Equine Inflammation: Comparing Modern and Traditional Treatment

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***Abstract*:** *A double edged sword, inflammation remains a key event in most equine diseases while also maintaining physiological balance. Inflammation has both pros and cons such when the equine experiences an injury, inflammation is part of the immune response—the body's healing mechanism—signaling white blood cells to attack the injured area to prevent further damage. The problem starts when acute inflammation, the temporary type, turns chronic. At this point, there is an excessive buildup of chemicals and cells that began to cause further damage rather than repair an already existing condition. Inflammation is one of the root causes effecting Equine health and keeping Equine from competing at their highest potential and/or competing at all. It is essential to look at inflammation on joints, body soreness, gastro-intestinal function (colic) or recovering from injuries and surgeries. There are many different types of treatment methods available to address the problem of inflammation and bring the body back to homeostasis. The most commonly administered medications for treating Equine are NSAIDs such as: phenylbutazone (Bute), flunixin meglumin (Banamine), ketoprofen (Ketofen), and firocoxib (Equioxx). However, there have been many documented side effects resulting from these drugs including: jugular vein thrombus, gastric ulcers, right dorsal colitis, kidney damage, and clostridia myositis if injected intramuscularly. Herbal medicines, which have been administered for hundreds of years are also a critical choice as they are cheaper than NSAIDs and safer. However, herbal medicines have unique limitations as there are only a few clinical studies to prove their efficacy, furthermore there is limited supply and availability as compared to NSAIDs. Another type of treatment method is the use of an enzyme called Serratiopeptidase, which has been shown to be both effective and safe in treating inflammation. Although its use in treating Equine inflammation has not been thoroughly characterized. Serratiopeptidase could be the most balanced treatment method due to its long history of use as an anti-inflammatory and its inherent biological nature rather than a synthetic drug which would appear foreign to the body and its normal biological processes. The numerous side effects resulting from NSAIDs calls into question current treatment methods by most veterinarians and emphasizes the use of alternative therapeutics.*

1. Introduction

Inflammation in Equine, when it has reached a chronic stage requires rapid, effective and safe treatment. There are numerous therapeutic methods available to treat inflammation in Equine. The choice most often taken by veterinarians is the use of synthetic drugs known as non-steroidal anti-inflammatory drugs (NSAIDs). Although effective these drugs are known to result in many damaging side effects. In this article, we hope to explore and compare NSAIDs alongside alternative therapeutics to address the deleterious effect of inflammation in Equine.

1.1. Inflammation in Equine: Basic Mechanism

Inflammation is a protective measure which has evolved in advanced animals to fight primarily injury and infection [10]. The immune system quickly responds to any foreign and undesirable variation in tissue, leading to recruitment of immune cells and several other inflammatory mediators. In another words, inflammation is a cleansing process, removing invading elements and harmful changes which leads to maintenance of homeostasis[11]. Acute or chronic inflammation is classified based on the intensity of trigger and the pathological condition of tissue. The molecular biology of inflammation is quite complex

and linked with a large numbers of players, including infectious agents, proteins, short peptides, enzyme, and hormones[12]. The inflammation lead to several life-threatening diseases and disorders became a major mark[13,14]. However, the pathogenesis ,i.e., both the cause and effect of inflammatory diseases, is difficult to locate[15].

1.2. Modern/Synthetic Method: NSAIDs (non-steroidal anti-inflammatory drugs)

There is a wide variety of therapeutic agents that are used to treat Equine inflammation. They include analgesics to control visceral pain, agents to regularize intestinal contractions, anti-inflammatory drugs to reduce the adverse effects of endotoxin, and many others. These medicines are categorized as non-steroidal anti-inflammatory drugs, or NSAIDs. These drugs most often inhibit either or both the COX-1 and COX-2 inflammatory pathway. NSAIDs also have additional and potentially adverse effects on the stomach and kidneys[2]. In some cases, the over reliance on NSAIDs have proven deadly. After prolonged and frequent ingestion of NSAIDs, the stomach remains unprotected and at increased susceptibility to ulcers, kidney damage and colic.

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Modern Method: Serrapeptase

Another alternative is the proteolytic enzyme Serratiopeptidase (serrapeptase). Serratiopeptidase holds broad substrate affinity and has been shown to be therapeutically helpful in the regulation of pain and inflammation. The enzyme serrapeptase promotes the reduction in levels of dead tissue in the circulatory system in order to promote smoother healthier flowing blood. Serrapeptase fights against fibrin build up in the cardiovascular system, organs and muscle tissue[1].

Traditional Methods (Herbs)

Herbal medicine can also be used in treating horse inflammation. Historically Equine were used as the main mode of transportation for many centuries, consequently any illness befalling Equine at the time was treated using traditional methods. Even today many people still utilize traditional practitices and medicinal plants to meet the primary health care requirements of Equine, even where more modern Western medical systems are obtainable. However, there remains little scientific studies demonstrating the efficacy and comparison of these traditional methods as compared to modern methods of treatment. In particular, we are unable to replicate the manner where the multitude of different phytochemicals found in plant medicines work together synergistically to cure a disease as we are able to with modern pharmaceutical drugs. Herbal medicines are also often significantly cheaper than pharmaceutical medicines as they are not patented[5,6].

2. Inflammation in Equine

2.1. Inflammation

Inflammation is the common response to many diseases and trauma. Inflammation is closely integrated with the response that constitutes healing and repair of damaged tissue. The process of inflammation acts basically as a "host defense" mechanism. Inflammation is usually caused by invasion of bacteria, virus, fungus, or parasite, or some mechanical trauma leading to damage of a body tissue. Many events that occur in the acute stage of inflammation are aimed at mobilization of host defenses in order to neutralize offending agent such as bacteria or viruses [2].

However, inflammation is not always caused by the invasion of a system by viruses or bacteria but the "irritation" of tissue by virtually anything that has the ability to incite some form of inflammatory reaction, such as an allergic reaction. The suffix "itis" means inflammation and there are several types of inflammation list below:

Table II.1: Type of inflammation

Laminitis	Inflammation within the laminae of the foot
Gastritis	Inflammation within the stomach
Arthritis	Inflammation within the joints
Dermatitis	Inflammation on the skin
Pharyngitis	Inflammation within the back of the throat
Sinusitis	Inflammation within the hollow in the face that lead to the nose
Bronchitis	Inflammation on the lining of the bronchial tubes
Otitis media	Inflammation located in the middle ear

2.2. Three main stages of inflammatory response:

1. Acute: Swelling stage

This is a fundamental type of response by the body to disease and injury. It is characterized by the classic signs of pain, heat, redness and swelling. Inflammation is a key part of the body's defense system, an indispensable protective response by the body's system of self-defense. Numerous causes (mosquito bites, a splinter, a virus infection, a bruise, a broken bone) can trigger an inflammatory response and dispatch cells and chemicals to the site to repair the damage. Acute swelling is short-lived, lasting for only a few days. If it lasts longer, it is referred to as chronic inflammation. Chronic inflammation may last for weeks, months, or longer.

2. Subacute: Repair and Regeneration

In this phase, special cells go into the damage tissue and start building new tissues. The subacute stage is the time of healing and repair. New collagen fibers are laid down in a disorganized manner in the form of a scar and there are weak links between each fiber. This new tissue is fragile and must be handled gently as it can be easily injured.

3. Chronic: Remodeling and Maturation

As the healing process continues, the tissue starts to remodel, strengthen, and improve its cellular organization. Signs of inflammation are absent and scar tissue starts maturing. Maturation refers to the growth of fibroblasts to fibrocytes and remodeling refers to the organization of and shrinking of collagen fibers along lines of stress. There is less new collagen formation, but an increased organization of collagen fibers, and stronger bonds between them.

In order to determine if the condition of the injury is in the acute, subacute or chronic inflammatory stage, an adequate case history is needed along with assessment. The assessment should include a visual scan, active muscle testing, passive range of motion testing, and resisted isometric tests, along with palpation of the structure involved.

2.3. Host Defense

As part of the host defense mechanism white blood cells including neutrophils, lymphocytes, eosinophils, basophils, and monocytes, as well as platelets and tissue cells called mast cells, are critical in the inflammatory response. In response to a stimulus (infection or mechanical damage), the fine blood vessels become “leaky” and the white blood cells migrate out of the blood vessel into the affected tissue. It is generally a “defensive” response and is the start of what needs to happen to “heal” the damaged tissue or fight off an invading organism. The cells involved either contain or can produce more than 100 chemical mediators which facilitate the inflammatory response. These chemicals can effectively “kill” invading bacteria or parasites, neutralize invading viruses, and practically control the entire inflammatory response.

Histamine for instance is the chemical produced by the mast cell and is a prominent player in many types of inflammation, including allergic reactions.

2.4. Problem of inflammation in equine

Historically, inflammation has been a significant problem for equine particularly in the past as they were the main means of transportation for centuries and even today veterinarians are challenged by its impact on the health and longevity of equine. Inflammation in equine arises due to various causes but the most common are invasion of bacteria, virus, fungus, or parasite, or some mechanical trauma leading to damage of a bodily tissue.

Veterinarians begin to diagnose the problem of inflammation by looking for the following symptoms [3]:

- Symptom of equine inflammation
- Fever
- Anxiety
- Pawing or depression
- Looking at their flank
- Rolling or wanting to lie down
- Lack of or infrequent defecation
- Poor appetite and water intake
- Excessive sweating

- Chronic weight loss
- Peripheral swelling
- Skin lesions
- Recurring or intermittent stomach pain: may be related to changes in motility of the gut of your equine
- Diarrhea
- Vaginal or cervical discharge
- Short estrus cycle
- Failure to become pregnant

After assessing the problem and determining the specific type of inflammation, several treatment options are explored. Below we discuss the various treatment options available. We compare and contrast their effectiveness, accessibility, and side effects.

2.5. Treatment：Effectiveness, accessibility, and side effects

The first step in the treatment of inflammation is to identify the underlying cause and work on eliminating it. In the case of bacterial infection, antibiotics might be used to augment the body's own immune system in an effort to help eliminate the infection. The three main types of treatment we will be exploring are NSAIDs, Serrapeptase, and traditional herbs. Each method has its pros and cons, which we will explore.

1. NSAIDs (non-steroidal anti-inflammatory drugs): Synthetic drugs

NSAIDs are non-steroidal anti-inflammatory drugs, which play an important role in controlling equine pain and inflammation. NSAIDs act by inhibiting the enzyme cyclooxygenase (COX), which has two major forms, or isoenzymes: COX-1 and COX-2. The first isoenzyme, COX-1, plays the role of "housekeeper" by managing many of the body's processes. Most notably, it acts on the stomach's mucosal lining, protecting it by producing prostaglandins to maintain blood flow. Prostaglandins are natural chemicals in the body responsible for regulating blood flow to many tissues. The body produces COX-2 a isoenzyme chiefly in response to inflammation

There are two classes of NSAIDs that are available to target these distinct enzymes: nonselective COX inhibitors and COX-2 inhibitors.

Nonselective COX inhibitors target both COX-1 and COX-2 thereby decreasing inflammation significantly, but at the cost of inhibiting COX-1's protective mechanisms. These NSAIDs include phenylbutazone, flunixin meglumine, and ketoprofen.

COX-2-selective inhibitors provide similar anti-inflammatory effects by mainly targeting the COX-2 enzyme. Therefore, these NSAIDs carry fewer systemic side effects associated with prolonged use. Equioxx is the only FDA-approved COX-2 selective NSAIDs for equine medicine[2].

Table II.2: NSAIDs commonly administered in Equine

[1] DRUG	[2] NSAID CLASS	[3] PRIMARY USES	[4] POSSIBLE SIDE EFFECTS
[5] Phenylbutazone (Bute)	[6] non selective COX inhibitor	[7] Acute musculoskeletal pain, such as soft tissue tears, laminitis, and bone bruising	[8] Jugular vein thrombus, gastric ulcers, right dorsal colitis, kidney damage
[9] Flunixin Meglumine [10] (Banamine)	[11] non selective COX inhibitor	[12] Pain associated with smooth muscle, including colic and pneumonia; treating endotoxemia	[13] Clostridia myositis if injected intramuscularly, gastric ulcers, kidney damage, right dorsal colitis
[14] Ketoprofen (Ketofen)	[15] Non-selective COX inhibitor	[16] Same as above, with fewer side effects. Recommended for equine with sensitivity to Bute or Banamine	[17] Gastric ulcers, kidney damage
[18] Firocoxib	[19] COX-2 selective inhibitor	[20] Small intestine colics, osteoarthritis, chronic laminitis, chronic bone injuries	[21] Minimal, through right dorsal colitis cases have occurred

Although NSAIDs is an effective drug used to control inflammatory and painful conditions such as colic, pneumonia, and orthopedic pain in equine, but when used excessively or without guidance from veterinarian, these drugs can cause undesirable and possibly serious side effects. The mere administering of the drugs by injection can be quiet risky such that improper injection can cause disfiguring and pain. Furthermore, in the case of the NSAID drug Bute, contact with tissue outside of the vein during attempted IV (intravenous) administration, can cause skin and tissue to slough. This scenario can also cause a blood clot, called a thrombus, in the jugular vein, which impedes blood return form the head to the heart. This results in backflow of blood in the veins of the head and neck, causing these vessels to bulge prominently.

When administered as oral paste or ground tablets, NSAIDs occasionally cause direct-contact ulcerations on the equine's lips, oral cavity, and/or tongue. But the bigger, more prevalent issue is damage to the stomach lining. Gastric ulceration is a common side effect of NSAID administration. The complex equine stomach has two regions: the squamous mucosa portion and the glandular portion, separated by a distinct line of tissue called the margo plicatus. The glandular portion of the stomach produces gastric

acid and tends to be a little more resistant to these effects. In addition, NSAIDs inhibit prostaglandins, which might lead to deceased mucous production and a lower gastric pH. So prolonged NSAID administration can lead to squamous or glandular ulcers, or both [2]. As a result, affected equine might show signs of colic, especially after eating or go off their feed.

Ulceration can also occur in the large colon (intestine) during NSAID use, specifically in the right dorsal (upper) portion. This is usually associated with long-term administration of high doses of phenylbutazone, this can also occur at lower doses with other drugs, especially in equine that appear to be more sensitive to NSAIDs' toxic effects. The best way to avoid NSAID-induced right dorsal colitis is to use NSAIDs at as low a dose as possible for as short a period of time as possible. To reduce the risk of NSAID-induced right dorsal colitis, one consideration is the use of COX-2 inhibitors. As colonic ulcers sill result in protein loss, veterinarians can monitor total blood protein to help detect them early. These ulcers can cause clinical signs such as colic with soft manure or diarrhea.

Equine that are dehydrated are at increased risk of kidney damage when using NSAIDs. Prostaglandins regulate blood flow to the kidney similar to how they do to the stomach. And again, we know that NSAIDs reduce prostaglandin levels, which in this case pares down blood supply to the kidney and results in a lack of oxygen delivery to the tissue, called ischemia. When blood flow decreases significantly, renal papillary necrosis might develop-in other words, the kidney tissue die, which severely impairs their function. One sign of this condition is more frequent urination than normal.

Equine that have received high-dose NSAID therapy or were treated while dehydrated (a common clinical sign in colicky equine), for instance, are at the highest risk for this complication.

Another disease most often dealt with using NSAIDs is Endotoxemia, or bacterial-associated sepsis (infection in the bloodstream), which is a condition that occurs when Gram-negative bacteria die in the body and release toxins that can gain access to the systemic circulation via damaged gut lining. This can occur with severe colic lesions, such as intestinal strangulation, as well as with colitis and septic peritonitis (bacterial infection of the abdominal lining). Bacterial sepsis causes release of potent inflammatory mediators and prostaglandins, which most notably results in fever, depression, dehydration, and a high heart rate. Although these contemporary medicines for inflammation can be effective they are not sustainable and or healthy in the long term[4].

2. Serrapeptase: Enzyme therapy

The Serrapeptase enzyme, is a natural COX-2 inhibitor, and a natural pain killer. Besides reducing inflammation, one of serrapeptases' most profound benefits is reduction of pain, due to its ability to block the release of pain-inflammatory amines from inflamed tissues. Physicians throughout Europe and Asia have recognized the anti-inflammatory and pain-blocking benefits of this naturally occurring substance and are using it in treatment as an alternative to NSAIDs [2].

Serratiopeptidase is a leading enzyme therapeutic agent that is an effective anti-inflammatory drug from trypsin protein family. Serratiopeptidase have been prescribed in specialties like surgery, orthopedics, otorhinolaryngology, gynecology and dentistry for its anti-inflammatory, anti-endemic and analgesic properties [9]. Serratiopeptidase was illustrated to directly effect the movement of immune cells. This enzyme manages recruitment of PMMS and other lymphocytes at the site of inflammation. A recent research suggested that serratiopeptidase reduces the permeability of capillaries, which is induced by histamine, bradykinin, and serotonin. In addition, enzyme promotes injuries healing and repair and restores the skin temperature of the inflamed tissues, burn or trauma to normal. The activity of serratiopeptidase remains steady and provides more effective in binding with the addition of metal ions, such as zinc and manganese. Serratiopeptidase has been shown to be absorbed from the digestive tract [8].

Serrapeptase works as a powerful natural anti-inflammatory when released into the bloodstream. Clinical studies show that it's fundamental ingredient serrapeptase include fibrinolytic, anti-inflammatory and anti-edemic (prevents swelling and fluid retention) activity in a number of tissues, such as the lungs, a condition in performance equine known as IAD. Serrapeptase is a protein digesting enzyme which breaks down "non living" matter in the equine body. This may promote a reduction in levels of dead tissue in the circulatory system, promoting smoother healthier flowing blood. Fibrin often builds up throughout the body and manifests itself in many undesirable and unhealthy outcomes. Serrapeptase fights fibrin build up in the cardiovascular system, organs and muscle tissue. Studies on the use of Serrapeptase are numerous and reports reference successful use aids and assists in the fight against many inflammatory conditions such as:

· Arthritis and Stiffness

· Navicular

· IAD (inflammatory Airway Disease)

· DSLD (Degenerative suspensory ligament desmitis) Laminitis

· Muscle Soreness & Post-Workout

· Ringbone

· Moon Blindness （ equine recurrent uveitis-ERU ）

· Colic

· Post-Surgical Recovery

Fibrin is a protein formed that can significantly impact our equine health, general well-being and performance. This formation of excess fibrin is documented to be responsible for scar tissue, thrombus formation and inflammation along with its associated pain.

3. Traditional: Herbal medicine

Similar to the use of all-natural ways to cure illness in human body, herbal medicine for equine also use ancient Chinese formulas aimed at treating the underlying causes of a diseases or illness to help the body repair itself, instead of only temporarily curing the presented symptoms. Herbal can be used to cure various ailments from sore muscles to issues have influence on the liver, heart, kidneys, joints, etc. Some herbs in anti-inflammatory and pain reducing trio have long history of use in both Chinese and Ayurvedic medicine. Some of them can lessen the effect of pro-inflammatory cytokines and enzymes like Cox-2 [5,7].

Arnica which scientific name is Arnica montana. Arnica montana is used externally as a mild analgesic (pain reliever) and anti-inflammatory. It is excellent applied topically in the management of pain and inflammation associated with arthritis, sprains, bruises, sore muscles and inflamed insect bites. Arnica also aids circulation, making it useful to assist venous insufficiency, such as varicose veins. It can combine with Witch hazel (Hamamelis virginiana) to treat bruises, inflamed swellings and varicose veins whereas it cannot be applied to damaged skin or open wounds

Frankincense with scientific name Boswellia serrata which is used for pain and inflammation. Frankincense is primarily used as an anti-inflammatory. The range of conditions treated include, but are not limited to, arthritis (osteo and rheumatoid), gastrointestinal ulcers, inflammatory conditions of the

digestive tract, chronic prostatitis, psoriasis, equine asthma (heaves), laryngitis and bronchitis. Human clinical trials in patients with osteoarthritis and rheumatoid arthritis have found that Frankincense reduces pain and the frequency of swelling, prevents the breakdown of cartilage, decreases pain and increase physical functioning. Frankincense is also useful in the treatment of pain by producing a sedative effect on the nervous system. The anti-inflammatory activities of Frankincense make it an excellent prescription for pulmonary disorders, including equine asthma (heaves) and laryngitis. Anti-microbial properties also make it effective in the management of pulmonary disorders caused by respiratory system infections, such as bronchitis and pleurisy. Frankincense taken orally and applied topically is useful in the treatment of inflammatory skin diseases such as eczema, dermatitis (including rain rot and Eosinophillic Granuloma) and psoriasis. It is also useful in the treatment of ringworm. Frankincense can be used to stimulate circulation, which is a key factor in the management of arthritic conditions. Unlike pharmaceutical non-steroidal anti-inflammatory drugs (NSAIDs), Frankincense has not been shown to result in irritation or ulceration of the stomach. The bowswellic acids in Frankincense are synergistic with glucosamine. Taken together, Frankincense and glucosamine can be highly beneficial in the treatment of osteoarthritis and rheumatoid arthritis.Combine with Celery seed (Apium graveolens) in the treatment of arthritis, with Skullcap (Scutellaria laterifolia) and Albizia (Albizia lebbeck) in the treatment of allergic condition but cannot be administered to pregnant mares.

Devil's Claw which scientific name is Harpagophytum procumbens. Devil's claw is an anti-inflammatory and analgesic. It is particularly useful in the management of pain and inflammation associated with arthritis (both osteo and rheumatoid), back pain, neuralgia and muscular pain. Devil's claw may be administered to aid in the management of venous inflammation. It aids in the treatment of sore, itchy, inflamed skin, it can also combine with Celery seed (Apium graveolens), Bogbean (Menyanthes trifoliata) or Meadowsweet (Filipendula ulmaria) in the management of arthritis. However, it cannot be administered to pregnant mares, competition equine and equine with gastric ulcers, as it may increase the secretion of gastric acid.

Turmeric with scientific name: Curcuma longa. Turmeric is a useful anti-inflammatory in the management of arthritis (osteo and rheumatoid), skin disorders and equine asthma (heaves). Turmeric can combine with Frankincense (Boswellia serrata) in the management of arthritis. High doses may cause skin rash and photosensitivity.

White Willow which scientific name is Salix Alba. The salicin in White willow is converted into salicylic acid by the body (a natural form of aspirin). As such, White willow is most commonly used to treat pain, inflammation, sciatica, neuralgia, rheumatism, osteoarthritis, headaches, colic, cramp, sprains, strains an tendonitis. Its analgesic effects are slower than aspirin, however its duration is longer and gastric side effects are avoided with correct dosage. The salicylic acid has also been shown to reduce fever without causing damage to the stomach, hence it is indicated in the treatment of influenza and other fever-producing conditions. White willow may be used for various forms of arthritis being specific for rheumatoid arthritis and other systemic corrective tissue conditions with inflammatory changes. Externally, White willow is used to treat wounds, warts, calluses, bunions, corns and acne. White Willow cannot be administered to pregnant and lactating mares, competition equine due to the presence of salicylates and cannot be taken by individuals sensitive or allergic to aspirin or salicylates. Respiratory side effects and skin rash may occur in these individuals. Due to the salicylate content, caution should be exercised in individuals with aspirin hypersensitivity, equine asthma (heaves), equine metabolic syndrome, diabetes, gastrosis, haemophilia, liver diseas, impaired blood clotting, kidney disease and peptic ulcers. The side effects of White Willow are uncommon, but may include nausea, gastrointestinal discomfort, dizziness and rash[6].

The selection of herbs chosen depends on the causes of the pain and inflammation. It will also depend on whether the equine is already taking pharmaceutical medications and whether they have any other medical conditions that need to be considered.

Herbal medicines and traditional therapeutics have been a major method of treatment for Equine over the course of history and thus an important avenue of treatment that must be further explored and tested using modern sciences to allow for systematic examination of their efficacy for Equine today. One area of limitation is a lack of research to better understand traditional therapeutics at the mechanistic level and how they compare with modern pharmaceutical drugs.

3. Conclusion

For treating equine inflammation, there are several methods, synthetic drugs like NSAIDs, enzymatic therapy with Serrapeptases and herbal medicines. Inflammation is a complex immune response based on various kinds of stimuli and may not be cured by common drugs. Most of the anti-inflammatory drugs are associated with severe side effects and adverse drug reactions. These drugs often allow for symptomatic relief rather than cure. Although, NSAIDs can be effective they are damaging in long term use resulting in serious side effects, such as ulcers, colic, and kidney damage. Herbal medicines are safer with less side effects and cheaper than synthetic medicines but are less clinically studied and not as readily available. On the other hand Serrapeptase seems to be the most balanced alternative treatment, backed by long standing use as an anti-inflammatory and its biological nature as an enzyme found in nature. Serratiopeptidase is a serine protease with a molecular weight of 60kDa that has been reported for its potent anti-inflammatory activity. The medical use of serratiopeptidase, primarily as an anti-inflammatory enzyme-based drug is well established. Several researches have suggested enzyme alone or in combination with other drugs can have a positive effect in treating sinusitis, bronchitis, atherosclerosis, carpal tunnel syndrome, rheumatoid arthritis, inflammatory bowel disease (IBD) and other autoimmune diseases. Some research findings have demonstrated that this enzyme possesses the unique ability to dissolve the dead and damaged tissue that is a by-product of the healing response without harming living tissues. Serratiopeptidase also works by modifying cell surface adhesion molecules which are directly and indirectly responsible for inflammation and bringing immune cells in damaged tissues. We propose a thorough clinical study comparing treatment of inflammation in Equine using NSAIDs, Serrapeptase enzyme and herbal medicines to provide clinicians and veterinarians with concrete evidence for the best approach in dealing with the deleterious problem of inflammation effecting our Equine population.

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