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## A CHICKEN-FLAVORED ELECTROLYTE DRINK COULD HELP SNIFFER DOGS STAY HYDRATED:

The first comparison of plain water, electrolyte injections and a chicken-flavored electrolyte drink as techniques for keeping sniffer dogs hydrated when working in hot weather finds that while all are safe and effective, dogs drink more and are more hydrated when given a chicken-flavored electrolyte drink. The study, published in open-access journal *Frontiers in Veterinary Science*, also shows that the dogs did not suffer from a buildup of electrolytes from the drink, suggesting that electrolyte drinks are a safe hydration alternative for sniffer dogs, who are at risk of heat stroke in hot weather. The dogs handled the electrolytes well, suggesting electrolyte drinks can be a safe and effective hydration alternative to plain water or electrolyte injections

## UNRAVELING THE GENETICS OF DISC DISEASE IN DOGS:

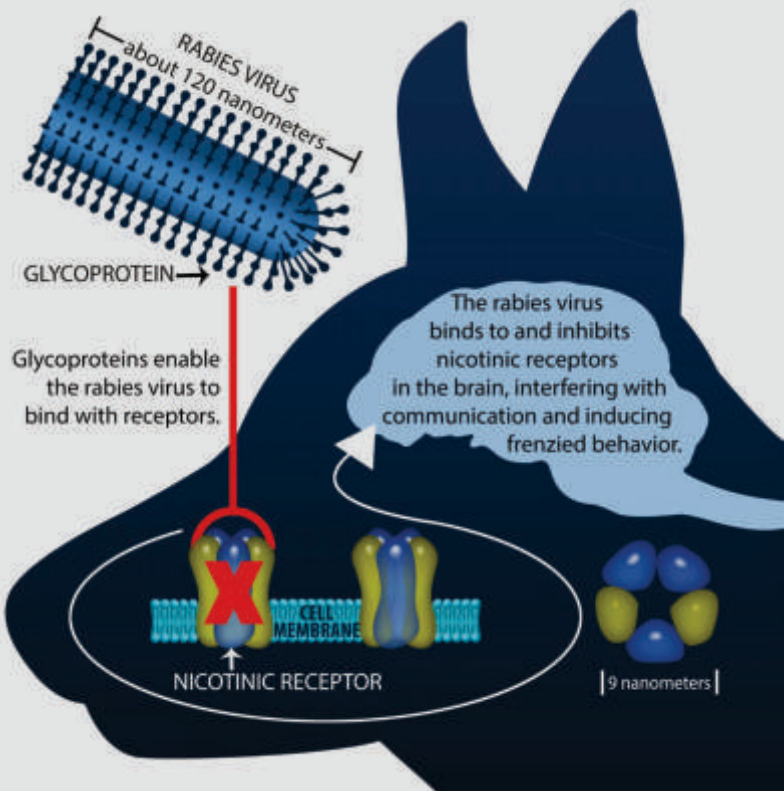
The researchers at University of California, Davis, reveal the discovery of a genetic mutation across breeds that is responsible for chondrodystrophy (the skeletal disorder leading to shorter legs and abnormal intervertebral discs) in a study published in the *Proceedings of the National Academy of Sciences*. Dogs with intervertebral disc disease (IVDD) are 50 times more likely to have this mutation. IVDD is the herniation of those abnormal discs that can lead to paralysis, extreme pain, discomfort **and inability to walk.** The geneticists, in short legged dog breeds, found a genomewide region of significance on chromosome 12 that appeared linked to abnormal long bone growth. They observed that other breeds that shared the DNA sequence in this region, they found that it was in the chondrodystrophic breeds such as beagles, dachshunds and spaniels. The FGF4 retrogene is an important molecule involved in development. When its receptor FGF3R is mutated, it can also lead to dwarfism in humans.

## HOW RABIES CAN INDUCE FRENZIED BEHAVIOUR:

A new study published in the journal *Scientific Reports* shows how a small piece of the rabies virus can bind to and inhibit certain receptors in the brain that play a crucial role in regulating the behavior of mammals. This interferes with communication in the brain and induces frenzied behaviors that favor the transmission of the virus. **Scientists may finally understand how the rabies virus can drastically change its host's behavior tohelp spread the disease, which kills about 59,000 people annually.** This research revealed that a glycoprotein on the surface of the rabies virus can bind to nicotinic acetylcholine receptors in the muscles. The virus then enters and hijacks muscle and nerve cells where it replicates and travels up the nerves to infect the brain and other tissues. The viruses collect in the spaces between brain cells during the early stages of infection. These spaces are where brain cells communicate. According to the experts on nicotine receptors, if viruses could bind to receptors in these spaces and change how brain cells normally communicate, the virus could change behavior of the infected animal. This change of behavior could work to the advantage of the virus, changing the behavior of infected animals to increase the chances that infection will spread to other animals.

## 3-D ANALYSIS OF DOG FOSSILS SHEDS LIGHT ON DOMESTICATION DEBATE IN

In an effort to settle the debate about the origin of dog domestication, a technique that uses 3-D scans of fossils is helpful to researchers determine the difference between dogs and wolves. The researchers found that in the early stages of domestication, the skull changed shape but evolution of the mandible lagged behind and did not co-evolve with the skull. Their study is reported in the journal Scientific Reports.



# THERAPEUTIC APPLICATION OF SYSTEMIC PROTEASES: A REVIEW

## INFLAMMATION:

Inflammation is a physiological response (immune response) against infection, injuries, autoimmune disorders and several diseases. In order to maintain physiological homeostasis, acute inflammation is essential and requires complete resolution. The resolution of inflammation defines tissues homeostasis and balanced immune activity. However, failure of selfresolution of acute inflammation results in chronic inflammation and remains a major challenge . Enzymes were first used as an anti-inflammatory in modern medicine in the 1950s when it was discovered in the United States that intravenous trypsin could relieve inflammation caused by rheumatoid arthritis, ulcerative colitis, and atypical viral pneumonia as well as post-surgical swelling and bruises caused by sports injuries.

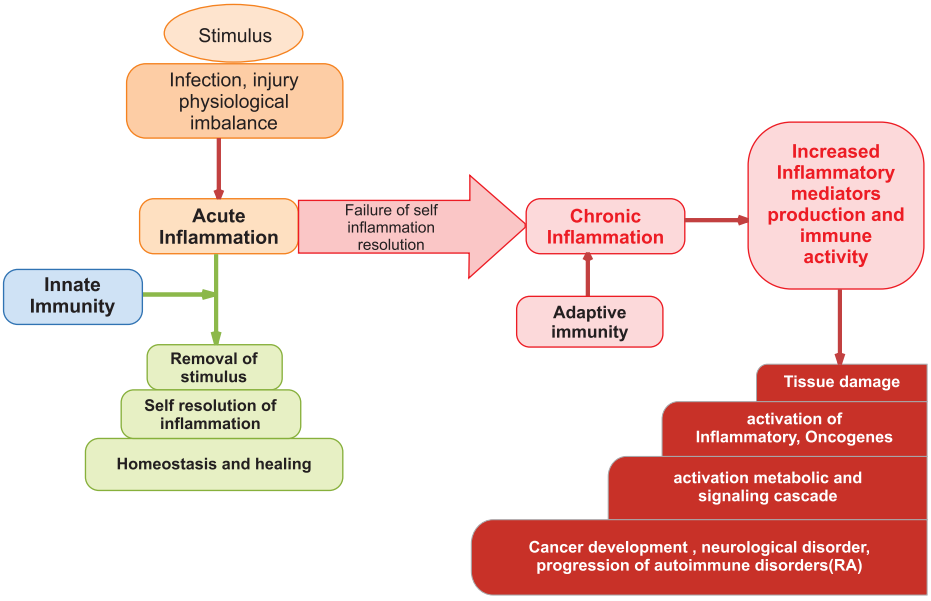



Fig: Various causes resulting in inflammation

## WOUND HEALING AND TISSUE REPAIR:

Wound healing is a complex and dynamic process of replacing devitalized and missing cellular structures and tissue layers. As a continuation of the inflammatory process, wound healing is a phenomenon consisting of sequentially controlled steps which result in the replacement of dead tissue with regenerated cells and/or scar tissue. Tissue damage of all types, such as surgical or accidental injuries, fractures, and burns, stimulates a well-orchestrated, physiological process of healing, which ultimately leads to structural and functional restoration of the damaged tissues.

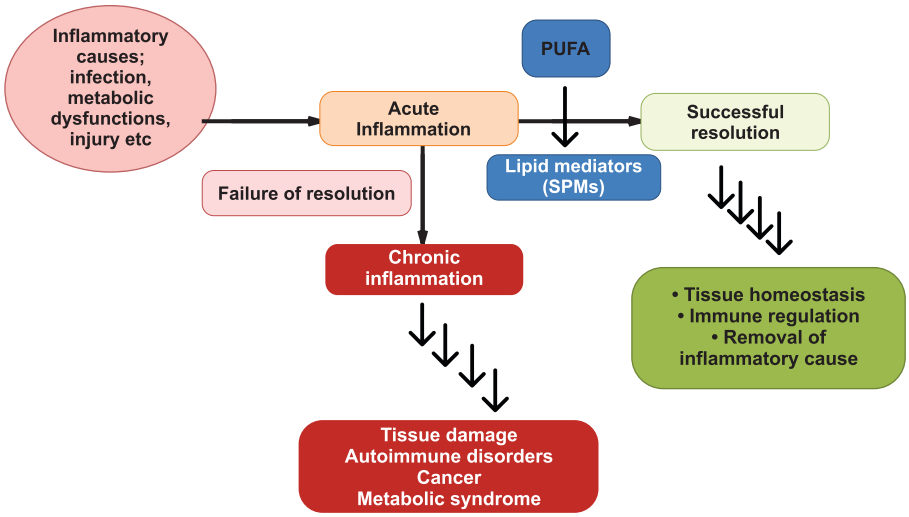



Fig. – Scheme of resolution of inflammation: causes, acute and chronic inflammation.

**Proteolytic enzymes are a group of enzymes whose catalytic function is to hydrolyze peptide bonds of proteins into amino acids. Proteases differ in their ability to hydrolyze various peptide bonds. Each type of protease has a specific kind of peptide bonds it breaks.**

Proteolytic enzymes occur naturally in all organisms and constitute 1-5% of all genetic content. They are different from other enzymes in the body in that they are able to adapt to changing needs. For example, the same proteolytic enzyme can meet both digestive and metabolic needs in the body. Examples of proteases include: fungal proteases, pepsin, trypsin, chymotrypsin, papain, bromelain, etc.

## BROMELAIN- PINAPPLE PROTEASES:

Bromelain is the collective term for enzymes (principally proteolytic enzymes) derived from the ripe and unripe fruit, as well as the stem and leaves, of the pineapple plant, Ananas comosus, a member of the Bromeliaceae family. Bromelain may have digestant activity and there is research suggesting that it may have wound healing, anti-inflammatory, antidiarrheal and anticarcinogenic effects, as well. A wide range of therapeutic benefits have been claimed for bromelain, such as reversible inhibition of platelet aggregation, sinusitis, surgical traumas, thrombophlebitis, pyelonephriti angina pectoris, bronchitis, and enhanced

absorption of drugs, particularly of antibiotics. Bromelain is comprised of an unusually complex mixture of different thiol endopeptidases and other notyet-completely characterized components, such as phosphatases, glucosidases, peroxidases, cellulases, glycoproteins and carbohydrates, among others (Rowan and Buttle, 1994; Maurer, 2001) and organically bound calcium (Kelly, 1996; Maurer, 2001).Bromelain activity is stable over a wide pH range, and has shown potentially beneficial effects due to its anti-inflammatory and analgesic properties. Its several therapeutic properties – including anti-tumour action, modulation of cytokines and immunity, skin debridement, and enhanced wound healing – have been demonstrated in both in vitro and in vivo studies (Cohen and Goldman, 1964; Maurer, 2001; Shahid et al., 2002).

## POTENTIAL ROLE OF BROMELAIN IN CLINICAL AND THERAPEUTIC APPLICATIONS

A study was conducted to determine the effect of bromelain treatment on canine articular chondrocytes in vitro (Siengdee et al, 2010). This research evaluated cell viability, levels of apoptotis and mitotis, proteoglycan concentrations and the expression of certain genes. Bromelain decreased the apoptotic rate in canine chondrocytes, with higher mitotic rate and is able to significantly activate the proliferation of these cells while not adversely affecting their viability. Furthermore, the results show a statistically significant decrease in the relative gene expression of TIMP-1 and MMP-3 mRNAs in bromelain-treated groups compared to the control groups. This research established that bromelain can control degradative processes and produce some glycosaminoglycans. In OA the apoptosis of chondrocyte cells involves the activity of nitric oxide (NO), inducible nitric oxide synthase (iNOS), COX-2, and prostaglandin E2 (PGE2) (Blanco, 1999; Goldring, 2000; Sandell and Aigner, 2001; Nesic et al., 2006). From these studies, it is obvious that bromelain exerts an inhibitory effect on NO, iNOS, COX-2 and PGE2 (Oh-ishi et al., 1979; Wen et al., 2006; Kalra et al., 2008), bromelain significantly decreases the rate of apoptosis and increases chondrocyte proliferation.

### Anti-inflammatory Activity Of Bromelain

Cyclooxigenase-2 (COX-2) is an important component of cancer-associated inflammation that is involved in the synthesis of prostaglandin E2 (PGE-2). PGE-2 is a pro-inflammatory lipid that also acts as an immunosuppressant, as well as a promoter of tumor progression. COX-2 converts arachidonic acid into PGE-2 and promotes tumor angiogenesis and cancer progression. It has been shown that bromelain downregulates COX-2 and PGE-2 expression levels in murine microglial cells and human monocytic leukemia cell lines. And tumor necrosis factor (TNF)-α in mouse macrophage and human peripheral blood mononuclear cells (PBMC). These results indicated that bromelain potentially activates the healthy immune system in association with the rapid response to cellular stress. Conversely, bromelain reduces IL-1β, IL-6 and TNF-α secretion whenimmune cells are already stimulated in the condition of inflammation-induced over production of cytokines. Studies have shown that bromelain reduced the expression of INF-γ and TNF-α in inflammatory bowel disease. A study demonstrated that bromelain diminished the cell damaging effect of advanced glycation end products by proteolytic degradation of receptor of advanced glycation end products and controlled the inflammation. The cell surface marker, cluster of differentiation (CD)44 is expressed by cancer and immune cells directly involved in cancer growth and metastasis. Furthermore, CD44 regulates lymphocyte requirement at the site of inflammation . Bromelain was shown to reduce the level of CD44 expression on the surface of mouse and human tumor cells, and regulate lymphocyte homing and migration to the sites of inflammation. Furthermore, bromelain modulates the expression of transforming growth factor (TGF)-β, one of the major regulators of inflammation in patients affected by osteomyelofibrosis and rheumatoid arthritis. There are various studies that report the immunomodulatory effect of bromelain . Bromelain activates natural killer cells and augments the production of granulocyte-macrophage-colony stimulating factor, IL-2, IL-6 and decreases the activation of T-helper cells . Thus, bromelain decreases the majority of inflammatory Bromelain activates the inflammatory mediators, including interleukin (IL)-1β, IL-6, interferon (INF)-γ mediators and has demonstrated a significant role as an anti-inflammatory agent in various conditions.

## PAPAIN:

Papain is an endolytic plant cysteine protease enzyme which is isolated from papaya (Carica papaya L.) latex. Papain enzyme belongs to the papain superfamily, as a proteolytic enzyme, papain is of crucial importance in many vital biological processes in all living organisms (Tsuge et al., 1999). Papain shows extensive proteolytic activity towards proteins, short-chain peptides, amino acid esters and amide links and is applied extensively in the fields of food and medicine (Uhlig, 1998). Papain acts as a debris-removing agent, with no harmful effect on sound tissues because of the enzyme's specificity, acting only on the tissues, which lack the α1-antitripsine plasmatic antiprotease that inhibits proteolysis in healthy tissues (Flindt, 1979). The mechanism of biochemical removal of caries involves cleavage of polypeptide chains and/or hydrolysis of collagen cross-linkages. Papain has advantages for being used for chemomechanical dental caries removal since it does not interfere in the bond strength of restorative materials to dentin (Lopes et al., 2007). Papain enzyme has a long history of being used to treat sports injuries, other causes of trauma and allergies (Dietrich, 1965). Fortunately papain has a proven track record in managing all of these conditions with clinical evidence of significant benefits for use of papain protease enzyme in cases of sports injury. It has previously been reported that minor injuries healed faster with papain proteases than with placebos. Furthermore, athletes using papain protease supplements were able to cut recovery time from 8.4 days to recovery time from 8.4 days to 3.9 days (Trickett, 1964; Dietrich, 1965).

Papain also has been successfully used to overcome the allergies associated with leaky gut syndrome, hypochlorhydria (insufficient stomach acid) and intestinal symbiosis like gluten intolerance. Papain has previously been reported to have significant analgesic and anti-inflammatory activity against symptoms of acute allergic sinusitis like headache and toothache pain without side effects (Mansfield et al., 1985).

## SUMMARY OF CLINICAL APPLICATIONS OF BROMELAIN.

| | Disorders | Observed effects | References |
|---|---|---|---|
| Anti-Inflammatory agent | Asthma | Change CD4+ to CD8+ T lymphocyte ratio and decreases AAD (Allergic airway disease). | Jaber et al. 2002; Secor et al.2008 |
| | Chronic Rhinosinusitis | Retards formation of pro-inflammatory prostaglandin resulting in fast recovery. | Bakhshaee et al. 2014 |
| | Colonic inflammation | Decreased the occurrence and severity of spontaneous colitis | Darshan; Doreswamy 2004 |
| | Osteoarthritis | Reduces in joint tenderness, pain and swelling | Klein 2006; Walker et al. 2002 |
| | Rheumatoid arthritis | Reduce joint stiffness | Maurer 2001 |
| | Soft tissue injuries | Have high wound healing capacity | Baumann et al. 2007; Lemay et al. 2004 |
| Anti tumor agent | Breast cancer | Decrease tumor size and cause apoptosis | Baez et al. 2007 |
| | Leukemia | Causes tumor regression | Maurer 2001; Pavan et al. 2012 |
| | Lung carcinoma | Bromelain possesses antimetastatic and anticoagulant functions | QIMR 2005 |
| | Ovarian cancer | Decrease tumor growth and invasive potential | Maurer 2001 |
| | Angina pectoris | Bromelain stops aggregation of platelets and causes blood thinning | Taussig and Nieper 1979 |
| Inhibition of thrombus formation | Transient ischemic attacks | Reduces its severity | Taussig and Nieper 1979 |
| | Thrombophlebitis | Treats thrombophlebitis | Kelly 1996 |
| | Thrombosis | Break down cholesterol plaques | Kelly 1996 |

### SERRATIOPEPTIDASE: AN AGENT OF INFLAMMATION CONTROL AND PAIN MANAGEMENT

Serratiopeptidase is an enzyme isolated from a non-pathogenic bacteria called enterobacteria Serratia E15. This enzyme makes its inhabitants in the intestine of the silkworm. Silkworms go through a transformational process within a cocoon that turns them into moths. It is this specific enzyme that is used by the silkworm to dissolve the cocoon and reemerge as a moth.

Serratiopeptidase has powerful anti-inflammatory properties and is particularly useful for post-traumatic swelling, fibrocystic breast disease and bronchitis. It is able to digest dead tissue, blood clots, cysts, and arterial plaques. Clinical studies have shown it to be effective at reducing swelling and edema and metabolizing scar tissue in the body. A 2003 study found that serratiopeptidase was effective at loosening and reducing mucous build-up in respiratory pathways. This was credited to its ability to reduce the neutrophil white blood cell numbers and to improve the viscoelasticity of the sputum in patients with chronic airway disease.

Serratiopeptidase is also renowned for its ability to reduce pain by blocking the release of pain-inducing molecules from inflamed tissues. There are no known side effects with this. The most common pain-reducing aids are aspirin, ibuprofen and acetaminophen, which are called non-steroidal anti-inflammatory drugs (NSAID`s). These drugs are known to deplete renal and hepatic glutathione and to deplete the body of critical B vitamins and trace minerals leading to stomach, kidney, liver and heart problems. A 2008 study compared Serratiopeptidase and its anti-inflammatory activity with 2 human pancreatic proteolytic enzymes (trypsin and chymotrypsin) and aspirin. Although all groups were effective at reducing inflammation, serratiopeptidase was the most effective. It was also proven to be effective at reducing swelling and pain intensity in individuals with carpel tunnel and sprained ankles. Other studies have shown similar anti-inflammatory effects after oral surgery was performed. A recent finding has suggested that serratiopeptidase reduces capillary permeability induced by histamine, bradykinin, and serotonin; breaks down abnormal exudates and proteins; facilitates the absorption of decomposed products through blood

and lymphatics. Further, enzyme promotes wound healing and repair and restores the skin temperature of the inflamed area, burn or trauma to normal.The activity of serratiopeptidase remains stable and offer more efficiency in combination with the addition of metal ions like zinc and manganese.

### Therapeutic Application Of Serratiopeptidase

The medical use of serratiopeptidase, primarily as an anti-inflammatory enzyme-based drug, has a very long history. The exact molecular mechanism of serratiopeptidase is not known completely but research findings have demonstrated that 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. These cell surface adhesion molecules are directly and indirectly responsible for inflammation and bringing immune cells in damaged tissues. A study by a team of Italian researchers suggests that proteolytic enzymes such as serratiopeptidase could significantly enhance the effectiveness of antibiotics against biofilm and can inhibit biofilm formation. Serratiopeptidase has been shown to enhance the activity of several antibiotics including ampicillin, ciclacillin, cephalexin, minocycline and cefotiam.

The clinical use of sserratiopeptidase during allergic conditions was studied and it actually reduces the thickness and viscosity of the mucus and improves the elimination of it through bronchopulmonary secretions.

Another promising area is the use of serratiopeptidase to break down atherosclerotic plaque. Khateeb et al. have demonstrated the role of serratiopeptidase in the management of ortho-dental inflammatory syndrome. Because the enzyme digests non-living tissue and leaves live tissue alone; it may be effective in removing the deposits of fatty substances, cholesterol, cellular waste products, calcium and fibrin on the inside of the arteries. The fibrinolytic (clot removal) activity of serratiopeptidase may also be able to help with thickened blood, increased risk of stroke, and phlebitis/thrombophlebitis.

## RUTIN:

Rutin (3,30,40,5,7-pentahydroxyflavone-3-rhamnoglucoside,) is a flavonol, abundantly found in plants, such as passion flower, buckwheat, tea, and apple. It is a vital nutritional component of food stuff (Harborne, 1986). Rutin, also called as rutoside, quercetin-3-rutinoside, and sophorin is a citrus flavonoid glycoside found in buckwheat (Kreft et al., 1997). The name 'rutin' comes from the plant Ruta graveolens, which also contains rutin. Chemically it is a glycoside comprising of flavonolic aglycone quercetin along with disaccharide rutinose. It has demonstrated a number of pharmacological activities, including antioxidant, cytoprotective, vasoprotective, anticarcinogenic, neuroprotective and cardioprotective activities (Javed et al., 2012; Richetti et al., 2011; Nassiri-Asl et al., 2010; Mellou et al., 2006; Trumbeckaite et al., 2006; Schwedhelm et al., 2003; Janbaz et al., 2002; La Casa et al., 2000).

### Pharmacological Actions Of Rutin:

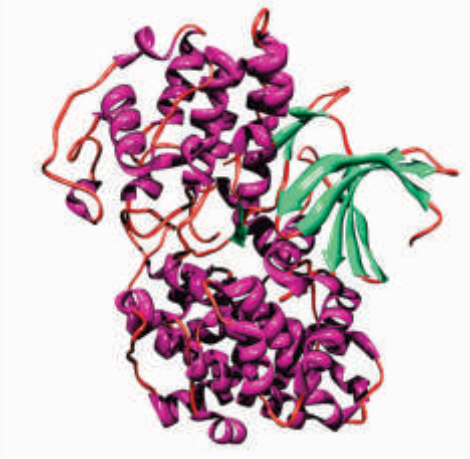
Prevention of neuroinflammation: Rutin has demonstrated the neuroprotective effect on brain ischemia. Administration of rutin caused attenuation of 'ischemic neural apoptosis' due to the embarrassment of p53 expression and lipid peroxidation along with increment in endogenous antioxidant defense enzymes' (Khan et al., 2009). It has been found to be useful in hypoxic, glutamate and oxidative stress (Pu et al., 2007). Reduction of 'neuroinflammation' in rat model of 'sporadic dementia of Alzheimer type' (Javed et al., 2012) and neuroprotective effects in 'dexamethasone-treated mice' (Tongjaroenbuangam et al., 2011) were observed on rutin administration. Sedative activity: Rutin, given by intraperitoneal route caused a depressant action on the CNS. Research confirmed the CNS depressant activity of rutin was unlikely due to the involvement of GABAA receptor (Ferna´ ndez et al., 2006).

Analgesic and antinociceptive effects: Analgesic effect of rutin was studied by hot plate test on swiss albino mice whereby the analgesic effect of rutin was established (Rylski et al., 1979). Further, it was also confirmed that rutin exhibited peripheral and central antinociceptive activities (Selvaraj et al., 2014).

Antiarthritic effects: Animals treated with rutin were observed with significant decrement in rheumatoid arthritis and Fanconi anemia by inhibiting 'oxygen radical overproduction' (Ostrakhovitch and Afanas'ev, 2001).

In adjuvant arthritis rat model, rutin inhibited acute and chronic phases of inflammation. Rutin was the most active in the chronic stage of inflammation (Guardia et al., 2001). Due to antifungal and anti-arthritic effects, rutin has a therapeutic effect on septic arthritis caused by Candida albicans (Han, 2009). Further in an independent study, rutin slowed down inflammatory and catabolic cartilage markers in osteoarthritic lesions in the Hartley guinea pig (Horcajada et al., 2014).

Antidiabetic effects: Streptozotocin is a toxic chemical known to deplete levels of insulin by destroying pancreatic islets. Streptozotocin selectively assaults pancreatic b-cells by generating free radicals of oxygen and nitrogen monoxide along with reducing levels of NAD and NADP. Excessive production of glucose and its decreased utilization by tissues serve as the fundamental bases of hyperglycemia (Chattopadhyay, 1993).



## TRYPSIN: CHYMOTRYPSIN

Trypsin and chymotrypsin are two different but related digestive enzymes produced and released by the pancreas. Both enzymes function within the intestine to help break down large protein molecules that we ingest in the foods we eat. Trypsin helps to break down large protein molecules by cutting protein chains at specific sites. The large protein molecule is actually a chain of smaller units called amino acids which are linked, end to end, in chains hundreds. There are 20 different amino acids from which these protein chains are made. The specific site along the protein chain where trypsin is active are those with the amino acids lysine and arginine, two of the smaller amino acids. The enzyme chymotrypsin also cuts the larger protein chain but at different sites from where trypsin cuts. Chymotrypsin makes its cut at positions along the protein chain that contain very large amino acids such as phenylalanine, tyrosine and tryptophan. Otherwise, it is very similar to trypsin.

**Role of Trypsin:Chymotrypsin in Tissue Repair:**

Trypsin:chymotrypsin is a widely used oral proteolytic enzyme combination to hasten repair of traumatic, surgical, and orthopedic injuries. It shows high bioavailability without losing its biological activities as an anti-inflammatory, anti-edematous, fibrinolytic, antioxidant, and anti-infective agent. These properties help in resolving signs and symptoms of inflammation due to tissue injury and facilitate the repair process. It also demonstrates analgesic effects and reduces the pain associated with healing.

**Mechanisms of Beneficial Effects of Trypsin: Chymotrypsin in Tissue Repair:**

Following an acute injury, there is a sharp rise in the levels of the protease inhibitors α1-antitrypsin and α2-macroglobulin.

These acute phase reactants inhibit several proteolytic enzymes, which if uncontrolled can lead to unregulated inflammation and impair healing. The order of affinity of α1-antitrypsin with proteolytic enzymes is as follows: elastase > chymotrypsin > cathepsin G > trypsin > plasmin. Similarly, α2-macroglobulin shows greatest affinity with cathepsin G. At this point, it must be reiterated that plasmin causes fibrinolysis and its inhibition prevents fibrinolysis. Therefore, a steep rise in α1-antitrypsin and α2-macroglobulin following acute injury leads to a period of fibrinolytic shutdown, with consequent maintenance of inflammatory response and edema and delay in repair. Oral combination of trypsin:chymotrypsin targets this early stage of inflammation. Since α1-antitrypsin shows greater affinity for trypsin and chymotrypsin compared to plasmin, oral supplementation of the enzyme complex ensures that plasmin remains available for fibrinolysis and the period of fibrinolytic shutdown is shortened. As a result, local microcirculation is restored, inflammatory edema is cleared, and tissue repair is facilitated.

Another mechanism which contributes to improved healing with trypsin:chymotrypsin combination is that it helps in maintaining high levels of α1-antitrypsin for a long duration. Consequently, the activity of proteolytic enzymes and their degradative effects are countered, leading to reduction in inflammatory milieu, ROS and oxidative stress, and faster healing. Additionally, the enzyme preparation also increases enzymatic and non-enzymatic antioxidant levels, which further augments its antioxidant and anti-inflammatory efficacy. The anti-infective property of the enzyme complex may be explained by enhanced phagocytic activity of natural killer cells and macrophages due to trypsin. It is also interesting to note that the combination has been shown to reduce the constant loss of albumin and pre-albumin after surgical procedures. Consequently, it may prevent many of the life-threatening postoperative complications, such as shock. Overall, the use of trypsin:chymotrypsin in patients with acute injury reduces inflammatory edema and tissue destruction, which in turn facilitates rapid healing. Figure 2 provides a comprehensive overview of postulated mechanisms of beneficial effects of trypsin:chymotrypsin in tissue repair.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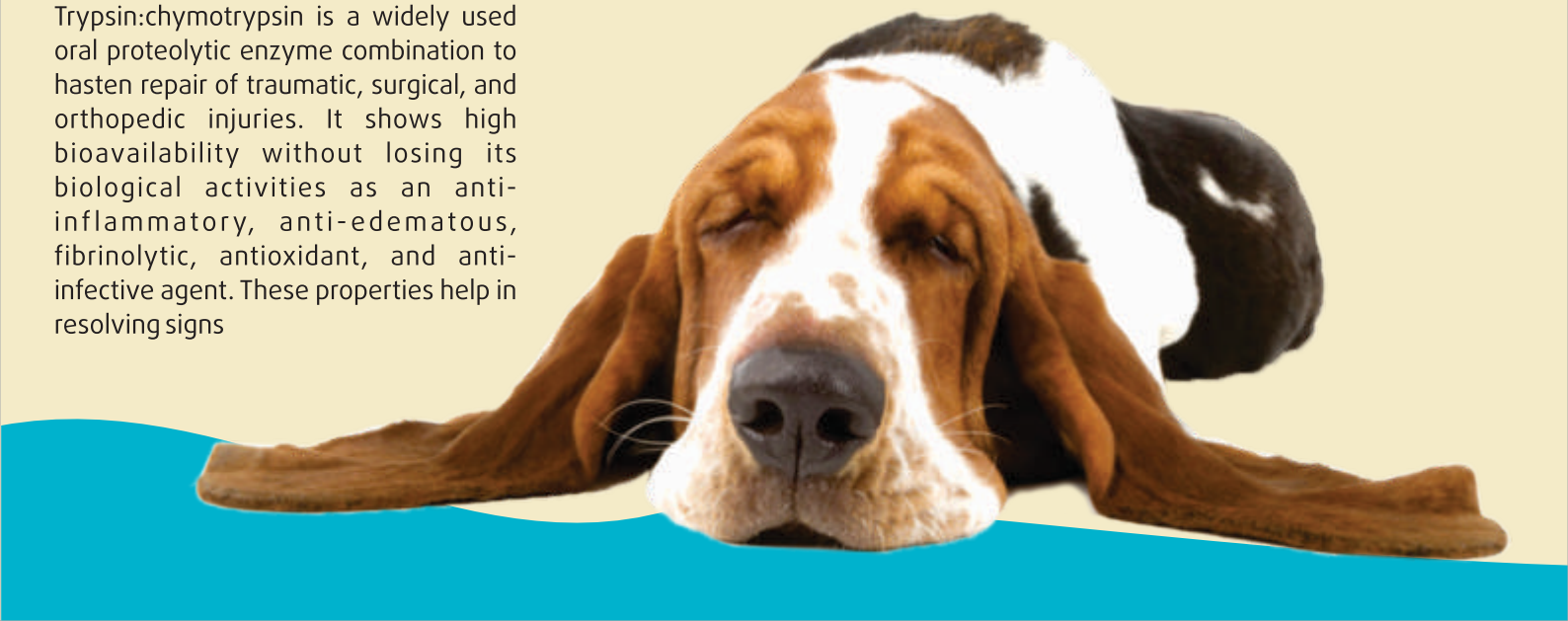

# SAFE WHOLE BLOOD DONATION IN DOGS

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**Frequently Asked Questions on canine blood donation:**

**Is my dog eligible for blood donation?**
Your pet dog - 1. Should be 1 to 8 years old.
2. Should be clinically healthy.
3. Should weigh a minimum of 20 kgs.
4. Should have been vaccinated ( not within 2 weeks)and dewormed periodically.
5. If female, then shouldn't be pregnant or delivered pups.
6. Shouldn't have donated blood within three months.
7. Should be free from infectious and haemoprotozoan diseases.

**How is the blood taken from my dog?**
If your dog is un co-operative, then blood collection will be done under sedation, in which case, your pet should be brought in an empty stomach ( 5 hrs of fasting).
A small area on the neck side in clipped and blood is collected from the jugular vein and the needle attached to the blood bag, is inserted for free flow of blood.

**How much blood will be collected from my dog?**
Around 350 mls of whole blood can be collected .

**Will my pet feel unwell after blood donation?**
If your dog is sedated, then it will take some time for recovery, Intravenous fluids are given after the collection to compensate the volume loss. The blood collection will cause no harm to your pet.

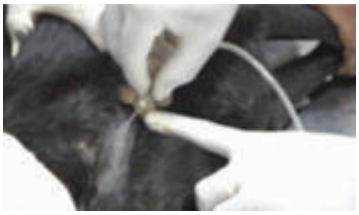
**Do I have to give any medicines for blood production?**
No. The blood will be produced within 3 weeks naturally.

**Will proper disposables be used for blood collection?**
The blood bag comes with an attached needle , hence each bag will be used for each dog and after transfusion of the blood, the bag will be properly disposed.

**How will my pet's blood be used?**
Your dog's blood will be used to save critically ill dogs that suffer from anemia of any cause.

**How often can my dog donate blood a year?**
Dogs can donate blood every three months a year.

**BLOOD COLLECTION**
1. Donor dogs are evaluated as per the pre requisites, for hematology, serology and blood parasites.
2. Once they are fit to donate blood, their blood is typed using Quick Test Kit whether they are DEA 1.1-Positive or Negative.
3. The **DEA 1.1 –ve are Universal Donors.**
4. These dogs can donate maximum of thrice a year.
5. Whole blood -350 ml is collected from the jugular vein using the blood collection monitor and sealed using blood bag tube sealer equipment.
6. Storage of the whole blood in the storage cabinet for 35 days.



A) Jugular blood collection

B) sealing

C) storage

1.A small area on the neck side in clipped and blood is collected from the jugular vein and the needle attached to the blood bag, is inserted for free flow of blood.
2.In uncooperative dogs, the blood collection will be done under sedation(BUTARPHANOL @0.1 mg/kg or 0.4 mg/kg iv) or DIAZEPAM 0.5 to 2mg/kg iv)
3.Around 350 ml of whole blood can be collected.
4.Intravenous fluids are given after the collection to compensate the volume loss.

Whole Blood contains both red blood cells and plasma. Platelets are none viable within 4 hours of collection and white blood cells are usually nonviable after a few days.

Each standard bag contains 350ml of Whole Blood in 43 ml of CPD anticoagulant solution.

**Uses**
Whole Blood may be used in the treatment of anaemia or other disorders of oxygen transport, when hypovolaemia is also a concern. Whole blood may be used in the treatment of acute blood loss (traumatic or surgical haemorrhage, acute immune mediated haemolytic anaemia) and chronic blood loss (parasitism, bone marrow disorders, chronic anaemia).

**Dr.Saloni Joshi-Gorhe**
**M.V.Sc (Surgery)**

## EXPERT OPINION ON PUPPY NUTRITION

Puppies are typically weaned off of their mother's milk at about 8 weeks of age. The goal of feeding growing puppies is to lay the foundation for a healthy adulthood.

Puppy food is designed specifically for the nutritional needs of young and still growing dogs with twice the daily nutritional requirements that a mature dog needs. Ideally, a puppy should be fed puppy food until he/she reaches 80% of his expected adult size which is about a year old for most dogs. Commercially available dog foods are divided into three types- moist, semi-moist and dry kibble. The best option is usually to feed your puppy a combined diet of dry kibble with moist dog food.

While choosing a nutritional product for your growing puppy it is important to understand four key nutrients- protein, fat, calcium and digestible carbohydrates. The recommended protein range for healthy puppy growth is 22-32% on a dry matter basis(DM), while the fat content for puppies should be rationed between 10-25%. Growth formulations for large and giant breed puppies should contain 0.7-1.2% calcium while for small to medium breed it should be 0.7-1.7% on a DM basis. No specific amount of digestible carbohydrates has been identified as optimal for growing puppies, but its suggested that 20% on a DM basis may maximise their health. Always remember that regular weigh-ins and body condition assessments are the most practical strategies to help keep a growing puppy on track at an optimal rate.

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