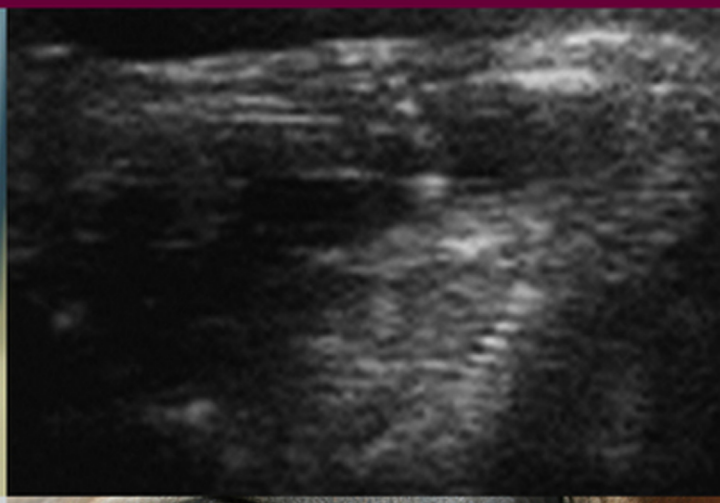
EQUINE REPRODUCTIVE PROCEDURES

Edited by John Dascanio and Patrick McCue

WILEY Blackwell

Equine Reproductive Procedures

Equine Reproductive Procedures

John J. Dascanio, VMD

Diplomate ACT and ABVP (Equine)
Professor
Ross University School of Veterinary Medicine
Department of Clinical Sciences
Basseterre, St Kitts, West Indies

Lincoln Memorial University – College of Veterinary Medicine
Harrogate, TN, USA

Patrick M. McCue, DVM, PhD

Diplomate ACT
Professor
Department of Clinical Sciences
College of Veterinary Medicine and Biomedical Sciences
Colorado State University
Fort Collins, CO, USA

WILEY Blackwell

This edition first published 2014 © 2014 by John Wiley & Sons, Inc.

Editorial offices: 1606 Golden Aspen Drive, Suites 103 and 104, Ames, Iowa 50014-8300, USA
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK
9600 Garsington Road, Oxford, OX4 2DQ, UK

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at www.wiley.com/wiley-blackwell.

Library of Congress Cataloging-in-Publication Data

Dascanio, John J. (John Joseph), 1961–author.
Equine reproductive procedures / John J. Dascanio, Patrick M. McCue.
pages cm
Includes bibliographical references and index.
ISBN 978-0-470-96039-4 (pbk.)
1. Horses – Reproduction. 2. Horses – Breeding. I. McCue, Patrick M., author. II. Title.
[DNLM: 1. Horses – physiology. 2. Reproduction – physiology. 3. Breeding. 4. Reproductive Techniques, Assisted – veterinary. SF 768.2.H67]
SF768.2.H67D37 2014
636.1'082 – dc23

2014005684

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Cover image: All photos provided by editor.
Cover design by Jennifer Miller Designs.

Set in 9/11pt Palatino by Laserwords Private Limited, Chennai, India

1 2014

Contents

Section VI Appendices

List of Contributors

Fausto Bellezzo, DVM
Department of Clinical Sciences
College of Veterinary Medicine and Biomedical Sciences
Colorado State University
Fort Collins, CO, USA

Jillian Bishop, BS
Equine Reproduction Laboratory
Colorado State University
Fort Collins, CO, USA

Etta A. Bradecamp, DVM
Diplomate ACT and ABVP (Equine)
Rood and Riddle Equine Hospital
2150 Georgetown Road
Lexington, KY, USA

Leonardo Brito, DVM, PhD
Diplomate ACT
US Laboratory Manager
ABS Global, Inc.
1525 River Road
DeForest, WI, USA

Julie T. Cecere, DVM, MS
Diplomate ACT
Clinical Assistant Professor
Department of Large Animal Clinical Sciences
Virginia-Maryland Regional College of Veterinary Medicine
Blacksburg, VA, USA

John J. Dascanio, VMD
Diplomate ACT and ABVP (Equine)
Professor
Ross University School of Veterinary Medicine
Department of Clinical Sciences
Basseterre, St Kitts, West Indies

Current Address: Lincoln Memorial University – College of Veterinary Medicine
Harrogate, TN, USA

Ryan A. Ferris, DVM, MS
Diplomate ACT
Assistant Professor
Department of Clinical Sciences
College of Veterinary Medicine and Biomedical Sciences
Colorado State University
Fort Collins, CO, USA

Amanda I. Glazar, PhD
Director, Adult Learning and Outcomes
Global Education Group Ltd
2629 West Main Street
Littleton, CO, USA

Richard D. Holder, DVM
Hagyard Equine Medical Institute
4250 Iron Works Pike
Lexington, KY, USA

G. Reed Holyoak, DVM, PhD
Diplomate ACT
Department Head and Professor
Department of Veterinary Clinical Sciences
Okalahoma State University
Stillwater, OK, USA

Teri L. Lear, PhD
Associate Professor
Department of Veterinary Science
Gluck Equine Research Center
University of Kentucky
Lexington, KY, USA

Charles Love, DVM, PhD
Associate Professor
Large Animal Clinical Sciences
College of Veterinary Medicine
Texas A&M University
College Station, TX, USA

Patrick M. McCue, DVM, PhD
Diplomate ACT
Professor
Department of Clinical Sciences
College of Veterinary Medicine and Biomedical Sciences
Colorado State University
Fort Collins, CO, USA

Charles F. Scoggin, DVM, MS
Diplomate ACT
Resident Veterinarian
Claiborne Farm
Lexington, KY, USA

Sofie Sitters, DVM
Department of Equine Sciences
Faculty of Veterinary Medicine
Utrecht University
Utrecht, the Netherlands

D. N. Rao Veeramachaneni, PhD
Professor
Department of Biomedical Sciences
Colorado State University
Fort Collins, CO, USA

Karen Wolfsdorf, DVM
Diplomate ACT
Hagyard Equine Medical Institute
4250 Iron Works Pike
Lexington, KY, USA

Preface

The goal of this book, *Equine Reproductive Procedures*, is to provide equine professionals with practical clinical information on basic and advanced techniques in the field of equine reproduction. This book should be of assistance to veterinary students, graduate students, researchers, and equine practitioners.

The book contains chapters on reproductive management, diagnostic techniques, and therapeutic procedures on stallions, mares, and newborn foals. In our opinion, approximately 90% of reproductive procedures used in the horse industry are nearly identical throughout the world. However, it is the other 10% that is of major interest and may provide opportunities to expand one's clinical repertoire. Consequently, while the objective of this book is to provide examples of how reproductive procedures may be performed, it should not be construed that these are the only methods to achieve diagnostic or therapeutic goals.

We would like to thank our many mentors and colleagues for providing academic and clinical guidance over the years. We owe our professional careers to their collective wisdom. We would also like to thank our families for their unwavering support.

John J. Dascanio
Patrick M. McCue

Section I

Non-Pregnant Mare

1 Reproductive Evaluation of the Mare

Patrick M. McCue
Department of Clinical Sciences, Colorado State University, USA

Introduction

The goals of a mare reproductive evaluation or breeding soundness examination (BSE) are to identify known or potential reproductive abnormalities and to evaluate the potential of a mare to become pregnant and carry a foal successfully to term. Mare reproductive examinations are performed in open (non-pregnant) mares prior to the onset of the breeding season, in problem mares during the breeding season, in barren mares at the end of the breeding season, as well as in mares with a history of embryonic loss, abortion, or other reproductive problems, or as part of a pre-purchase examination. The goal of this chapter is to provide an overview of the mare breeding soundness evaluation. Details on specific examinations will be covered in other chapters.

Equipment and Supplies

Obstetrical sleeve (non-sterile), obstetrical lubricant (non-sterile), tail wrap, metal bucket and garbage bag liner, non-irritant soap, roll cotton, vaginal speculum, obstetrical lubricant (sterile), obstetrical sleeve (sterile), uterine culture device, culture transport system (optional), uterine cytology device, glass slides, uterine biopsy forceps, formalin.

Examination Technique

Identification

All mares should be properly identified, and the breed, registration name, registration number, and date of birth recorded. Photographs should be taken or accurate drawings of markings and tattoos recorded.

Reproductive History

A complete breeding history should be obtained, including current reproductive status (maiden, barren, pregnant, or foaling), number of cycles bred during the last season, date of last breeding, breeding technique used (artificial insemination, natural cover, or pasture breeding), number of stallions, date of last foal, number of previous foals, and any previous history of abnormal estrous cycles, uterine infections, embryonic loss, or abortion.

Physical Examination

A general physical examination should be performed to assess whether the mare has the capacity to carry

Equine Reproductive Procedures, First Edition. Edited by John Dascanio and Patrick McCue.

a foal to term. The evaluation should include, but is not limited to, examination of the oral cavity, eyes, and the respiratory, cardiac, and musculoskeletal systems. In addition, diet and body condition should be evaluated.

Perineal Conformation

The external genitalia (vulva) should be evaluated for conformation and muscular tone. The optimal perineal conformation consists of a vulva in a nearly vertical position with at least 70% of the vulva ventral to the brim of the pelvis. The muscular tone of the vulva should be sufficient to prevent or minimize aspiration of air into the vestibule or vagina. Horizontal sloping of the vulva secondary to recession of the anus or poor muscular tone to the labia of the vulva may predispose the mare to an ascending infection of the uterus.

Estrous Detection

The mare should be exposed to a stallion with good libido to evaluate estrous cycle stage. Adequate time should be taken to allow shy or nervous mares to express behavioral estrus. When teasing a mare with a foal, the foal must be restrained, and the mare may need to be restrained with a twitch before signs of estrus are exhibited.

Palpation Per Rectum

The entire reproductive tract, including the cervix, uterus, and ovaries, should be thoroughly and systematically examined by palpation per rectum. The tone of the uterus and cervix, size and consistency of ovarian follicles, and the presence of a recent ovulation or a corpus hemorrhagicum should be recorded. The presence of abnormal ovarian, parovarian (i.e., fimbrial cysts), or uterine structures should be recorded.

Ultrasonography Per Rectum

Manual palpation should be followed by a systematic ultrasound evaluation of the entire reproductive tract. Ultrasound is used in broodmares to visualize structures in the reproductive tract that cannot be palpated or differentiated on palpation per rectum, and in the early diagnosis of pregnancy, diagnosis of twins, and evaluation of potential ovarian or uterine pathology.

Vaginal Speculum Examination

A vaginal speculum examination is performed to evaluate the anatomy of the vagina and the external os of the cervix. Speculum examination is useful in determination of the stage of the estrous cycle (via cervical morphology and vaginal mucous membrane changes), and detection of urine pooling and the presence of cervical/vaginal inflammation or discharge.

Digital Examination of the Cervix

After the speculum examination is completed, the cervix should be examined manually for patency and the presence of abnormalities, such as adhesions, lacerations, or other cervical defects.

Uterine Culture

Culture of the uterine lumen is usually performed in conjunction with cytology for the diagnosis of endometritis. Endometritis can be suspected in mares that exhibit an abnormally short estrous cycle, vaginal or cervical discharge, inflamed cervix on speculum examination, and free fluid in the uterus during diestrus detected on ultrasound.

Endometrial Cytology

Cytologic evaluation of the uterus involves the collection and interpretation of cells lining the uterus (endometrium) and within the uterine lumen. Cytology is used in conjunction with culture and biopsy in the diagnosis of endometritis. Advantages of endometrial cytology for the diagnosis of endometritis include the ease of sample collection, low cost, and rapid availability of results.

Endometrial Biopsy

Endometrial biopsy involves collection of a small sample of the uterine lining (endometrium) for histologic

Table 1.1 Diagnostic tests that may be performed in addition to the standard tests in a mare breeding soundness evaluation.

Test	Indication
Chromosome analysis (karyotype)	Evaluate numeric or structural changes in chromosomes
Hormone analysis	Evaluate pituitary and/or ovarian endocrine function. Most commonly used to evaluate corpus luteum function and in the detection of an ovarian granulosa cell tumor
Hysteroscopy	Direct visualization of the interior of the uterus to detect intrauterine adhesions and other localized lesions, as well as inflammation and fibrosis
Laparoscopy	Direct visualization of the serosal surface of the ovary, oviduct, uterus, and abdominal cavity. Also used in ovarian biopsy, evaluation of oviductal patency, and the application of prostaglandin E_2 (PGE_2) to the oviductal surface
Low volume lavage	Collection of uterine samples for culture, cytology, and other evaluations (i.e., polymerase chain reaction). The effluent fluid may also be evaluated for clarity and pH
Oviductal flush	Performed by laparotomy or laparoscopy; used both diagnostically and therapeutically in suspected cases of oviductal blockage
Oviductal patency test	Deposition of fluorescent microbeads or starch granules onto the surface of the ovary or possibly within the infundibulum of the oviduct and subsequent examination of the uterine lumen for passage of the test material is used diagnostically to evaluate oviductal patency
Oviductal PGE_2 application	Direct application of PGE_2 can be used diagnostically and therapeutically in suspected cases of oviductal blockage
Ovarian biopsy	Laparoscopic collection of ovarian tissue for histologic evaluation may be used in the diagnosis of ovarian pathology
Test breed	Breeding to a highly fertile stallion can be used diagnostically to help determine if the mare is a cause of subfertility or infertility

evaluation. It is primarily used as an aid in the diagnosis of uterine disease and as a prognostic indicator of the ability of a mare to carry a foal to term. An endometrial biopsy can also be used as the sample source for culture and cytologic evaluation.

Other Tests

The standard examination procedures in the mare BSE may not identify the cause of subfertility. Consequently, other examinations may be indicated (Table 1.1).

Additional Comments

Interpretation of the results of a mare BSE should take into account the mare's age, reproductive history, breed, stallion, breeding management, and other factors. Ultimately the goals are to determine the potential for fertility and detect abnormalities that may be associated with reduced fertility. Management and therapeutic options may be outlined to help optimize a successful outcome. It is important to emphasize that a mare BSE is only an evaluation of potential fertility and that the true assessment of fertility is the ability of the mare to conceive and carry a foal to term.

Further Reading

LeBlanc MM, Lopate C, Knottenbelt D, Pascoe R. 2003. *The Mare. Equine Stud Farm Medicine and Surgery*. London: Elsevier, pp. 113–213.

McCue PM. 2008. The problem mare: management philosophy, diagnostic procedures, and therapeutic options. *J Eq Vet Sci* 28: 619–26.

2 Teasing

Patrick M. McCue
Department of Clinical Sciences, Colorado State University, USA

Introduction

The 21-day equine estrous cycle can be divided into two phases: estrus and diestrus, based on sexual receptivity to a stallion. Estrus is the period during which a mare is sexually receptive to the advances of a stallion. Behavioral estrus is stimulated by increasing levels of estradiol produced by the developing dominant follicle in the absence of progesterone. The average length of estrus has been reported to be 6.5 days, with a range of 4.5–8.9 days. Ovulation typically occurs 24–48 hours before the end of estrus. An increase in progesterone from the developing corpus luteum is responsible for the cessation of behavioral estrus. Behavioral diestrus largely overlaps the physiological luteal phase associated with high levels of progesterone produced by the corpus luteum.

Equipment and Supplies

Stallion, lead shank, helmet.

Technique

- A mare should be teased with a stallion that exhibits good libido in order to successfully evaluate estrous cycle stage.
- Adequate time should be taken to allow shy or nervous mares to express behavioral estrus.
- Knowledge of the mare's previous behavioral patterns may be helpful.
- In addition, observation of the mare's behavior with other horses in a pasture or paddock may indicate when a mare is in estrus.

Individual Teasing

An individual mare should be exposed to a stallion for an interval of time that is long enough for her to show estrous or diestrous types of behavior. It is preferable to have both the mare and stallion restrained for individual teasing; however, if only one handler is present, it is better to have the stallion restrained with the mare loose so that abnormal behaviors in the stallion may be corrected. Mares that remain indifferent may need to be teased longer, teased with a different stallion, or may just show more subtle signs. Mares may be reluctant initially and yet later show frank estrous behavior (i.e., "break down"). Sometimes full behavioral estrus is only expressed within a few hours of ovulation. It is also not unusual for a mare to fail to show signs of estrus while being directly teased to a stallion, and then break down as the stallion leaves. Mares may also display estrus at the mere sound or sight of a stallion. Mares with a foal by their side may be reluctant to display estrous behavior readily as they are concerned for their foal's safety.

Equine Reproductive Procedures, First Edition. Edited by John Dascanio and Patrick McCue.

Group Teasing

A stallion may be used to tease more than one mare concurrently if he is brought to the edge of a pen or turned out adjacent to a group of mares. Mares are allowed to approach the stallion at will in such a teasing program. However, some mares will not approach the stallion and will not express estrus when teased as part of a group. It may be necessary to tease such mares individually.

It is often not very efficient to tease mares as a group, since often the only mares that come to the fence or tease rail are assertive mares in heat or mares that want to attack the stallion. One may not be able to determine the heat status of mares that remain a distance from the stallion. It is generally more effective, but certainly more time consuming, to tease mares individually. Mares that are less dominant mares or further away from the fence or tease rail should still be observed for estrous behavior.

Behavioral Responses

Common behavioral responses of mares in estrus and diestrus are listed in Boxes 2.1 and 2.2 and shown in Figures 2.1 and 2.2.

Figure 2.1 Mare in estrus (i.e., teasing in heat). Note the base-wide stance, raised tail, and urination.

Figure 2.2 Mare in diestrus (i.e., out of heat). Note the ears and aggressive stance.

Box 2.1 Common Behavioral Characteristics of Mares in Estrus

Tail raised and arched or deviated to one side
Rhythmic eversion of the labia and exposure of clitoris ("winking")
Passive urination
Ears relaxed and either held forward or in a neutral position
Rear limbs slightly abducted (i.e., wide-based stance)
Stifles and hocks flexed
Lowering of the pelvis (i.e., "squatting")
Leaning into fence or gate
Vocalization (squealing)
Calm behavior; does not try to bite or strike stallion

Box 2.2 Common Behavioral Characteristics of Mares in Diestrus

Tail held down or aggressively switched from side to side
Ears pinned back
Aggressive toward advances of the stallion
Biting at the stallion
Attempt to move away from the stallion
Squealing or vocalization
Calm behavior; does not try to bite or strike stallion

Table 2.1 Abbreviations for responses of a mare to a stallion (i.e., teasing behavior).

Abbreviation	Levels: Option 1	Levels: Option 2	Behavior
H	+	+++	In heat
O	–	–	Out of heat
H/O	+/–	++	Coming into or going out of heat
I		+	Indifferent

It should be noted that expression of estrus does not always indicate that a mare is in the follicular phase of the estrous cycle. Seasonally anovulatory mares, ovariectomized mares, and pregnant mares have all been reported to occasionally show signs of estrus when teased with a stallion. This may be due to submissive behavior or a lack of progesterone.

Records

Maintaining an accurate record of teasing behavior will be helpful when monitoring the estrous cycle of a mare. Notations can be made as to whether or not the mare exhibits overt, subtle, or no signs of estrus throughout a cycle (Table 2.1).

Silent Estrus

Maiden mares may not show heat well and foaling mares may not show heat at all unless the foal is restrained and/or safely away from the stallion. Subordinate mares may be inhibited from expressing estrus in the presence of a dominant mare. In addition, a mare may have a preference for, or an aversion toward, an individual stallion. Mares with "silent estrus" may have lower concentrations of estradiol 17β than mares expressing normal estrus.

Additional Comments

There are many systems used for teasing mares, including chutes, rails, fences, pens, and paddocks. Keys to successful teasing are patience, persistence, and knowing the behavioral characteristics of each mare. Consequently, it is advantageous for the same individual(s) to tease mares each day, so that slight variations in individual responses can be recognized.

Further Reading

Ginther OJ. 1979. *Reproductive Biology of the Mare: Basic and Applied Aspects*. Ann Arbor, MI: McNaughton and Bunn, pp. 59–68.

McCue PM, Scoggin CF, Lindholm ARG. 2011. Estrus. In: McKinnon AO, Squires EL, Vaala WE, Varner DD (eds). *Equine Reproduction*, 2nd edn. Ames, IA: Wiley Blackwell, pp. 1716–27.

3 Tail Wrap and Preparation/Washing of the Perineum

John J. Dascanio
Lincoln Memorial University – College of Veterinary Medicine, USA

Introduction

The perineum should be washed prior to any internal reproductive procedure in the mare and in preparation for foaling to remove gross debris and to reduce bacterial numbers. In addition, the perineum is washed prior to perineal surgery such as the placement of a Caslick suture (vulvoplasty). The perineum is also washed as part of the minimum contamination breeding technique to reduce contamination of the uterus during natural cover or artificial insemination.

Equipment and Supplies

Tail wrap, tail rope, non-irritant soap, roll cotton, stainless steel bucket, plastic bag/bucket liner, paper towels, examination gloves.

Placement of a Tail Wrap

- A tail wrap should be placed prior to washing of the perineum. This may be a reusable neoprene wrap, Velcro wrap, gauze wrap, flexible elastic wrap (Vetrap™), or an obstetric sleeve.
- Gauze is placed on the tail for a wrap using one of two techniques. With both techniques the wrap goes from the base of the tail to a level just below the ventral commissure of the vulva. Technique one is to start at the top of the tail and with every circumferential wrap, flip some tail hairs upward so that they become trapped between successive layers (Figure 3.1). This prevents the tail wrap from slipping down the tail. This tail wrap must be unwound to remove. The second type of gauze wrap starts at about the level of the ventral vulvar commissure (Figure 3.2). A small piece of gauze is left hanging and the wrap placed around the tail, moving upward to the tail base. Hair should not be included between layers, with each layer overlapping the previous slightly. Once at the tail base, the gauze is twisted 360 degrees so that the twisted part is on the dorsal tail, while the ventral aspect of the wrap remains flat and untwisted. This allows the twist to bite into the tail hair on the dorsum, preventing slippage of the wrap, while the flat underneath aspect prevents blood occlusion. The wrap is continued downward and is twisted upon every circumferential wrap ending at the point where the wrap began. The small hanging piece of gauze from the beginning is tied to the remaining wrap to prevent the wrap from coming loose. This wrap may be pulled from the top to slide down the tail and

Equine Reproductive Procedures, First Edition. Edited by John Dascanio and Patrick McCue.

Figure 3.1 Gauze tail wrap with tail hairs flipped up to prevent sliding of the wrap down the tail.

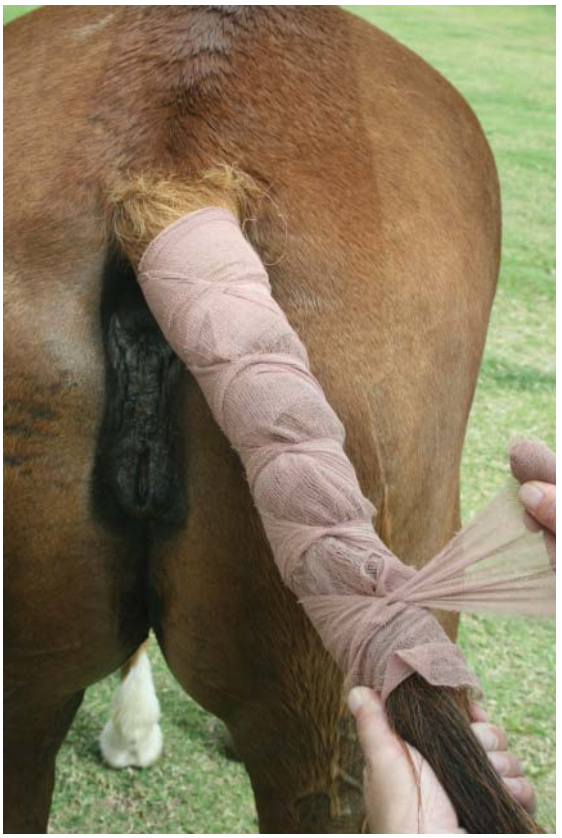


Figure 3.2 Gauze tail wrap twisted 360 degrees on the dorsum of the tail while the ventral aspect is wide.

removed without having to unwind the wrap when the procedure is completed.

- If an obstetrical sleeve is used for a tail wrap, the tail is placed entirely inside the sleeve. The sleeve may be split at the tail base and tied together to close the sleeve around the tail base, or elastic adhesive tape or an elastic band and clamp may be used to wrap around the sleeve at the tail base to secure it. This type of tail wrap is useful for mares with diarrhea to prevent spoilage of the tail hairs.
- If a flexible elastic wrap is used such as Vetrap™, the wrap may either be used to wrap the entire tail or the upper portion (Figure 3.3). The entire tail is wrapped for a dystocia or a fetotomy to prevent tail hairs from interfering with the procedure. To place the entire tail in a wrap, fold the tail hairs so that the hairs do not extend beyond the tail stump. Wrap the elastic wrap around the tail/tail hairs so that no hair is visible along the entire tail length. This in effect creates a "club" with the tail wrapped completely.
- After wrapping, the tail is held to the side so that the perineum can be washed or the tail is tied to the mare (Figure 3.4).
- Alternative tail wrap techniques include use of a sock held in place by 2 inch medical tape (Figure 3.5) or a plastic bag (75 × 25 cm) held in place by 2.5 cm rubber tubing and a clamp (Figure 3.6). The wrapped tail can be held out of the way by using an elastic cord (Figure 3.7) or being tied to the mare as previously described. A neoprene Velcro lower leg wrap may also be used as a reusable tail wrap, but must be disinfected properly between mares.

Washing Perineum Technique

- Feces should be evacuated from the rectum prior to washing the perineum.

Figure 3.3 Elastic tail wrap encompassing the entire tail.

Figure 3.4 Tail wrap tied to the mare with quick release knots.

- The perineum is usually washed using one of two techniques: a bucket technique or a water hose technique.

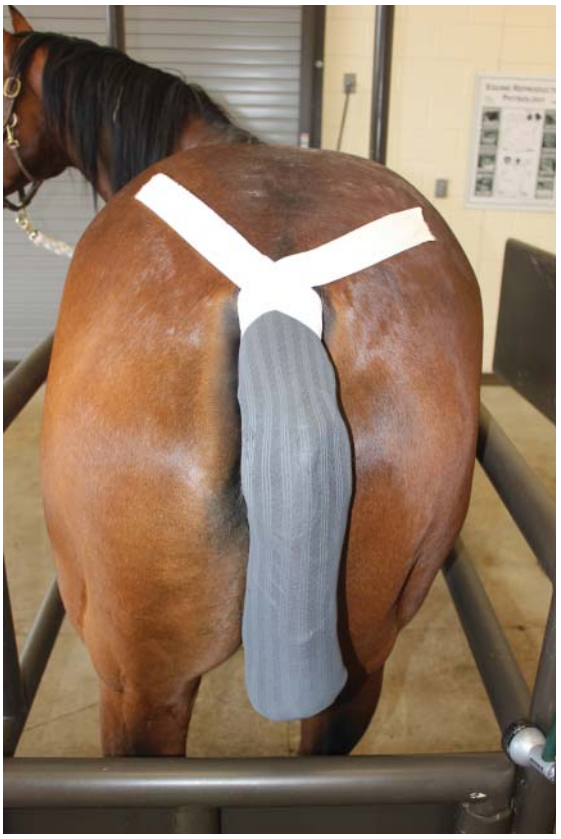


Figure 3.5 Tail wrap using a sock and secured with medical tape.

- The bucket technique requires a clean bucket with a disposable liner. A small clean garbage bag works as a liner (Figure 3.8). The liner can be filled with warm water and the top tied to prevent spillage when carrying or to prevent dirt and dust from blowing into the water in a barn environment (Figure 3.9). When ready to use, simply open the plastic bag over the bucket. This also provides some biosecurity, with a new disposable liner used between horses or farms. The classic "clean hand, dirty hand" technique is used to wash the mare. Handfuls of loose cotton are placed into the bucket of water. The person washing the mare wears disposable examination gloves. The "clean" hand retrieves a piece of cotton and holds it away from the bucket over the "dirty" hand and allows the water to drip over the "dirty" hand. The "dirty" hand is massaged under the water flow to clean it of any dirt or debris. The cotton piece is then dropped from the "clean" hand into the "dirty" hand. The "dirty" hand is then used to

Figure 3.6 Tail wrap using a plastic bag and secured with rubber tubing and a clamp. An extra clamp is shown above the tail.

Figure 3.7 Wrapped tail held out of the way using an elastic cord.

wash the mare's perineum using concentric circles going outward from the vulva. A mild detergent may be used to help remove smegma and organic debris. The perineum is successively washed until the cotton washing the vulva appears clean after performing the wash. Typically three to four wash/rinse cycles are needed for the average mare. It is important to insure that all soap is rinsed from the perineum.

- The water hose technique is less labor intensive and involves fewer materials than the bucket

Figure 3.8 Bucket with liner to provide clean water for washing mares. All materials are disposed of between horses.

Figure 3.9 Bucket with liner closed to prevent dirt from contaminating water or to prevent water spillage when walking quickly with the bucket.