the premises where the stallion is standing or at a registered veterinary college where both mare and stallion have been taken. The presence of the owner of the mare, owner or manager of the stallion, and attending veterinarian is required, and all must sign the breeding certificate.</td>
</tr>
<tr>
<td>Morab</td>
<td>Morab Horse Registry of America Clovis, California 93612</td>
<td>Eligible only if insemination immediately follows semen collection. The registry must be notified in advance of intentions to breed a stallion artificially.</td>
</tr>
<tr>
<td>Morgan *</td>
<td>American Morgan Horse Association Hamilton, New York 13346</td>
<td>Not eligible for registration.</td>
</tr>
<tr>
<td>Paint Horse</td>
<td>American Paint Horse Association Fort Worth, Texas 76118</td>
<td>Insemination must take place immediately (not to exceed 24 hrs) following collection and at the place or premises of collection.</td>
</tr>
<tr>
<td>BREED</td>
<td>ORGANIZATION</td>
<td>COMMENT</td>
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<tr>
<td>Palomino</td>
<td>Palomino Horse Assn. Brundidge</td>
<td>Acceptable only if semen is used at time and place of collection.</td>
</tr>
<tr>
<td></td>
<td>Palomino Horse Breeders of America</td>
<td>Will accept if breeders certificate accompanies application and foal qualifies under PHBA rules and regulations.</td>
</tr>
<tr>
<td>Peruvian Paso</td>
<td>American Association of Owners and Breeders of Peruvian Paso Horses</td>
<td>Foals must be begotten by natural service, but with 2 major exceptions</td>
</tr>
<tr>
<td></td>
<td>California City, CA 93505</td>
<td>1) Stallion has acquired injuries which make natural breeding inadvisable, verified in writing by a veterinarian.</td>
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<tr>
<td></td>
<td></td>
<td>2) The association may grant approval for A.I.  when mare and stallion are at the same location during estrus, and that stallion naturally service the mare at least once during the same heat period.</td>
</tr>
<tr>
<td>Quarter Horse</td>
<td>American Quarter Horse Association</td>
<td>Insemination must be done immediately after collection at the place or premises of collection.</td>
</tr>
<tr>
<td>Spanish-Barb</td>
<td>Spanish-Barb Breeders Association</td>
<td>Not eligible for registration.</td>
</tr>
<tr>
<td></td>
<td>Colorado Springs</td>
<td></td>
</tr>
<tr>
<td>Standardbred *</td>
<td>U.S. Trotting Assn. Columbus, Ohio 43215</td>
<td>Use of semen transported off the premises is not permitted.</td>
</tr>
<tr>
<td>Tarpan</td>
<td>American Tarpan Studbook Association</td>
<td>No policy has been formally established, but attitude indicates that A.I. will not be allowed.</td>
</tr>
<tr>
<td></td>
<td>Lilburn, Georgia 30247</td>
<td></td>
</tr>
<tr>
<td>Tennessee Walking Horse *</td>
<td>Tennessee Walking Horse Breeders and Exhibitors Association</td>
<td>Not eligible for registration.</td>
</tr>
<tr>
<td></td>
<td>Lewisburg, Tennessee 37091</td>
<td></td>
</tr>
<tr>
<td>BREED</td>
<td>ORGANIZATION</td>
<td>COMMENT</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Thoroughbred *</td>
<td>The Jockey Club New York, N.Y.</td>
<td>Eligible only if A.I. is accompanied by natural insemination from the same stallion.</td>
</tr>
<tr>
<td>Connemara</td>
<td>PONIES American Connemara Pony Society Goshen, Connecticut 06756</td>
<td>Allowed only by private treaty between owners of mare and stallion using fresh semen, so long as there are letters on file signed by the owner of the mare and owner of the stallion from which semen was taken; also certificates signed by veterinarian collecting the semen and impregnating the mare.</td>
</tr>
<tr>
<td>POA</td>
<td>Pony of the Americas Club Mason City Iowa 50401</td>
<td>No A.I. by mailing semen is approved. A.I. on farm where stallion is standing is allowed.</td>
</tr>
<tr>
<td>Shetland *</td>
<td>American Shetland Pony Club Fowler, Indiana 47944</td>
<td>Permitted only if veterinarian considers mare incapable of natural service. Owner of mare must also own stallion and A.I. must be done by licensed veterinarian.</td>
</tr>
<tr>
<td>Welsh Pony</td>
<td>Welsh Pony Society of America White Post, Virginia 22663</td>
<td>No rules have been established by the registry.</td>
</tr>
<tr>
<td>DRAFT BREEDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgian</td>
<td>Belgian Draft Horse Corp. of America Wabash, Indiana 46992</td>
<td>Eligible only if stallion and mare were on the same farm when semen was taken and the mare bred.</td>
</tr>
<tr>
<td>BREED</td>
<td>ORGANIZATION</td>
<td>COMMENT</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Percheron *</td>
<td>Percheron Horse Assn of America Belmont, Ohio 43718</td>
<td>Eligible if stallion and mare are on the same farm when semen was taken and the mare bred.</td>
</tr>
<tr>
<td>Suffolks</td>
<td>American Suffolks Horse Association Des Moines, Iowa 50312</td>
<td>Accepted if adequate evidence is furnished.</td>
</tr>
</tbody>
</table>

* Information from these breeds was taken from a 1972 list of policies compiled at the University of Minnesota. These registries did not reply to the present inquiry by the deadline.