

LISA H. GREGORY PH.D

BEGINNERS GUIDE TO

# HEALING WITH DMSO





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# Introduction

This science-backed guide will help you understand how DMSO works, why it works, and the many ways you can harness its power to heal your aches, pains, and other ailments, all in an easy-to-read and friendly way. DMSO (dimethyl sulfoxide) is a natural substance that comes from wood, and, when applied topically, can offer a host of pain-relieving benefits. Healing with DMSO will dispel the myths and falsehoods surrounding this substance while presenting the latest research-backed facts on how you can reap DMSO's many benefits.

From dosages to application methods, you'll be presented with all the information needed to find the best and safest method for using DMSO at home. Discover how you can use DMSO to speed your body's healing process from wounds, burns, and muscle injuries. This book will help you understand how you can safely and effectively use DMSO to treat everything from headaches and inflammation to osteoarthritis and rheumatoid arthritis, all without the use of prescription medication!

# Topical DMSO for Pain

DMSO (dimethyl sulfoxide) is a small organic compound originally used for its solvent properties. Prior to the 1960s it was widely used in the wood and paper industry. Dr. Stanley Jacob, an organ transplant surgeon, noticed in 1961 that DMSO could be used to preserve organs, and it continues to be used when storing biological tissues and organs to this day. Dr. Jacob noticed that DMSO penetrated the skin, rapidly leading to a garlic-like taste and odor on people's breath; thus began a life-long research interest for Dr. Jacob. He continues to advocate widespread use of DMSO, which he maintains is as useful as aspirin.

The biological properties of DMSO have been broadly investigated. During the 1970s, many veterinary and human applications were examined, which ultimately gave rise to FDA approval for DMSO as a treatment for at least one clinical entity, that being interstitial cystitis. This condition primarily affects women who typically present with bladder pain and difficulties with urination. Treatment consists of instillation of DMSO into the bladder using a catheter. Treatment, though uncomfortable, is effective. The focus of this review is on the more general use of DMSO in treating various painful conditions. For these, DMSO is primarily used topically.

# Biochemistry

Chemically, DMSO is called an amphipathic molecule, meaning it is compatible with both polar and non-polar chemicals. This allows it to both dissolve water-insoluble compounds and mix well with water. For this reason, it is widely used as a solvent in a variety of chemical and pharmaceutical settings. These properties also allow DMSO to readily cross tissue membranes, carrying with it any dissolved compounds.

## Mechanism of Action

DMSO reversibly crosses biological membranes without damaging them, including the blood-brain barrier. This property has led to its use as a vehicle for drug therapy. The absorption of a wide range of drugs and other small molecular weight compounds can thus be facilitated, though not larger molecules like insulin and other proteins. This also underlies concerns about the transfer of undesirable contaminants across these membranes.

A large number of biological studies has been carried out with DMSO. These studies have established that DMSO impacts a wide range of physiological processes, including the inflammatory process, the cell cycle, apoptosis, and lipid metabolism. The precise contribution that each of these makes to a possible analgesic effect is not known. DMSO is also known to be a free radical scavenger, particularly of the hydroxyl radical. It is believed that DMSO may relieve pain by inactivating the toxic oxygen radicals produced by various types of tissue injury.

# Clinical Studies

The topical use of DMSO to treat pain is reported to be supported by many studies. However, a highly positive review only cited studies published in the 1960s. The only painful condition in which DMSO was studied in a number of controlled studies was complex regional pain syndrome type 1 (CRPS I). CRPS I is a heterogeneous syndrome diagnosed after other painful conditions have been excluded. It is characterized by pain originating with an initial noxious event that proceeds to pain disproportionate to the initial injury. This leads to symptoms of diffuse pain, spreading edema, temperature disturbances, and restricted range of motion.

Many different treatments, pharmacological and non-pharmacological, have been recommended for CRPS I.<sup>7</sup> A 1997 review of CRPS therapy found 26 controlled trials involving 17 different treatments. Many of these had no controlled studies to support their use, but topical application of DMSO was found to have "limited support" in relieving pain. This conclusion was based on one clinical trial, which a more systematic review in 2002 evaluated as being of low quality. The trial randomly assigned 26 patients to either 50% aqueous DMSO or a regional intravenous sympathetic block. DMSO was applied four times daily for three weeks. Significant improvements were found for pain and daily activity scores compared to baseline ( $P < 0.05$ ), but no differences were found between the two groups.

The 2002 systematic review located one other study that was evaluated as being of high quality. This double-blind, randomized study assigned 32 subjects to either 50% DMSO cream or placebo cream. Subjects also received physical therapy as pain would allow. After two months, both groups showed significant improvements in pain and overall symptom scores compared to baseline. The overall symptom score was significantly better for the DMSO group ( $P < 0.01$ ).



A 2003 double-blind, randomized study was conducted with 146 subjects. One group applied 50% DMSO cream to the affected area five times daily and took one effervescent placebo tablet three times daily. The second group applied a placebo cream five times daily and took one 600 mg N-acetylcysteine (NAC) effervescent tablet three times daily. NAC is another free radical scavenger used to treat CRPS I. Subjects in both groups also received standard oral analgesics as required, along with standard occupational or physical therapy. Outcome measurements included those for pain, temperature, and range of motion. These were evaluated at baseline and after six, 17, 32, and 52 weeks. Subjects were offered the opportunity to switch groups at 17 weeks. No significant differences were found between the two groups for pain reduction. Both groups had a clinically relevant reduction in an overall impairment level score. This study also referenced an open trial published in Dutch, which found reduced pain in CRPS I patients using 50% DMSO cream.

A small number of additional studies were located in which topical DMSO was used to treat pain. A Cochrane review of nonsteroidal anti-inflammatory drugs for the treatment of tennis elbow identified one study using DMSO. A randomized, double-blind controlled study involved 102 subjects with either tennis elbow or rotator cuff tendinitis. For one year, patients used either 70% DMSO aqueous solution or 5% DMSO aqueous solution. The latter was used as a placebo so that patients would still detect the distinctive DMSO taste and odor. Measurements of pain, tenderness, swelling, and range of motion showed no significant differences between the groups.

A German study examined topical DMSO in another painful condition, gonarthrosis (knee joint damage that is not advanced). This double-blind controlled study randomized 112 patients to either 25% DMSO gel or a placebo gel. After three weeks, patients using DMSO had significantly improved scores over placebo for pain during everyday activities ( $P = 0.019$ ), pain at rest ( $P = 0.015$ ), and

pain on palpation ( $P = 0.029$ ). Pain diaries also reflected significant improvements.

## Adverse Effects

Topical application of DMSO is generally well tolerated, although mild transient local burning, rash, and pruritis have been reported. The most frequently reported adverse effect with topical DMSO is the distinctive garlic-like taste and breath odor. This arises within minutes of applying DMSO and is caused by sulfur meta-bolites. Much of the controversy surrounding DMSO arose after a woman in Ireland died from an allergic reaction to DMSO in 1965. Headache, drowsiness, and other flu-like symptoms have also been reported occasionally.

# Drug Interactions

Evidence from animal studies has raised concerns about drug interactions, but specific reports were not found. DMSO enhances the topical absorption of many drugs. Use of DMSO along with other topical drugs will likely increase their systemic concentrations.

# Formulation

DMSO is available as aqueous solutions, gels, or creams. Most studies were conducted with 50% preparations, although formulations are available in various concentrations.

# Why Do People Use DMSO

DMSO has been used to try to relieve the pain of osteoarthritis. It has also been promoted as an "alternative" cancer treatment.

People have used it to try to treat wounds, burns, and other injuries. People have also used it to try to treat such conditions as:

- Headache
- Rheumatoid arthritis
- Eye problems
- Scars
- Scleroderma (disease that causes scar tissue to form in the skin)

Other than its use as a prescription medicine, there is little or no scientific evidence to support other claims made about DMSO's effectiveness.

The American Cancer Society says there is no evidence to support the use of DMSO to treat cancer. Using it that way could cause serious delays in getting proper and effective treatment.

A recent analysis of studies on the use of DMSO to relieve osteoarthritis pain found that it was not significantly more effective than placebo in relieving joint pain.

There are no studies that provide guidelines for determining the proper dose of DMSO. The gel used to treat osteoarthritis typically has a concentration of 25%. It is applied three or four times a day. But DMSO sold without a prescription can range from 10% concentration to 90%.

# How to Apply DMSO Topically

Dimethyl Sulfoxide (DMSO) is a byproduct of the paper-making process, originating from a substance found in wood. It now can be found as a prescription medication as well as a dietary supplement that can be taken by mouth, applied topically, or injected, depending on its intended purpose and effectiveness.

DMSO is most frequently used for muscles and joints as a natural pain reliever. It is excellent as an anti-inflammatory and has many uses as a general pain reliever. DMSO is a pretty unique substance, so let's go over how to properly apply DMSO gel topically.

## ***Clean Your Hands and the Application Area***

DMSO is an amazing carrier! What this means is that DMSO has the ability to enhance the absorption of things that are applied with DMSO or that are already on your skin. (This is one of the reasons we offer essential oil-infused DMSO and blends with things like Magnesium, and vitamins.)

It is important to wash your hands and under your nails thoroughly before using topical DMSO so that any dirt, bacteria, or other unwanted substance doesn't also absorb into the skin. Similarly, you should always clean the area you plan to apply DMSO, just in case there is some harmful substance on your skin with a molecule small enough to be carried through the skin.

## ***Test a Patch First***

Temporary skin irritation is normal with DMSO, so before the first use, apply it to a small area on your forearm to test your skin sensitivity so you know what to expect. To reduce skin irritation, allow the DMSO to be absorbed for a few minutes (5-20 depending on your sensitivity) and then wipe off any excess. If irritation persists, rinse with cool water.

DMSO can be applied directly to your skin with clean hands. If you prefer not to use your hands, you can use a cotton ball to apply it to the desired area. If using liquid DMSO, you can also use a spray top.

Allow it to dry for about 20 minutes, then you can wipe off any excess.

Remember, DMSO is a solvent that can dissolve other substances (like some types of plastic), so make sure your skin is dry before you put on clothes or come in contact with other things.

Your skin may tingle after topically applying DMSO. In some instances, people have reported experiencing a slight smell and/or taste of garlic after applying DMSO topically. A little odd, but nothing to fret about. (Essential oil infused DMSO also tends to help with any lingering smell. Try Wintergreen, Peppermint, or Orange if you don't like the smell.)

### ***How to Mix***

Apply DMSO to areas of pain such as the spine, a bone, wound (not to an open wound), sprained muscles, torn ligaments, joints, or over the abdomen such as in cases of IBD's, endometriosis, ovarian cysts, or other issues. DMSO can be applied to bruises, injuries, scar tissue, and is exceptional for any area of inflammation. It is can be helpful for arthritic joints or knee injuries.

### ***Here is how it is mixed and applied:***

#### **General Mixing**

- 50/50 mix- 1 part water, aloe vera juice or colloidal silver to 1 part 99% DMSO- apply 1-4 times daily
- 70/30 mix- 1 part water, aloe vera juice or colloidal silver to 2 parts 99% DMSO- apply 1 or 2 times daily



- 10/90 mix- 1 part DMSO to 90% carrier such as making a cream or ointment for mild applications

If mixing the DMSO yourself and not using a premixed retail product, blend with a carrier either aloe vera juice, distilled water, or colloidal silver. Lily of the Desert is preferable, whole leaf, preservative free, and organic aloe vera juice. Do not use the gel because it is juice thickened with carrageenan and not gel. Mix this in the appropriate ratio in a glass bottle. The products when mixed will cause a heat reaction for a few minutes. This is a chemical reaction and normal. The reaction indicates you have real product and should briefly become hot during the chemical reaction as the DMSO bonds to the carrier. When using a dropper bottle, you can easily measure and apply a few drops quickly to a small area like a knee or ankle.

For larger coverage areas. Use either a 50/50 blend or combine 2 tablespoons of 99% pure DMSO to 2 tablespoons Aloe Vera Juice; mix thoroughly in a glass bottle or glass bowl, then apply directly to the area of application. Allow this to dry completely, which takes about 20 minutes. DO NOT rub or massage. Rubbing will cause redness or a skin burn similar to a rug burn. Just leave it alone and allow it to dry. Skin may tingle or itch, even become red. This is also normal. If it is too strong, you will need to further reduce your dilution to a 1 part DMSO to 3 parts carrier for example.

DMSO is a dehydrating substance. The reason for diluting to a 70/30 or 50/50 product is in order to apply it more frequently to a problem area without drying out the skin. Between applications you can also apply organic coconut oil to the skin to help it remain more hydrated. If the skin is too dry you will need to stop using the product for a day and let the skin rest. This is an amazing product with awesome results if it is used correctly.

If you are purchasing a premixed solution, be sure it is in glass. Do NOT buy product stored in plastic as it will leach out chemicals from the plastic into the DMSO. If mixing it yourself, only combine and store it in glass. What is DMSO is stored in matters just as

application to clean skin matters. DMSO will carry contaminants into your bloodstream just as it will carry pain relief. Pain relief can be further realized by adding a few drops of essential oils to your blend. Do not use oils like clove or cinnamon for example. Certain essential oils are too harsh on the skin and should be used other ways and not combined with DMSO.

Remember DMSO will draw into the body, anything it is combined with. What is on the body will go in the body. So for this reason, be SURE that you have cleaned the area it is to be applied over and use only a pure clean soap, such as castile. Do not apply over lotion or soap residue.

When applying to your abdomen as our example (or wherever your scar tissue/pain/cramping/injury is) use your fingers or a natural hair paintbrush, and apply to the area. DO NOT massage into the skin. Simply lay it over the area. Never use anything synthetic with DMSO. Do not lay a plastic bag over the area like with a castor oil pack because it will pick up and transport into your bloodstream, everything it comes into contact with. This is the beauty of DMSO. DO wash your hands and avoid lotions, creams, soap residue, fragrance, or other contaminants.

DMSO may cause the skin to itch when it is applied and as it dries. This is normal. A rash is not normal. Redness is normal, especially when you first start to use it. Redness can be reduced by changing the area it is applied to each time so as to avoid repeat application to just the same area over and over without resting the skin, especially sensitive skin. If using it on a particular area, such as your knees, alternate from one knee to the other and you will experience less redness. If the area becomes too irritated, just stop for a couple of days and then begin again. The redness is not dangerous. It is an irritation from the effectiveness of this product caused by its strength or dehydration of the skin which is unavoidable.

*Allow the Mixture to Dry*

If you wish to follow with a hot castor oil pack, then you can apply this after the DMSO mixture. If using a castor oil pack, use the flannel with the castor oil and cover the area with another cotton towel but do not use plastic. Use the hot water bottle as normal. Waiting at least an hour or two after the DMSO application before applying the castor pack is probably a good time gap.

Note: After you have applied a 50/50 DMSO mixture a few times, if you think your skin will tolerate a stronger application, you can increase it to 70% DMSO to 30% Aloe Vera Juice or Colloidal Silver liquid. Persons with red hair tend to have more sensitive skin so a 50/50 mixture is generally recommended. DMSO applied to areas below the waist (such as on the knees for example) (not including genitals) will tolerate a higher concentration more easily. You may also often develop a garlic-like odor on your skin or breath. This is due the high sulfur content of DMSO which is why it is so effective. This is normal and stops as soon as you stop using it.

## How Much to Use

When using DMSO for pain relief, apply it to an area larger than where the pain is. For example, if your knee is painful, it is recommended that you apply it to six inches above and below your knee, all around the circumference of your knee. If your hand hurts, apply it all the way to the middle of your forearm, and so on.

Dabbing it onto your skin may reduce skin irritation from DMSO use. However, rubbing it in may help it to work quicker and make the effects last longer. It's best to experiment with the amount you use to see how it affects your pain and your body specifically. By experimenting, you'll find the minimum amount you can use that eases the pain.

With DMSO, a little goes a long way! Start small and apply more as you feel is needed. You will be the best judge of how much and how often to apply it.

# How Often To Apply

Some people have been known to apply DMSO anywhere from 1 to 6 or more times per day. Sources and studies show different dosages for different diagnoses.

For instance, for nerve pain, they recommend you apply it 4x daily for up to 3 weeks, but for osteoarthritis, the study had it applied 3x daily for up to 3 weeks.

In a study testing its effectiveness in treating shingles, it was applied within 48 hours of the rash appearing and then reapplied every 4 hours for 4 days.

All that being said, it's important to listen to your body when using a product like DMSO so that you're staying safe and using it properly.

For acute conditions, some sources recommend that you apply it every two hours for six to eight hours immediately after the injury occurs. Then, for the next five days or more, apply DMSO every four to six hours.

Typically, the benefits associated with DMSO uses will come in the first three weeks. For chronic conditions, the effects may take longer. Chronic pain patients often have to apply the substance for 6 weeks before a notable change occurs, but many report relief to a degree they had not been able to obtain from any other source. Although some notice some easing of pain right away, it may take six to eight weeks, or even six months in rare cases, for the maximum benefit to be achieved depending on the person and their pain.

# The Risks of Using DMSO

Some DMSO on the market may actually be industrial grade. Industrial grade DMSO may contain a number of impurities that can easily be absorbed into the skin with potentially serious health effects.

*The most frequent side effects from using DMSO on the skin include:*

- Stomach upset
- Skin irritation
- Strong odor of garlic

*More serious side effects include:*

- Severe allergic reactions
- Headaches
- Itching and burning when applied to the skin

DMSO can also cause a deadly reaction when used in high concentrations.

*Using DMSO by mouth can cause:*

- Dizziness
- Drowsiness
- Nausea
- Vomiting
- Diarrhea
- Constipation

- Decreased appetite

DMSO can increase the effect of some medicines, which can lead to serious health issues. *Examples of such medicines include:*

- Blood thinners
- Steroids
- Sedatives

The biggest concern of DMSO as a solvent is that when it gets on the skin it will cause anything on the skin to be absorbed. So be sure to wash your hands and skin well before using.

Pregnant women and women who are breastfeeding should not use DMSO, since little is known about its possible effects on the fetus or infant.

*You should also not use DMSO without talking to your doctor if you have:*

- Diabetes
- Asthma
- Liver and kidney conditions

Always keep in mind that supplements are not regulated by the FDA. And be sure to tell your doctor about any supplements you use.

# What is DMSO Used For

DMSO is an exceptionally versatile therapy. For starters, it's one of the few compounds that can be administered orally, topically, and through injection of both the vein and the muscle. The results of thousands of studies attesting to its health-promoting properties strongly support the view that DMSO is a truly significant therapeutic anti-inflammatory and that holds promise in managing a wide range of debilitating conditions:

- Arthritis - With its ability to penetrate tissues, DMSO shows value in reducing pain and inflammation in osteoarthritis, rheumatoid arthritis, and possibly even gout.
- Atherosclerosis - In laboratory tests, DMSO has demonstrated its ability to delay the development of atherosclerosis (narrowing of the arteries) induced by dietary cholesterol, as well as suppress the accumulation of cholesterol in tissues, despite severely elevated levels.
- Drug extravasation injury - Extravasation refers to the escape of a drug into the extravascular space (soft tissue), either by leakage from a vessel or by direct infiltration. When chemotherapy drugs leak into surrounding tissues (extravasate), the effects can be severely damaging. Many studies have shown that DMSO application has significantly improved extravasation tissue injury in affected patients.
- Herpes - DMSO has been used to enhance penetration of alpha-interferon ointment in the treatment of herpes.
- Interstitial cystitis - Instilling DMSO in the urinary bladder is an FDA-approved pain-relieving treatment for this chronic inflammatory condition.
- Reflex sympathetic dystrophy - DMSO helps relieve the pain of this condition, an autonomic nervous system disorder characterized



primarily by overwhelming pain in the extremities.

- Scleroderma (hardening of the skin) - In basic work done at the Cleveland Clinic, topical DMSO was found to have an anti-inflammatory effect while increasing blood supply to the skin.

- Strains and sprains - DMSO provides rapid elimination of pain and increased mobility when used topically. It passes through the skin's oily membranes and reduces swelling and inflammation almost immediately.

- Keloids, Scars, Burns, Bruises - A concentration of 50 to 80% put on two or three times a day will flatten a raised scar after several months. It is of considerable value in superficial burns and when applied quickly to an injury, it can eliminate any bruising.

## Why It's So Effective

Sulfur compounds are found in all body cells and are indispensable. They are needed for a number of chemical reactions involved in the detoxification of the body. As a source of sulfur, DMSO aids in heavy metal detoxification. Sulfur binds with toxic heavy metals (mercury, lead, aluminum, cadmium, arsenic, nickel) and eliminates them via urination, defecation and sweating. DMSO protects the cells from mechanical damage and considerably less amounts of it is needed to achieve results compared to many other pharmaceutical drugs. This is a crucial mechanism since some molecules in our bodies produce an unequal number of electrons and the instability of the number causes them to destroy other cells. DMSO hooks on to those molecules and they are then expelled from the body. DMSO is an effective pain killer, blocking nerve conduction fibers that produce pain and reduces inflammation and swelling by eliminating inflammatory chemicals.

It also has a calming effect on the central nervous system and it reaches all areas of the body, when absorbed through the skin, including the brain. That is, DMSO applied to one area often leads to pain relief in some other location due to its systemic effect. DMSO effortlessly penetrates the skin and the blood-brain barrier, penetrating tissues, and entering the bloodstream. It further improves blood supply to an area of injury by dilating blood vessels and increasing delivery of oxygen and by reducing blood platelet stickiness. DMSO boosts the immune system, increasing the production of white cells and macrophages that destroy foreign material and pathogens in the body. It also has anti-bacterial, anti-viral and anti-fungal properties. Among the sulfur compounds, DMSO is probably the one that has the widest range and greatest number of therapeutic applications ever shown for any other single chemical. It stimulates healing, which is a key to its usefulness in any condition. It is among the most potent free radical scavengers known to man, if not the most potent one.

## Important Points about DMSO

DMSO is a very temperature sensitive product. Liquid DMSO can and will crystallize in a cold environment. If this occurs, place or keep the DMSO bottle in a warm location (15°C – 20°C), and within a few hours it should go back to liquid form. For faster results, place the bottle in a clean zip lock bag, seal it, and place it in warm water. Under any circumstances, do not microwave it! When using DMSO, always make sure to have clean hands and skin. DMSO is a powerful pain reliever and transporter. If you have dirt or anything else on your hands and /or skin, DMSO will take it down to your deep tissue, as far as to the seventh layer into the dermis, and it can cause irritation or discomfort. If using DMSO after a shower, it is recommended to wait 30 minutes to an hour, as the pores in the body are wide open and too much DMSO can be absorbed by the body, causing irritation or discomfort. Also, do not cover areas where DMSO is applied; it should be allowed to air dry. When starting a DMSO regimen, we recommend starting with a small amount and gradually increasing the dosage, as the product is very strong. If the DMSO is still too strong, we recommend mixing it with other topical products such as Recovery H Cream or Sweet Relief Cream at a 50:50 ratio to reduce the product strength. DMSO has a strong sulfur and garlic odor. When applied, you may experience a garlic taste in your mouth. This is a normal occurrence.

# DMSO Penetrates Membranes and Eases Pain

The first quality about the drug was its ability to pass through membranes, an ability that has been verified by numerous subsequent researchers. DMSO's ability to do this varies proportionally with its strength up to a 90 percent solution. From 70 percent to 90 percent has been found to be the most effective strength across the skin, and, oddly, performance drops with concentrations higher than 90 percent. Lower concentrations are sufficient to cross other membranes. Thus, 15 percent DMSO will easily penetrate the bladder.

In addition, DMSO can carry other drugs with it across membranes. It is more successful ferrying some drugs, such as morphine sulfate, penicillin, steroids, and cortisone, than others, such as insulin. What it will carry depends on the molecular weight, shape, and electrochemistry of the molecules. This property would enable DMSO to act as a new drug delivery system that would lower the risk of infection occurring whenever skin is penetrated.

DMSO perhaps has been used most widely as a topical analgesic, in a 70 percent DMSO, 30 percent water solution. Laboratory studies suggest that DMSO cuts pain by blocking peripheral nerve C fibers. Several clinical trials have demonstrated its effectiveness, although in one trial, no benefit was found. Burns, cuts, and sprains have been treated with DMSO. Relief is reported to be almost immediate, lasting up to 6 hours. A number of sports teams and Olympic athletes have used DMSO, although some have since moved on to other treatment modalities. When administration ceases, so do the effects of the drug.

DMSO is one of the few agents in which effectiveness can be demonstrated before the eyes of the observers. If we have patients appear before the Committee with edematous sprained ankles, the

application of DMSO would be followed by objective diminution of swelling within an hour. No other therapeutic modality will do this.

Chronic pain patients often have to apply the substance for 6 weeks before a change occurs, but many report relief to a degree they had not been able to obtain from any other source.

# DMSO and Inflammation

DMSO reduces inflammation by several mechanisms. It is an antioxidant, a scavenger of the free radicals that gather at the site of injury. This capability has been observed in experiments with laboratory animals and in 150 ulcerative colitis patients in a double-blinded randomized study in Baghdad, Iraq. DMSO also stabilizes membranes and slows or stops leakage from injured cells.

At the Cleveland Clinic Foundation in Cleveland, Ohio, in 1978, 213 patients with inflammatory genitourinary disorders were studied. Researchers concluded that DMSO brought significant relief to the majority of patients. They recommended the drug for all inflammatory conditions not caused by infection or tumor in which symptoms were severe or patients failed to respond to conventional therapy.

# DMSO and Central Nervous System Trauma

Experiment using DMSO with injury to the central nervous system. Working with laboratory animals, he discovered that DMSO lowered intracranial pressure faster and more effectively than any other drug. DMSO also stabilized blood pressure, improved respiration, and increased urine output by five times and increased blood flow through the spinal cord to areas of injury. Since then, DMSO has been employed with human patients suffering severe head trauma, initially those whose intracranial pressure remained high despite the administration of mannitol, steroids, and barbiturates. In humans, as well as animals, it has proven the first drug to significantly lower intracranial pressure, the number one problem with severe head trauma.

We believe that DMSO may be a very good product for stroke and that is a devastating illness which affects many more people than head injury. We have done some preliminary clinical trials, and there's a lot of animal data showing that it is a very good agent in dissolving clots.

# Other Possible Applications for DMSO

Many other uses for DMSO have been hypothesized from its known qualities and have been tested in the laboratory or in small clinical trials.

DMSO has long been used to promote healing. People who have it on hand often use it for minor cuts and burns and report that recovery is speedy. Several studies have documented DMSO use with soft tissue damage, local tissue death, skin ulcers, and burns.

In relation to cancer, several properties of DMSO have gained attention. In one study with rats, DMSO was found to delay the spread of one cancer and prolong survival rates with another. In other studies, it has been found to protect noncancer cells while potentiating the chemotherapeutic agent.

Researcher as early as 1975 discovered that it could break down the resistance certain bacteria have developed.

In addition to its ability to lower intracranial pressure following closed head injury, a study suggests that the drug may actually have the ability to prevent paralysis, given its ability to speedily clean out cellular debris and stop the inflammation that prevents blood from reaching muscle, leading to the death of muscle tissue.

With its great antioxidant powers, DMSO could be used to mitigate some of the effects of aging, but little work has been done to investigate this possibility. Toxic shock, radiation sickness, and septicemia have all been postulated as responsive to DMSO, as have other conditions too numerous to mention here.



## Recommendation

Some generalized pain conditions do not respond well to conventional analgesics. Given that topical DMSO has been somewhat effective in treating CRPS I, and that it is generally well tolerated, use on a trial basis can be suggested. However, patients should be warned of the taste and odor on their breath, which may make its use intolerable. Patients should be alerted to the importance of using pharmaceutical grade DMSO. Although less expensive, industrial grade DMSO can contain impurities that will be rapidly absorbed into the body and may cause adverse reactions. Similarly, the skin should be cleaned thoroughly before applying DMSO to prevent absorption of skin contaminants. Patients should also be given information about other pain-relieving strategies that may complement the use of DMSO or other analgesics.

# Safety Concerns

DMSO is likely safe when used as a prescription medication. Don't use products that are not prescribed by your health professional. There is concern that some non-prescription DMSO products might be "industrial grade", which is not intended for human use. These products are possibly unsafe, as they can contain impurities that can cause health effects. To make matters worse, DMSO readily penetrates the skin, so it carries these impurities rapidly into the body.

Some side effects of taking DMSO by mouth or applying it to the skin include skin reactions, dry skin, headache, dizziness, drowsiness, nausea, vomiting, diarrhea, constipation, breathing problems, vision problems, blood problems, and allergic reactions. DMSO also causes a garlic-like taste, and breath and body odor.

## *Special Precautions & Warnings:*

**Pregnancy and breast-feeding:** There is not enough reliable information about the safety of taking DMSO if you are pregnant or breast-feeding. Stay on the safe side and avoid use.

**Diabetes:** There are reports that topical use of DMSO can change how insulin works in the body. If you use insulin to treat diabetes and also use DMSO, monitor your blood sugar closely. Insulin doses may need to be adjusted.

Certain blood disorders. Injecting DMSO intravenously (by IV) might cause red blood cells to break down. This might be a problem for people with certain blood disorders. DMSO might make these conditions worse.

**Liver problems:** DMSO might harm the liver. If you have liver conditions and use DMSO, be sure to get liver function tests every 6 months.

**Kidney problems:** DMSO might harm the kidneys. Kidney function tests are recommended every 6 months if you use DMSO and have a kidney condition.

# Dosing Considerations

The following doses have been studied in scientific research:

## *Applied To The Skin:*

- For prevention of some side effects of cancer treatment: 77-90% DMSO is typically applied under medical supervision every 3-8 hours for 10-14 days.
- For shingles (herpes zoster): 5-40% idoxuridine in DMSO is within 48 hours after the appearance of a rash and applied every 4 hours for 4 days.
- For nerve pain: 50% DMSO solution has been used 4 times daily for up to 3 weeks.
- For osteoarthritis: 25% DMSO gel has been used 3 times a day, and 45.5% DMSO topical solution has been used 4 times a day.

It's important to note that DMSO is possibly unsafe when applied to the skin. There are reports that industrial-grade DMSO is being used for self-treatment of several disease conditions. Industrial-grade DMSO is not of the same quality as the DMSO that is used for drug research purposes since it may contain impurities. DMSO easily penetrates the skin and brings along impurities and other substances that may be hazardous to health.

## *Inside The Bladder:*

- For frequent urge to urinate (interstitial cystitis) and for chronic inflammatory bladder disease: Healthcare providers drip a DMSO solution into the bladder using a tube called a catheter. The catheter is removed and the patient is asked to hold the solution for a period of time before urinating.

# DMSO Use in Horses

Two decades ago, if you mentioned dimethyl sulfoxide (DMSO) around the horse barn you may have gotten puzzled looks in response. Back then, this industrial solvent turned anti-inflammatory therapy was relatively new to the horse world, and even if people had heard of DMSO they viewed it as an unusual or even mysterious option. Since then, DMSO has gone mainstream. It is approved by the Food and Drug Administration (FDA) for topical use on horses, but veterinarians regularly use the chemical “off-label” in other ways to treat a wide array of inflammatory conditions, from laminitis to neurological problems. When the DMSO’s distinctive garlicky smell wafts through the barn these days, people are more likely to nod knowingly than wonder what’s going on.

Nonetheless, DMSO is a little like aspirin something that many people use without necessarily thinking too much about how it works. But learning more about DMSO may help you appreciate how it can be useful in maintaining your horse’s health and comfort

Its Anti-Inflammatory Properties Come Primarily from Its Antioxidant Action

DMSO is classified as a nonsteroidal anti-inflammatory drug (NSAID), just like phenylbutazone (“bute”). Unlike bute, however, DMSO controls inflammation primarily by acting as an antioxidant.

You may be more familiar with anti-oxidant sources in nutrition, such as vitamin E or lycopene, but DMSO has a molecular structure that allows it to function in the same way. Specifically, DMSO binds with “free radicals,” which are oxygen compounds leftovers from normal biochemical reactions that damage or destroy healthy cells. These free radicals are often the byproduct of inflammation and, in turn, cause more swelling and inflammation as they accumulate. DMSO is a free radical scavenger that slows or halts this process.

When used to control inflammation in strains and other soft-tissue injuries, DMSO is usually applied topically. However, it may also be injected into a target area when an injury occurs in particularly dense tissue, such as a bowed tendon, or the site is difficult to reach. A veterinarian may administer DMSO orally or intravenously in the early stages of laminitis to try to slow or halt the inflammatory cascade.

## It Draws Fluid from Tissues

DMSO is a hygroscopic compound, meaning it attracts water. This property makes the compound especially versatile. For instance, it can reduce edema in swollen limbs and is often used as part of a “sweat” to combat stocking up. DMSO can also reduce swelling in the brain and spinal cord, which can be literally lifesaving in diseases like West Nile encephalitis. DMSO may be used to draw fluids out of the lungs in cases of acute pulmonary edema.

Because it pulls water from tissues, DMSO has a diuretic effect, meaning it makes a horse urinate more. This can help flush toxins from the body more quickly. With this action in mind, DMSO is often given intravenously in the treatment of cantharidin poisoning (blister beetle toxicity), to lessen the effect of the toxin on the kidneys and intestinal tract. After episodes of tying up, DMSO may help horses eliminate waste products of muscle breakdown through their urine more quickly. The diuretic action of DMSO, however, can make it unsafe for horses who are dehydrated or in shock. It can further dehydrate these animals or dangerously lower their blood pressure.

# It Can Carry Other Substances through the Skin

DMSO's molecular structure allows many substances to dissolve completely within it. It also allows the chemical to transport these dissolved substances through cell membranes without damaging them, even if these substances wouldn't be able to pass through on their own.

For instance, treating rainrot or other skin infections can be difficult because the responsible organisms are buried deep under the skin or crusty, painful scabs. However, a mixture combining antibacterial medication with DMSO can pass through the skin and reach the affected area. For the same reason, DMSO is often added to antifungal medications for treatment of eye conditions and sometimes to steroids for targeted, topical anti-inflammatory treatment.

It's important, of course, to avoid inadvertently mixing DMSO with potentially toxic substances. You wouldn't want fly spray crossing into your horse's bloodstream, for example, so take care to avoid applying DMSO to your horse if he has recently been sprayed. Likewise, avoid mixing DMSO with substances that could be toxic if ingested, such as organophosphates or mercury salt. Also be mindful that the effects of some drugs, such as corticosteroids and atropine, are intensified when mixed with DMSO, so doing so needs to be done with caution under a veterinarian's direction.



# It May Provide Pain Relief on Its Own

Although it's commonly mixed with compounds to provide pain relief, some studies suggest that DMSO alone has analgesic properties. Research shows that DMSO slows or blocks conduction of impulses along nerve cells, which in effect reduces pain from musculoskeletal injuries, postoperative incisions and other sources. Relief is only temporary lasting up to a few hours because as the DMSO dissipates, normal nerve function returns. It can be combined with other pain-relieving drugs, however, to extend the analgesic action.

If it seems like DMSO has a variety of purported actions, that's true. It's nothing if not versatile. Some applications of DMSO combine all of these: For instance, it is often used in surgical colic cases to reduce the risk of tissue adhesions due to inflammation and poor circulation; some surgeons think that it may also provide some pain relief in the hours following surgery.

# It's a Prohibited Substance in Some Sports

DMSO isn't technically a medication, but various competition organizations treat it as one when it comes to drug testing.

The Fédération Equestre Internationale (FEI) classifies DMSO as a "controlled" prohibited substance, meaning that although it may have some therapeutic value, DMSO has the potential to affect a horse's performance and its use is forbidden or limited. As of January 2018, the threshold of DMSO allowed by FEI was 15 micrograms per milliliter in urine or one microgram per milliliter in plasma. The Jockey Club allows 10 micrograms per milliliter of plasma. If you compete with your horse, check any governing association rules regarding DMSO use.

Also keep in mind that because DMSO can move other materials through the skin, combining it with other medications could result in a violation of thresholds for both. For instance, mixing DMSO with the topical NSAID Surpass (diclofenac) can cause an increase of the medication in the bloodstream, leading to a disqualifying test. The medication guidelines for the United States Equestrian Federation state, "Do not apply diclofenac cream in combination with any other topical preparations including DMSO, nitrofurazone, or liniments."