◀ A veterinarian rasping a horse's teeth during dental treatment, using a battery-powered dental float while the horse is fitted with an equine dentistry speculum, with bite plates used to hold the horse's mouth open during treatment

GETTY IMAGES

Oral Health as Horses Age

HORSES AGED 20 AND OLDER NEED ANNUAL DENTAL EVALUATION

By **AMANDA DUCKWORTH**

AS FAR AS expressions go, "Don't look a gift horse in the mouth" is one that has stood the test of time. The phrase, which first began appearing in print as far back as 1546, is meant to remind people they should not be ungrateful when they receive a gift, but it also is based on the dental realities of horses.

Obviously much has changed in equine care since the 1500s, but the fact remains that trained people can reasonably guess a horse's age once they take a look inside its mouth. As horses grow older, their age is reflected in the state, shape, and wear of their teeth.

Good oral health is important when it comes to a horse's overall well-being throughout its life, but it can take center stage as equines become elderly. Adequate nutrition is a key part of keeping aged equines happy and healthy, but if their oral health has been neglected, they are unlikely to be able to reap the benefits of even the best feed plan. Additionally, like many other ailments, oral diseases are easier to resolve if they are caught sooner rather than later.

In its review "The Importance of Maintaining the Health of Your Horse's Mouth," the American Association of Equine Practitioners explains that dental care is required for a number of reasons and is more relevant than ever before. Because horses have been domesticated, their diet and eating patterns have been modified, and performance horses are being put into work at a younger age than in the past. Furthermore, while many factors go into what breeding stock enters the gene pool, it is not all that common that a horse's dental health is considered.

"The age of a horse affects the degree of attention and frequency of dental care required," explained the AAEP. "Senior horses (17 years old or older) are at increased risk for developing periodontal disease. This painful disease must be diagnosed early for a successful treatment. Also, it is important to maintain a correct bite plane during a horse's teens in order to ensure a functional grinding surface beyond 20 years of age. Beyond the age of 20, the tooth surfaces might be worn excessively and/or unevenly, and dental alignment correction might be impossible.

"Horses over 20 years of age should receive a dental evaluation and nutritional counseling at least annually to maintain their conditioning and quality of life. With routine dental care, many horses will maintain a functional dentition into their third and fourth decades of life."

Common dental issues can include sharp enamel points forming on cheek teeth, causing lacerations of cheeks and tongue; hooks forming on the upper and lower cheek teeth; long and/or sharp canine (bridle) teeth interfering with the insertion or removal of the bit; lost and/or broken teeth; abnormal or uneven bite planes; excessively worn teeth; abnormally long teeth; infected teeth and/or gums; misalignment/poor apposition; and periodontal disease.

As horses age, equine odontoclastic tooth resorption and hypercementosis (EOTRH) can also become a concern. It is a progressive condition in older horses that involves multiple teeth, including canines and incisors, and is often quite painful. However, it is also not always easy to recognize and can be hard to treat.

Researchers examined EOTRH in several recent studies, including "Early incisor lesions and Equine Odontoclastic Tooth Resorption and Hypercementosis: Reliability of radiographic findings," published by the *Equine Veterinary Journal* in March 2022.

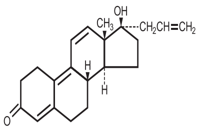
"In clinical practice, EOTRH and other resorptive incisor diseases is difficult to achieve," explained researchers. "The radiographic appearance of subtle pathological changes has not been described in detail and might be confused with age-related changes."

The aim of the study was to define typical radiographic signs of early incisor lesions and to evaluate the reliability of the radiographic findings. This was done using postmortem clinical, radiographic, macroscopic, and uCT examination of 20 cadaveric horse heads.

Altren®
(altrenogest)
SOLUTION 0.22% (2.2 mg/mL)

CAUTION:
Federal law restricts this drug to use by or on the order of a licensed veterinarian.

DESCRIPTION:
Altren® (altrenogest) Solution 0.22% contains the active synthetic progestin, altrenogest. The chemical name is 17α-allyl-17β-hydroxyestra-4,9,11-trien-3-one. The CAS Registry Number is 850-52-2. The chemical structure is:



Each mL of Altren® (altrenogest) Solution 0.22% contains 2.2 mg of altrenogest in an oil solution.

ACTIONS:
Altren® (altrenogest) Solution 0.22% produces a progestational effect in mares.

INDICATIONS:
Altren® (altrenogest) Solution 0.22% is indicated to suppress estrus in mares. Suppression of estrus allows for a predictable occurrence of estrus following drug withdrawal. This facilitates the attainment of regular cyclicity during the transition from winter anestrus to the physiological breeding season. Suppression of estrus will also facilitate management of prolonged estrus conditions. Suppression of estrus may be used to facilitate scheduled breeding during the physiological breeding season.

CONTRAINDICATIONS:
Altren® (altrenogest) Solution 0.22% is contraindicated for use in mares having a previous or current history of uterine inflammation (i.e., acute, subacute, or chronic endometritis). Natural or synthetic gestagen therapy may exacerbate existing low-grade or "smoldering" uterine inflammation into a fulminating uterine infection in some instances.

PRECAUTIONS:
Various synthetic progestins, including altrenogest, when administered to rats during the embryogenic stage of pregnancy at doses manyfold greater than the recommended equine dose caused fetal anomalies, specifically masculinization of the female genitalia.

DOSAGE AND DIRECTIONS:
While wearing protective gloves, remove shipping cap and seal; replace with enclosed plastic dispensing cap. Remove cover from bottle dispensing tip and connect luer lock syringe (without needle). Draw out appropriate volume of Altren® solution. (Note: Do not remove syringe while bottle is inverted as spillage may result.) Detach syringe and administer solution orally at the rate of 1 mL per 110 pounds of body weight (0.044 mg/kg) once daily for 15 consecutive days. Administer solution directly on the base of the mare's tongue or on the mare's usual grain ration. Replace cover on bottle dispensing tip to prevent leakage. Excessive use of a syringe may cause the syringe to stick; therefore, replace syringe as necessary.

DOSAGE CHART:

Approximate Weight in Pounds	Dose in mL
770	7
880	8
990	9
1100	10
1210	11
1320	12

WHICH MARES WILL RESPOND TO ALTREN® (altrenogest) SOLUTION 0.22%:
Extensive clinical trials have demonstrated that estrus will be suppressed in approximately 95% of the mares within three days; however, the post-treatment response depended on the level of ovarian activity when treatment was initiated. Estrus in mares exhibiting regular estrus cycles during the breeding season will be suppressed during treatment; these mares return to estrus four to five days following treatment and continue to cycle normally. Mares in winter anestrus with small follicles continued in anestrus and failed to exhibit normal estrus following withdrawal.

Response in mares in the transition phase between winter anestrus and the summer breeding season depended on the degree of follicular activity. Mares with inactive ovaries and small follicles failed to respond with normal cycles post-treatment, whereas a higher proportion of mares with ovarian follicles 20 mm or greater in diameter exhibited normal estrus cycles post-treatment. Altrenogest Solution 0.22% was very effective for suppressing the prolonged estrus behavior frequently observed in mares during the transition period (February, March and April). In addition, a high proportion of these mares responded with regular estrus cycles post-treatment.

SPECIFIC USES FOR ALTREN® (altrenogest) SOLUTION 0.22%:

SUPPRESSION OF ESTRUS TO:
1. Facilitate attainment of regular cycles during the transition period from winter anestrus to the physiological breeding season. To facilitate attainment of regular cycles during the transition phase, mares should be examined to determine the degree of ovarian activity. Estrus in mares with inactive ovaries (no follicles greater than 20 mm in diameter) will be suppressed but these mares may not begin regular cycles following treatment. However, mares with active ovaries (follicles greater than 20 mm in diameter) frequently respond with regular post-treatment estrus cycles.

2. Facilitate management of the mare exhibiting prolonged estrus during the transition period. Estrus will be suppressed in mares exhibiting prolonged behavioral estrus either early or late during the transition period. Again, the post-treatment response depends on the level of ovarian activity. The mares with greater ovarian activity initiate regular cycles and conceive sooner than the inactive mares. Altren® (altrenogest) Solution 0.22% may be administered early in the transition period to suppress estrus in mares with inactive ovaries to aid in the management of these mares or to mares later in the transition period with active ovaries to prepare and schedule the mare for breeding.

3. Permit scheduled breeding of mares during the physiological breeding season. To permit scheduled breeding, mares which are regularly cycling or which have active ovarian function should be given Altren® (altrenogest) Solution 0.22% daily for 15 consecutive days beginning 20 days before the date of the planned estrus. Ovulation will occur 5 to 7 days following the onset of estrus as expected for non-treated mares. Breeding should follow usual procedures for mares in estrus. Mares may be regulated and scheduled either individually or in groups.

ADDITIONAL INFORMATION:
A 3-year well controlled reproductive safety study was conducted in 27 pregnant mares, and compared with 24 untreated control mares. Treated mares received 2 mL altrenogest solution 0.22%/110 lb body weight (2x dosage recommended for estrus suppression) from day 20 to day 325 of gestation. This study provided the following data:

1. In filly offspring (all ages) of treated mares, clitoral size was increased.

2. Filly offspring from treated mares had shorter interval from Feb. 1 to first ovulation than fillies from their untreated mare counterparts.

3. There were no significant differences in reproductive performance between treated and untreated animals (mares & their respective offspring) measuring the following parameters:

   - interval from Feb. 1 to first ovulation, in mares only.
   - mean interovulatory interval from first to second cycle and second to third cycle, mares only.
   - follicle size, mares only.
   - at 50 days gestation, pregnancy rate in treated mares was 81.8% (9/11) and untreated mares was 100% (4/4).
   - after 3 cycles, 11/12 treated mares were pregnant (91.7%) and 4/4 untreated mares were pregnant (100%).
   - colt offspring of treated and control mares reached puberty at approximately the same age (82 & 84 weeks respectively).
   - stallion offspring from treated and control mares showed no differences in seminal volume, spermatozoal concentration, spermatozoal motility, and total sperm per ejaculate.
   - stallion offspring from treated and control mares showed no difference in sexual behavior.
   - testicular characteristics (scrotal width, testis weight, parenchymal weight, epididymal weight and height, testicular height, width & length) were the same between stallion offspring of treated and control mares.

REFERENCES:

Shoemaker, C.F., E.L. Squires, and R.K. Shideler, 1989.

Safety of Altrenogest in Pregnant Mares and on Health and Development of Offspring. Eq. Vet. Sci. (9); No. 2: 69–72.

Squires, E.L., R.K. Shideler, and A.O. McKinnon. 1989.

Reproductive Performance of Offspring from Mares Administered Altrenogest During Gestation. Eq. Vet. Sci. (9); No. 2: 73–76.

WARNING:
For oral use in horses only. Keep this and all other medications out of the reach of children. Do not use in horses intended for human consumption.

HUMAN WARNINGS:
Skin contact must be avoided as Altren® (altrenogest) Solution 0.22% is readily absorbed through unbroken skin. Protective gloves must be worn by all persons handling this product. <u>Pregnant women or women who suspect they are pregnant should not handle Altren® (altrenogest) Solution 0.22%.</u> Women of child bearing age should exercise extreme caution when handling this product. Accidental absorption could lead to a disruption of the menstrual cycle or prolongation of pregnancy. Direct contact with the skin should therefore be avoided. Accidental spillage on the skin should be washed off immediately with soap and water.

INFORMATION FOR HANDLERS:
WARNING: Altren® (altrenogest) Solution 0.22% is readily absorbed by the skin. Skin contact must be avoided; protective gloves must be worn when handling this product.

Effects of Overexposure
There has been no human use of this specific product. The information contained in this section is extrapolated from data available on other products of the same pharmacological class that have been used in humans. Effects anticipated are due to the progestational activity of altrenogest.

Acute effects after a single exposure are possible; however, continued daily exposure has the potential for more untoward effects such as disruption of the menstrual cycle, uterine or abdominal cramping, increased or decreased uterine bleeding, prolongation of pregnancy and headaches. The oil base may also cause complications if swallowed.

In addition, the list of people who should not handle this product (see below) is based upon the known effects of progestins used in humans on a chronic basis.

PEOPLE WHO SHOULD NOT HANDLE THIS PRODUCT:
1. Women who are or suspect they are pregnant.
2. Anyone with thrombophlebitis or thromboembolic disorders or with a history of these events.
3. Anyone with cerebral-vascular or coronary-artery disease.
4. Women with known or suspected carcinoma of the breast.
5. People with known or suspected estrogen-dependent neoplasia.
6. Women with undiagnosed vaginal bleeding.
7. People with benign or malignant tumors which developed during the use of oral contraceptives or other estrogen-containing products.
8. Anyone with liver dysfunction or disease.

Accidental Exposure
Altrenogest is readily absorbed from contact with the skin. In addition, this oil based product can penetrate porous gloves. Altrenogest should not penetrate intact rubber or impervious gloves; however, if there is leakage (i.e., pinhole, spillage, etc.), the contaminated area covered by such occlusive materials may have increased absorption. The following measures are recommended in case of accidental exposure.

Skin Exposure: Wash immediately with soap and water.

Eye Exposure: Immediately flush with plenty of water for 15 minutes. Get medical attention.

If Swallowed: Do not induce vomiting. Altren® (altrenogest) Solution 0.22% contains an oil. Call a physician. Vomiting should be supervised by a physician because of possible pulmonary damage via aspiration of the oil base. If possible, bring the container and labeling to the physician.

Store upright at or below 25° C (77° F). Reclose tightly.

HOW SUPPLIED:
Altren® (altrenogest) Solution 0.22% (2.2 mg/mL). Each mL contains 2.2 mg altrenogest in an oil solution. Available in 150 mL and 1000 mL plastic bottles.

Manufactured by:
Aurora Pharmaceutical, Inc.
Northfield, Minnesota 55057

Approved by FDA under ANADA # 200-620

07/2021

EQUISUL-SDT®
(Sulfadiazine/Trimethoprim) Oral Suspension

For use in horses only.

Approved by FDA under NADA # 141-360

CAUTION
Federal law (USA) restricts this drug to use by or on the order of a licensed veterinarian.

DESCRIPTION
EQUISUL-SDT is a broad-spectrum antimicrobial from the potentiated sulfonamide class of chemotherapeutic agents. These two drugs block different sequential steps in the biosynthesis of nucleic acids. Sulfadiazine inhibits bacterial synthesis of dihydrofolic acid by competing with para-aminobenzoic acid. Trimethoprim blocks the production of tetrahydrofolic acid from dihydrofolic acid by reversibly inhibiting dihydrofolate reductase. The effect of the dual action is to reduce the minimum inhibitory concentration of each agent (synergism) and to convert a bacteriostatic action to a bactericidal action. Sulfadiazine is the non-proprietary name for 4-amino-N-2-pyrimidinylbenzenesulfonamide. Trimethoprim is the non-proprietary name for 5-[(3,4,5-trimethoxyphenyl) methyl]-2,4-pyrimidinediamine.

Figure 1. Structure of sulfadiazine

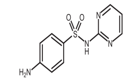
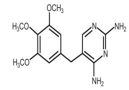


Figure 2. Structure of trimethoprim



Each mL of EQUISUL-SDT contains 400 mg combined active ingredients (333 mg sulfadiazine and 67 mg trimethoprim) in an aqueous suspension.

INDICATION
EQUISUL-SDT is indicated for the treatment of lower respiratory tract infections in horses caused by susceptible strains of *Streptococcus equi* subsp. *zooepidemicus.*

DOSAGE AND ADMINISTRATION

Shake well before use.

Administer EQUISUL-SDT orally at the dosage of 24 mg combined active ingredients per kilogram body weight (10.9 mg/lb) twice daily for 10 days. EQUISUL-SDT can be administered by volume at 2.7 mL per 45.4 kg (2.7 mL/100 lb) body weight.

EQUISUL-SDT in containers of 280 mL and 560 mL with draw-off caps: Remove cap. Peel off white foil backed bottle seal and replace cap. Peel off outer cap seal exposing (hole) opening. Push an oral tip syringe into the cap opening. Invert and draw out appropriate volume of EQUISUL-SDT solution. (Note: Do not remove syringe while the bottle is inverted as possible spillage may result.) Detach syringe and administer orally at the dosage of 24 mg combined active ingredients per kilogram body weight (10.9 mg/lb) twice daily for 10 days. EQUISUL-SDT can be administered by volume at 2.7 mL per 45.4 kg (2.7 mL/100 lb) body weight.

CONTRAINDICATIONS
EQUISUL-SDT is contraindicated in horses with a known allergy to sulfadiazine, sulfonamide class antimicrobials, or trimethoprim.

WARNING
Do not use in horses intended for human consumption.

HUMAN WARNINGS
Not for use in humans. For use in animals only. Keep this and all drugs out of the reach of children. Consult a physician in the case of accidental human exposure.

Antimicrobial drugs, including sulfonamides, can cause mild to severe allergic reactions in some individuals. Avoid direct contact of the product with the skin, eyes, mouth, and clothing. Persons with a known sensitivity to sulfonamides or trimethoprim should avoid exposure to this product. If an allergic reaction occurs (e.g., skin rash, hives, difficulty breathing, facial swelling) seek medical attention.

PRECAUTIONS
Prescribing antibacterial drugs in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to treated animals and may increase the risk of development of drug-resistant animal pathogens.

The administration of antimicrobials, including sulfadiazine and trimethoprim, to horses under conditions of stress may be associated with acute diarrhea that can be fatal. If acute diarrhea or persistent changes in fecal consistency are observed, additional doses of EQUISUL-SDT should not be administered and appropriate therapy should be initiated.

The safe use of EQUISUL-SDT has not been evaluated in breeding, pregnant, or lactating horses. Potentiated sulfonamides should only be used in pregnant or lactating mares when the benefits to the mare justify the risks to the fetus. Use of potentiated sulfonamides during pregnancy has been associated with an increased risk of congenital abnormalities that may be related to folate deficiency. In humans, sulfonamides pass through the placenta, are excreted in milk, and may cause hyperbilirubinemia-induced neurotoxicity in nursing neonates.

Decreased hematopoetic activity and blood dyscrasias have been associated with the use of elevated doses and/or prolonged administration of potentiated sulfonamides. EQUISUL-SDT should be discontinued if prolonged clotting times, or decreased platelet, white blood cell or red blood cell counts are observed.

Sulfonamides should be used with caution in horses with impaired hepatic function. Although rare, sulfonamide use has been associated with fulminant hepatic necrosis in humans.

Neurologic abnormalities have been reported in several species following administration of potentiated sulfonamides. In horses, potentiated sulfonamides have been associated with gait alterations and behavior changes that resolved after discontinuation of the drug.

The safe use of EQUISUL-SDT has not been evaluated in horses less than 1 year of age.

ADVERSE REACTIONS
Adverse reactions reported during a field study of 270 horses of various breeds, ranging from 1 to 25 years of age, which had been treated with either EQUISUL-SDT (n = 182) or with a saline control (n = 88) are summarized in Table 1. At least one episode of loose stool of varying severity was observed in 69 of 182 (38%) of the EQUISUL-SDT-treated horses, and 29 of 88 (33%) saline control horses. Of those animals experiencing loose stool, 2 of 182 (1.1%) of the EQUISUL-SDT-treated horses and 0 of 88 (0%) placebo-treated horses were removed from the study due to diarrhea (defined as at least one episode of watery stool). Both cases of diarrhea in this study were self-limiting and resolved without treatment within 5–10 days after discontinuation of EQUISUL-SDT.

Table 1. Number of Horses with Adverse Reactions During the Field Study with EQUISUL-SDT

Adverse Reactions	Equisul-SDT (n=182)	Saline control (n=88)
Loose stool (including diarrhea)	69 (38%)	29 (33%)
Colic	3 (1.6%)	2 (2.2%)
Diarrhea	2 (1.1%)	0 (0%)

To report suspected adverse events, for technical assistance or to obtain a copy of the SDS, contact Aurora Pharmaceutical, Inc. at 1-888-215-1256 or www.aurorapharmaceutical.com. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at www.fda.gov/reportanimalae.

CLINICAL PHARMACOLOGY
Following oral administration, EQUISUL-SDT is rapidly absorbed and widely distributed throughout body tissues. Sulfadiazine levels are usually highest in the kidney, while the tissue concentration in other tissues is only slightly lower than plasma concentrations. Concentrations of trimethoprim are usually higher in the lungs, kidney, and liver than in the blood. Sulfadiazine and trimethoprim are both eliminated primarily by renal excretion, both by glomerular filtration and tubular secretion. Urine concentrations of both sulfadiazine and trimethoprim are several-fold higher than blood concentrations.[1] Sulfadiazine and trimethoprim are 20% and 35% bound to plasma protein, respectively. Administration of sulfadiazine and trimethoprim with food has no apparent effect on the absorption of sulfadiazine but the absorption of trimethoprim is decreased.

Based on a study in fed horses, trimethoprim concentrations following repeat oral administration of 24 mg/kg EQUISUL-SDT to 6 horses reached peak concentration in 0.5 to 12.0 hours. The median plasma elimination half-life was 3 hours, with a range of 2.31 to 4.96 hours. Peak sulfadiazine concentrations were reached within 1.0 to 12.0 hours in the same study. The median plasma elimination half-life for sulfadiazine was approximately 7.80 hours, with a range of 6.78 to 10.39 hours. Only minor accumulation of both drugs was observed following repeat oral administration of EQUISUL-SDT and both drugs reached steady state by day 3. Sulfadiazine and trimethoprim key steady state parameters associated with administration in 6 fed horses over a period of 7 days are found in Table 2.

Table 2. Median (Range) of sulfadiazine and trimethoprim pharmacokinetics parameters following repeat dosing of 24 mg/kg bid EQUISUL-SDT for 7 days to six horses in fed condition

Drug	Sulfadiazine	Trimethoprim
Tmax (hr)	4.75 (1.00–12.00)	8.50 (0.50–12.00)
Cmax (µg/mL)	17.63 (10.10–31.15)	0.78 (0.60–1.14)
AUC 0–12 (last dose) (hr*µg/mL)	159.35 (73.90–282.54)	5.47 (3.31–10.91)
T 1/2 (hr)	7.80 (6.78–10.39)	3.00 (2.31–4.96)

MICROBIOLOGY
EQUISUL-SDT is the combination of the sulfonamide sulfadiazine and trimethoprim. These two drugs block sequential steps in nucleic acids biosynthesis. Sulfadiazine inhibits bacterial synthesis of dihydrofolic acid by competing with para-aminobenzoic acid. Trimethoprim blocks the production of tetrahydrofolic acid from dihydrofolic acid by reversibly inhibiting dihydrofolate reductase. The two drugs act synergistically, reducing the minimum inhibitory concentration of each, while enhancing the bacteriostatic action of each separately to a bactericidal action when combined.

EQUISUL-SDT administered as a combined sulfadiazine-trimethoprim dose of 24 mg/kg body weight twice daily for 7 days provided concentrations of sulfadiazine and trimethoprim with T>MIC90 (%T) values of 100% and 98% respectively. The minimum inhibitory concentration (MIC) values for EQUISUL-SDT against indicated pathogens isolated from lower respiratory tract infections in horses enrolled in a 2010–2011 effectiveness field study are presented in Table 3. All MICs were determined in accordance with the Clinical and Laboratory Standards Institute (CLSI) Approved Standard M31-A3 using a broth microdilution system and 3% lysed horse blood.

Table 3. Trimethoprim/sulfadiazine minimum inhibitory concentration (MIC) values[a] of isolates recovered from horses with lower respiratory infection caused by *Streptococcus equi* subsp. *zooepidemicus* treated with EQUISUL-SDT in the U.S. (2010–2011)

Treatment Outcome	Success	Failure
Number of Isolates	65[c]	46
Time of Sample Collection	Pre-Treatment	Pre-Treatment
MIC 50[b] (µg/mL)	0.25/4.75	0.25/4.75
MIC 90[b] (µg/mL)	0.25/4.75	0.25/4.75
MIC Range (µg/mL)	0.12/2.4 to 0.5/9.5	0.12/2.4 to 0.5/9.5

[a] The correlation between *in vitro* susceptibility data and clinical effectiveness is unknown.
[b] The lowest MIC to encompass 50% and 90% of the most susceptible isolates, respectively.
[c] One isolate of *S. equi* subsp. *zooepidemicus* was not tested.

EFFECTIVENESS
A negative control, randomized, masked, field study evaluated the effectiveness of EQUISUL-SDT administered at 24 mg/kg body weight, orally, twice daily for 10 days for the treatment of lower respiratory tract infections in horses caused by *Streptococcus equi* subsp. *zooepidemicus*. In this study, a total of 182 horses were treated with EQUISUL-SDT, and 88 horses were treated with saline. One hundred seventy-three horses (112 EQUISUL-SDT and 61 saline) were included in the statistical analysis. Therapeutic success was characterized by absence of fever and no worsening of clinical signs at Day 5 and Day 10, and significant clinical improvement or resolution of clinical signs of lower respiratory tract infection by Day 17. The observed success rates are 58.9% (66/112) and 14.8% (9/61) for the EQUISUL-SDT and saline-treated groups, respectively.

Table 4 summarizes the statistical analysis results on the overall success rate.

Table 4. Overall Clinical Effectiveness Results

	Equisul-SDT	Saline	P-value*
Least Square Means	61%	13.1%	0.0123

* P-value and estimated success rates are based on back-transformed mean estimates from the statistical analysis.

ANIMAL SAFETY
In a target animal safety study, EQUISUL-SDT was administered orally to 32 healthy adult horses at 0 (0X), 24 (1X), 72 (3X), or 120 (5X) mg/kg twice daily for 30 days. Loose stool was the most common abnormal observation. Observations of loose stool (pellets with liquid or unformed/cowpile stool) occurred more often in horses treated with EQUISUL-SDT with the incidence of loose stool increasing in a dose related manner. All incidents of loose stool were self-limiting and resolved without treatment.

Horses in all EQUISUL-SDT groups demonstrated statistically significantly higher mean serum creatinine concentrations, and those in the 3X and 5X groups demonstrated statistically significantly higher mean serum albumin concentrations. Statistically higher mean neutrophil counts and mean serum gamma glutamyl transferase (GGT) activity were seen in the 1X and 5X groups. Individual animal creatinine, GGT, and albumin concentrations remained within the reference range. Individual animal elevations in absolute neutrophil counts ranged up to 7.09 x 10^3/mcL (reference range: 1.96-5.31 x 10^3/mcL).

Based upon blood concentrations obtained during the study, it was noted that the sulfadiazine and trimethoprim plasma concentrations did not increase in proportion to dose. For sulfadiazine, a 3X and 5X dose resulted in an average exposure of 2.0X and 2.6X the concentrations observed following a 1X dose. For trimethoprim, the corresponding values were 2.5X and 3.5X as compared to the 1X dose. Furthermore, marked intersubject variability, particularly with sulfadiazine, resulted in substantial overlap of individual subject blood levels across the three dosing groups.

STORAGE CONDITIONS
Store upright at 59°– 86° F (15°– 30° C).
Brief periods up to 104° F (40° C) are permitted.
Protect from freezing. EQUISUL-SDT in containers of 280 mL and 560 mL — discard 60 days after removing bottle seal.

HOW SUPPLIED
EQUISUL-SDT is available in the following package sizes:
135 mL
280 mL
560 mL
900 mL

[footnote]

[1] Kahn CM, Line S, eds. The Merck Veterinary Manual. 10th Ed. Merck & Co. 2010.

01/2021

ALTREN®
(altrenogest)

Throughout the mare breeding season, **Altren® (altrenogest)** is quickly becoming the product of choice in handling estrus issues in horses.

Containing the same formulation and active ingredient as Regu-Mate®(altrenogest) and backed by Aurora's *Best-Price-Always* commitment, Altren is becoming the industry's most requested altrenogest product line, enhanced by Altren's proprietary 150 mL dose and FDA-approved vented cap.

Spending more no longer makes sense when it comes to effective estrus management.

Wade Shoemaker, DVM
Countryside Large Animal Veterinary Clinic
Greeley, CO

"Altren® (altrenogest) is a product our practice relies on to provide the same active ingredient as Regu-Mate® (altrenogest), but at a much better price point.

My clients appreciate the cost savings I can pass on to them. Altren has quickly become the #1 altrenogest in our practice due to the cost savings and specialized packaging.

We routinely send the Altren 150 mL home with clients, especially if we have a problem mare that needs to be on altrenogest after breeding.

That will allow us to get out to the ranch at 15 days for the first preg-check and then decide if the mare stays on the Altren or not.

It's been a great deal for us and for the client."

TOOLS OF THE TRADE

Andy Roberts, DVM
Lexington, KY

"EQUISUL-SDT® is my first course broad spectrum antibiotic. Because the combination of Sulfadiazine/ Trimethoprim is so broad spectrum, I can treat problematic respiratory bacteria before they become a major problem.

EQUISUL-SDT is mainly used for respiratory issues, i.e., a febrile horse, elevated SAA, no cough and making a presumptive diagnosis that they have an early respiratory issue. I want a horse on this product a minimum of 10 days.

With the convenient 560 mL bottles, I can script it out to a trainer/owner for 10 days."

EQUISUL-SDT®
(Sulfadiazine/Trimethoprim)

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"The prevalence and severity of incisor lesions increased with age," concluded researchers. "Early, subtle lesions develop on the palatal/lingual side of incisors. While radiographically detected lesions were confirmed macroscopically and on the uCT scans, numerous teeth that were radiographically classified as healthy displayed lesions by macroscopic inspection (13.7%) and uCT analysis (58.1%).

"The detection of early and subtle incisor lesions indicating first signs of EOTRH on dorsoventral intraoral radiographs is limited due to the typical localization of the lesions on the palatal/lingual side of the incisors."

In July 2022, several of the same researchers published "Equine Incisor Lesions: Histologic Confirmation of Radiographic, Macroscopic, and Micro-Computed Tomographic Findings" in *Veterinary Sciences*.

"EOTRH and other incisor lesions are often diagnosed only in advanced stages," they explained. "The health of equine cheek teeth is of highest importance with regard to normal food comminution and nutrition. Therefore, it is not surprising that numerous studies in the field of equine dentistry are focused on the diagnosis and therapy of equine cheek teeth diseases and wear abnormalities. However, recognition of pathological changes in the equine incisor arcades is widely limited to traumatic injuries, developmental abnormalities (including brachygnathia), and EOTRH.

"EOTRH is a progressive and often painful disease which causes several destructive processes in the teeth and their periodontal surrounding. Hitherto, palliative therapies, such as tooth brushing and oral irrigation, dietary modifications, floating and incisor reduction, anti-inflammatory and/or antibiotic drugs, corticosteroids, surgical curettage, and debridement, show limited to no success in stopping the disease progression."

For the study, the incisors of 20 horses of various breeds and sexes were examined radiographically, macroscopically, and via micro-computed tomography to categorize EOTRH-affected teeth. A total of five categories, ranging from healthy to severely affected, were assigned, and teeth from each category were examined histologically to evaluate the opportunity of earlier radiographic diagnosis. All horses were arranged into three age groups according to their ID documentation: 9–14 years, 15–19 years, and 20 years and older.

Good oral health is important to a horse's overall health; here a veterinarian conducting an annual check-up lifts the lips of the horse to examine the health and condition of the teeth before deciding whether any dental treatment is needed

"THE AGE OF A HORSE AFFECTS THE DEGREE OF ATTENTION AND FREQUENCY OF DENTAL CARE REQUIRED."

—AMERICAN ASSOCIATION OF EQUINE PRACTITIONERS

"Histologically, odontoclastic resorptive lesions, leukocytic infiltrations, and areas of irregular cementum and granulation tissue were observed," researchers concluded. "The extent and severity of histological findings were correlated to the uCT data. Micro-CT imaging was suitable to detect subtle irregularities in the dental substances that were referred to as resorptive lesions. Although histological examinations confirmed the presence of resorptive lesions, not all of them were classified as pathological conditions. Instead, repaired surface lesions were documented that were regarded as a physiological condition.

"Nevertheless, incisors which were radiographically regarded as healthy can also feature histological signs of EOTRH. Therefore, due to the possibility of misinterpreting radiographic findings combined with superimpositions on intraoral radiographs, the detection of early resorptive lesions remains challenging."

While the importance of healthy teeth is an easily understood objective, knowing why teeth begin to fail is not always easy to analyze. In May 2021, *Frontiers in Veterinary Science* published

THIS PAGE: GETTY IMAGES; OPPOSITE PAGE: MATHEA KELLEY

"Equine 'Idiopathic' and Infundibular Caries-Related Cheek Teeth Fractures: A Long-Term Study of 486 Fractured Teeth in 300 Horses."

"Limited objective information is available on the prevalence of non-traumatic equine cheek teeth fractures, the signalment of affected horses, and the clinical features and treatment of these fractures," explained researchers. "This study aims to document patterns of idiopathic and infundibular caries-related cheek teeth fractures in a referral population and evaluate associations between fracture patterns and horse age, Triadan position of affected teeth, clinical signs, and deemed necessity for treatment."

For the study, researchers examined the Edinburgh University Veterinary School's clinical records from 2010-18

Tucker and Levi Burleson look on as their mother, Modesty Burleson (VMD), examines the gums and teeth of a new foal

for the presence of non-traumatic equine cheek teeth fractures. Variations in the frequencies of different fracture patterns were compared among horse ages, Triadan tooth positions, clinical signs, and deemed necessity for treatment. In total, records of 300 horses with 486 non-traumatic cheek teeth fractures including 77% maxillary and 23% mandibular teeth with a mean of 1.6 (range 1-10) fractured teeth/horse were available.

"The median age of affected horses ranged from 11 years with maxillary 'slab' fractures to 15 years with infundibular caries-related fractures," researchers found. "Triadan 08-10s were the most commonly (86%) fractured maxillary teeth. The Triadan 08 and 09 positions were the most commonly (64%) fractured mandibular teeth. No clinical signs were noted in horses with 48% of the fractured teeth; oral pain/quidding was recorded with 26%, clinical apical infection with 23%, and bitting/head shaking problems with 6%. Treatments included extraction of 40% fractured teeth, extraction of small/loose fragments (10%), and odontoplasty. Stable remnants of 60% of fractured teeth were left in horses without clinical signs."

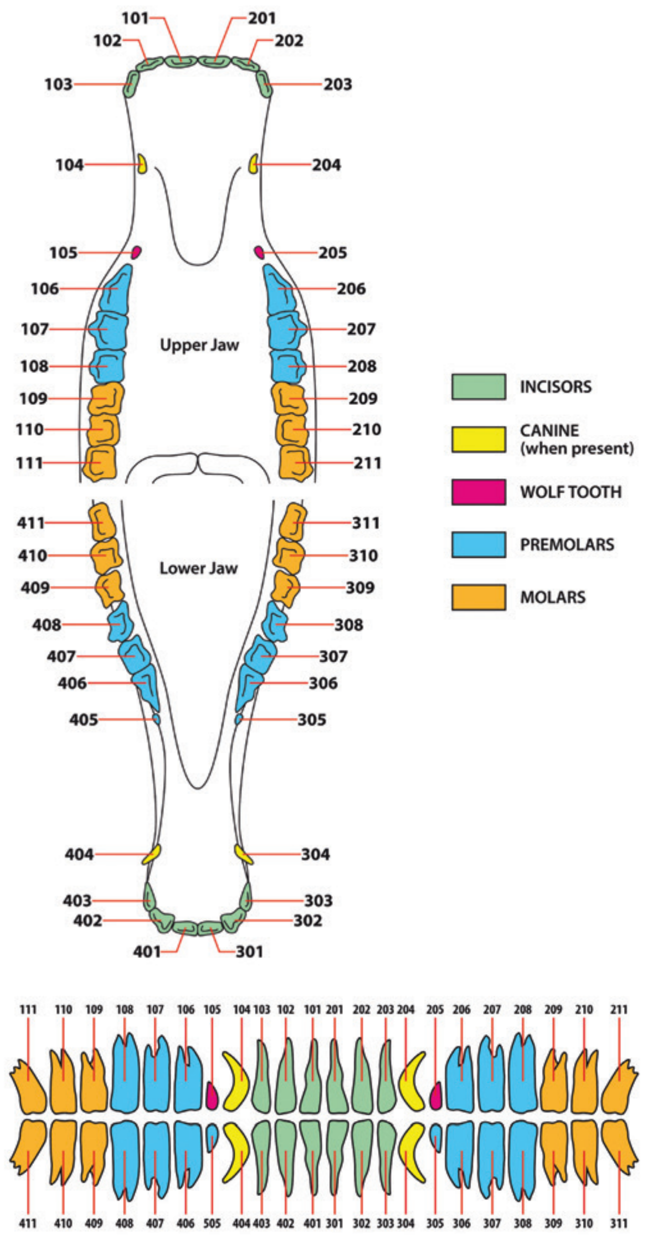
One of the main limitations of this retrospective case review was that long-term follow-up information was not available for all cases. However, that only motivated researchers to examine the topic more.

"Non-traumatic cheek teeth fractures are increasingly recognized in horses, with almost half of the fractures in this study in horses with no clinical signs," researchers concluded. "Fractured teeth with apical infection (which includes most teeth with infundibular caries-related fractures) and those with multiple fractures or advanced caries require extraction. Most other teeth do not necessarily need immediate extraction, and most can remain in situ for many years without causing clinical signs, despite the presence of subclinical endodontic and apical changes in some. Further studies of these disorders with repeat imaging and obtaining long-term follow-up information of all cases would be of value."

A greater understanding of how a horse's mouth changes as it ages can help inform both veterinarians and caregivers. In February 2022, *Frontiers in Veterinary Science* published "Studies on Age-Related Changes in Equine Cheek Teeth Angulation and Dental Drift." It was a retrospective review of computed tomographic images of equine heads.

"Cheek teeth diastemata with resultant periodontal disease is a very common equine dental disorder," explained researchers. "A UK general practice study showing a prevalence of 50% in the general equine population. This disorder was also regarded as the most common, painful equine dental disorder in equine referral clinic studies. The etiopathogenesis of this disorder is incompletely understood, but the presence of effective dental drift (in both directions) should bring and dynamically

The permanent dentition of horses



maintain the occlusal aspects of cheek teeth in tight occlusal contact and, thus, prevent or treat this disorder.

"Interproximal dental wear due to individual movement of adjacent teeth and tapering of the cheek teeth crowns should cause equine cheek teeth rows to become shorter with age, but this feature does not appear to have been documented in horses."

Researchers examined case details and CT images from clinical equine cases that had undergone standing CT head examination. Three sets of measurements were obtained: head size, the length of the cheek teeth rows, and the rostro-caudal

THIS PAGE: GETTY IMAGES; OPPOSITE PAGE: RICK SAMUELS (antero-posterior) position and angulation of the mandibular and maxillary Triadan 06 and 11 teeth.

"From a clinical perspective, this study shows that, in general, horses maintain the occlusal angulations of their cheek teeth well into their adulthood," explained researchers. "This angulation appears to be the prime factor in keeping the cheek teeth occlusal surfaces in close contact and preventing diastemata from developing. Overall, the mesial drift caused by the caudal cheek teeth, especially the 11s, is stronger than the distal drift induced by the 06s, resulting in an overall mesial drift while keeping all occlusal surfaces together.

"In the population of horses used for this study, age-related mesial drift occurred in both Triadan 06 and 11s, and the angulation of these teeth also decreased with age. A study with a larger number of cases with more age variability and/or following horses over their lives would be useful to better understand the development of certain conditions such as diastemata."

Although some horses will make it clear they are suffering from dental issues—by becoming head shy, sloppy eaters, or losing interest in food, for instance—many others are more stoic about the situation and simply adapt to their new reality. This becomes problematic over time, and caregivers might not notice an issue until the loss of overall body condition becomes evident well after the problem has begun.

While having some fun at his stall earlier this year, Breeders' Cup Turf Sprint winner Golden Pal shows off his teeth

While "looking a gift horse in the mouth" is considered rude by society, routine and thorough dental care can help extend the quality and quantity of life as horses work through the aging process. BH

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