Generic Name – Methylprednisolone acetate

Common Brand Name – Depo-Medrol

Drug Type – Steroid hormone

Indications – Anti-Inflammatory, Immunosuppressive

Basic Information:

Corticosteroids are hormones normally produced by the adrenal gland. They are essential for life and affect every level of metabolism and the function of all cells and organ systems. There are two major types of hormones produced by the adrenal gland: mineralocorticoids and glucocorticoids. Mineralocorticoids primarily control salt and water balance in the body. The glucocorticoids, also called corticosteroids, are important in normal protein, carbohydrate, and fat metabolism and for their role in controlling inflammation. There is some crossover in function between these two groups of hormones. The monograph discusses glucocorticoids or corticosteroids.

In the horse, corticosteroids are given systemically to decrease inflammatory and immune responses. They are also injected into joints to decrease local inflammation. Corticosteroids are extremely powerful hormones and have both strong beneficial effects and a definite potential to cause negative side effects. It is important to have a basic understanding of their pharmacology in order to use them successfully and minimize the side effects. Their anti-inflammatory effects are due to multiple actions at the cellular levels. They stabilize cell membranes, alter the movement of different types of white blood cells, and influence chemical responses to inflammation, including reduction of prostaglandin production.

Corticosteroids are used systemically in high doses in emergencies for anaphylactic reactions, spinal cord trauma, or shock. They are used in lower doses to treat allergic reactions, such as heaves, hives, itching, and inflammatory diseases, such as arthritis. Corticosteroids are sometimes used systemically as a "performance-enhancing drug" because they decrease inflammation, possibly enhance glucose metabolism (there is some debate about this), and may have some mood-elevating properties. Obviously, this use is illegal in most competitive situations.

When corticosteroids are used systemically, the basic rule is to use the preparation with the shortest duration of action, at the lowest dose level, and for the shortest period of time possible. Chronic or inappropriate use of corticosteroids can cause life-threatening hormonal and metabolic changes. These drugs may be given orally, topically, or by injection.

Corticosteroids are frequently injected into the joints of horses. Intra-articular corticosteroids dramatically lower the local inflammatory response in that joint. There has been a great deal of research through the years concerning the local effects of corticosteroids on joint health and the

ideal duration of rest/exercise post corticosteroid injection. Despite this research, there are no clear-cut answers, and opinion is still divided on these questions. Corticosteroids should not be injected into any joint without an appropriate clinical work up and diagnostics, including radiographs. Intra-articular corticosteroids have systemic effects because they diffuse from the joint into the general circulation. If the dose injected into the joints is large, systemic adverse reactions are possible.

Corticosteroids are also used topically to treat certain conditions of the skin and eyes. Preparation for topical use may include other active ingredients such as antibiotics, antifungals, or miticides, which kill mites.

There are many different corticosteroids available on the market. Different medical conditions are treated with different corticosteroid drugs, based on the individual drug's pharmacology (potency, speed of onset, duration of action). A major goal in developing new corticosteroid drugs is to increase the anti-inflammatory effect and reduce their crossover effect on salt and water balance.

Side Effects, Precautions, and Overdose:

- Systemic side effects to corticosteroids vary depending on the dose and duration of treatment.
- Administration of corticosteroids, either systemically or intra-articularly, can suppress the body's normal production of these hormones.
- Systemic corticosteroids can mask signs of infection, such as an elevated temperature.
- Corticosteroids suppress immune response. Local immune response in injected joints is decreased, increasing the possibility of a bacterial infection in the joint secondary to injection. Horses receiving systemic corticosteroids may be more susceptible to bacterial or viral infections.
- Corticosteroids can cause laminitis in horses and ponies. Some corticosteroids are thought to be more likely to cause laminitis than others are, but any corticosteroid can cause laminitis.
- Increased urination (polyuria), increased water consumption (polydipsia), and muscle wasting can be seen with prolonged corticosteroid use.
- Corticosteroids can cause or worsen gastric ulcers.

Drug Interactions:

- When diuretics such as furosemide are given with corticosteroids, there is an increased risk of electrolyte imbalances due to calcium and potassium losses.
- The immune response to vaccination may be reduced when corticosteroids are given at the same time. The risk of gastrointestinal ulcers may be increased if corticosteroids and other drugs prone to causing ulcers such as NSAIDs are given at the same time.

- Corticosteroids should not be given intravenously with fluids containing calcium.

Special Considerations:

- Cushing's disease (hyperadrenocorticism) is caused by excess corticosteroid. The most common example of naturally occurring Cushing's disease in the horse occurs with pituitary pars intermedia dysfunction. Addison's disease (hypoadrenocorticism) is caused by insufficient mineralocorticoid and sometimes glucocorticoid. Both of these diseases are potentially fatal and can accidentally occur due to overuse or abrupt withdrawal after a prolonged treatment with corticosteroids.
- The doses of corticosteroids that are used in emergency medicine and the treatment of autoimmune diseases are considerably higher than the doses used under other circumstances.
- The corticosteroid Depo-Medrol (Methylprednisolone acetate) is FDA approved in the horse and is a prescription drug. U.S. federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian within the context of a valid veterinarian-client-patient relationship.

Special Populations:

Breeding Animals
Corticosteroids should be avoided during pregnancy and lactation unless the benefits outweigh the risks. Excessive levels may cause birth defects. Corticosteroids can induce labor in cattle. Although it is not well documented, the drugs may present a similar risk in late pregnancy mares. Some corticosteroids have been shown to have a negative effect on semen characteristics in other species.

Foals
Corticosteroids should be avoided in young foals because the drugs suppress the immune system. Corticosteroids are sometimes used under special circumstances when the benefits outweigh the risks. If they are used in foals, many veterinarians prescribe anti-ulcer medication at the same time.

Ponies
Pony breeds may be more susceptible to developing laminitis than horses. If corticosteroids are used in ponies, the drugs should be used with special attention to dose and duration.

Geriatrics
Corticosteroids may be used in older horses without other underlying health problems. The drugs should not be used in horses with pituitary pars intermedia dysfunction. These horses may already have high levels of natural corticosteroids and are prone to laminitis and suppressed immune function.

Competition Horses

Corticosteroids are commonly used in competition horses both systemically and intra-articularly. They are forbidden in any drug-free competition. They are a prohibited class A medication under the new FEI rules. Most corticosteroids are forbidden for horses showing under USEF's therapeutic substance rules. The exception is dexamethasone; and explanation of dexamethasone use may be found in the group's drug rules.

Different corticosteroids have different withdrawal times, ranging from 24 hours to as long as *44 days for methylprednisolone*. Intra-articular corticosteroids can cause a positive drug test. It is important to consult with the individual regulatory group.

Dose and Route of Administration:

The dose of all corticosteroids should be adjusted as needed for the individual to control clinical signs with the minimal dose for as short a time as is possible. Tapering doses are frequently used at the end of a course of corticosteroids.

Oral:

Betamethasone: 0.01 to 0.05 mg/lb.

Dexamethasone: 10mg/ day for an adult horse. Maintenance dose for management of COPD will probably be much less.

Flumethasone: 0.001 to 0.004 mg/lb./day

Prednisone: 0.01 to 2.0 mg/lb., twice a day

Triamcinolone: 0.005 to 0.01 mg/lb., twice a day

- ***No Oral Methylprednisolone acetate (Depo-Medrol)***

Injectable:

Betamethasone: 0.01 to 0.05 mg/lb./day, IM. May be used intra-articularly.

Dexamethasone: 0.01 to 0.1 mg/lb. or 10 mg/day for an adult horse, IV or IM. The high end of the dose range is for emergency or shock use.

Flumethasone: **No injectable**

Isoflupredone acetate: 5 to 14 mg/day for an adult horse, IM. May be used intra-articularly.

Methylprednisolone acetate: 0.1 to 0.35 mg/lb. for an adult horse, IM. May be used intra-articularly and intralesionally.

Prednisone: 0.01 to 2 mg/lb., IM, twice a day

Triamcinolone: 0.01 to 0.02 mg/lb./day, IM or subcutaneous. May be used intra-articularly and intralesionally.

Dose Form:

Betasone: 7mg/ml injectable**.** (This product is a combination of two forms of Betamethasone to provide both an immediate and a longer lasting effect)

Dexamethasone: 2mg/ml injectable and packets containing 10mg oral powder.

Flumethasone: 0.5mg/ml

Isoflupredone acetate: 2mg/ml
Methylprednisolone acetate: 20mg/ml and 40mg/ml
Prednisone: 10mg/ml and 50mg/ml
Triamcinolone: 2mg/ml or 6mg/ml or 1.5mg tablets

Bibliography

Forney, Barbara D., *Understanding Equine Medications Your Guide to Horse Health Care and Management* (Lexington, KY: Blood-Horse Publications, 2007), pgs. 83-88.

<u>Generic Name</u> – Xylazine hydrochloride

<u>Common Brand Name</u> – Rompun

<u>Drug Type</u> – Sedative/analgesic

<u>Indications</u> – Tranquilization and pain relief

Basic Information:

Xylazine is a short-acting tranquilizer or sedative that also provides significant pain relief, especially for abdominal pain. It also acts indirectly as a muscle relaxant through its effects on the central nervous system. Xylazine has a similar mechanism of action as detomidine although it is less powerful and shorter acting than detomidine.

Xylazine is a commonly used drug for short-term sedation and treatment and management of colic. The level of abdominal pain relief provided by xylazine is superior to that of many narcotics. Colic cases that are too painful to be managed by this drug are more likely to require surgery.

Xylazine is sometimes used in combination with butorphanol and other drugs for chemical restraint for many veterinary procedures or as a preoperative drug.

Xylazine is given by injection in the muscle (IM) or in the vein (IV).

Side Effects, Precautions, and Overdose:

- Xylazine initially slows the heart rate and can change the heart rhythm in some horses (dropped beats)
- Horses drop their heads and appear very sedate. Moderate loss of coordination and sweating are common.
- With any form of sedation, horses can react suddenly and unexpectedly. Always work carefully around a sedated horse no matter how "asleep" it appears. Xylazine in particular has the reputation that horses may kick or react suddenly while sedated with this drug.
- Although xylazine provides some pain relief, it does not completely block pain. Horses can and will respond to painful stimulation.
- It is important to keep accurate records of xylazine and other medications used to treat a horse with colic, particularly if the animal is referred to an equine hospital for intensive care or surgery.
- Xylazine should not be used in horses with abnormal heart rhythms or heart disease. It should be used with "extreme caution" in horses with other major health problems, including shock, severe respiratory disease, and sever liver and kidney problems.
- Xylazine reduces the body's ability to regulate its temperature.

- Xylazine is a very safe drug and is tolerated at up to 10 times the recommended dose. Overdose causes heart arrhythmias, low blood pressure, and respiratory and central nervous system depression.
- Yohimbine is a drug that can be used to reverse some of the effects of xylazine.

Drug Interactions:

- Xylazine has additive effects when combined with other tranquilizers and general anesthetic drugs. Although these combinations are frequently used in veterinary practice, only veterinarians experienced with the use of these drugs should do so.

Special Considerations:

- Xylazine causes a drop in blood pressure but to a lesser degree than acepromazine.
- Xylazine will reliably cause a horse to drop its head when sedated. The level of sedation may vary, depending on the dose. The effect is less predictable if the horse is excited or stimulated before the drug takes full effect.
- When sedating a horse using xylazine, it is important to wait until the drug has taken effect before beginning any procedure. Sedation occurs three to five minutes after IV injection and 10 to 15 minutes after IM injection.
- Xylazine is a FDA approved in the horse, and it is a prescription drug. U.S. federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian within the context of a valid veterinarian-client-patient relationship.

Special Populations:

Breeding Animals
No information was found regarding safety during pregnancy or lactation. Clinical use of xylazine in pregnant mares has not shown detrimental effects to the mare or fetus. It is not known if xylazine is present in milk. Although stallions may relax and drop their penises when treated with xylazine, there are no reports of penile paralysis such as those with acepromazine.

Foals
Because xylazine can cause a low heart rate and slow breathing, it should be used with caution in sick foals and very young foals. Additionally, xylazine can affect an animal's ability to regulate its temperature. When xylazine is used in very young foals, the foal should remain in a temperature-controlled area until it has fully recovered. When xylazine is used in foals, it is generally used at a lower dose.

Ponies
Pony breeds do not appear to differ from horses in their response to xylazine.

Geriatrics
Xylazine should be used with caution in older animals. When xylazine is used in older horses, it is generally used at a lower dose. Reversal with Yohimbine should be considered to minimize side effects.

Draft Horses
Draft horse breeds are particularly sensitive to most sedatives. When xylazine is used in draft horse breeds, it is generally used at a lower dose.

Competition Horses
Xylazine is a prohibited substance in most sanctioned competitions. It is a prohibited class A medication under the new FEI drug rules. It may be detected for up to 72 hours. Detection may be affected by the number of doses and the sensitivity of the test. USEF has provisions in its rules for the therapeutic use of prohibited substances. It is important to check with the individual regulatory group.

Dose and Route of Administration:

Injectable: 0.1to 0.5mg/lb., IV or IM

Dose Form: 100mg/ml, injectable

Bibliography
Forney, Barbara D., *Understanding Equine Medications Your Guide to Horse Health Care and Management* (Lexington, KY: Blood-Horse Publications, 2007), pgs. 229-232.

Acepromazine/PromAce
commonly referred to as “ace,” a tranquilizer

It is most commonly used to calm horses or make them manageable for medical procedures/stressful situations. It is also used as a premedication for general anaesthesia to decrease mortality rate and as a vasodilator for treatment of laminitis. Its effects generally last from 1-4 hours.

It acts by depressing the central nervous system, thereby causing sedation, muscular relaxation, etc. There are risks with the depressant effect, which can also suppress the sympathetic nervous system. Dosage is not always consistent, and it can cause too much of a sedative effect. If given in combination with other tranquilizers, it can cause general anaesthesia. It can cause hypotension and cardiac collapse. In males, particularly stallions, it can cause paralysis of the penis.

A veterinarian should be consulted before use because ace can interact negatively with other drugs, including certain dewormers. It has a very low toxicity on its own, but should not be used if there is a possibility of organophosphate poisoning or in conjunction with fly prevention containing organophosphates.

It comes in a solution for intravenous (effect within 15 minutes), intramuscular (effect within 30-45 minutes), or subcutaneous injection, and can also be obtained as an oral gel (Sedalin gel) and in tablet form. It should be stored at room temperature (68-77 degrees).

Special care should be taken with tranquilized horses. Affected horses should not have access to food as their ability to chew and swallow may be limited. They also may sweat and have an elevated temperature, so depending on the weather may need support staying cool or drying off.

http://onlinelibrary.wiley.com/doi/10.1046/j.1467-2995.2002.00106.x/abstract;jsessionid=4216E14072CE12B783155323D99C3275.f01t04
http://www.bi-vetmedica.com/species/pet/products/promace.html

Dexamethasone/Azium
commonly referred to as “dex,” a glucocorticoid

It is a corticosteroid, acting like the natural hormone cortisol (but 20-30 times more powerfully) to reduce inflammation and suppress immune response.
This means that it is indicated in treatment of allergic responses, particularly acute allergies. It can help with respiratory distress, hives, etc. It can also be used in its anti-inflammatory capacity to treat acute trauma (including to the eyes). It can be used in the long-term for treatment of chronic conditions such as heaves.

It can also be used as a supportive treatment for fatigue, heat exhaustion, influenza, laminitis, and retained placenta.

It is not indicated in treatment of horses that have Cushings except in emergencies. It comes with an increased risk of laminitis, and can lead to weight gain. Overdose can lead to sodium retention, fluid retention, potassium loss, and weight gain. It can also inhibit the horse's own production of steroids upon withdrawal. Because it suppresses the immune system, it can put the horse at increased risk of infection. It can also mask the symptoms of injury/illness, so it is important to have a firm diagnosis before using dex.

A veterinarian should always be consulted before use due to the potency and potential side effects. If the horse exhibits any negative side effects, a vet should be contacted.

It can be obtained in a variety of forms. Pills and powder can be stored dry, at room temperature and are administered orally. Solution, for intramuscular OR intravenous injection, should also be stored at room temperature or below (up to 36 degrees). It is also an ingredient in some anti-inflammatory eye ointments.

Additional attention should be paid to potential infection in horses on dex. Minimizing contact with unfamiliar horses and travel is recommended to reduce the possibility of infection. Also, because it can cause weight gain and laminitis, special attention should be paid to diet.

http://www.drugs.com/vet/azium-solution.html
http://www.fairfieldequine.com/sites/www.fairfieldequine.com/files/dex_rdm.pdf