DMSO Health Benefits

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# Table Of Contents

- **DMSO: The Wonder Drug – but really a Natural Healing Compound**  
- **What is DMSO?**  
- DMSO penetrates skin and membranes  
- DMSO carries other compounds alongside  
- DMSO as a cryoprotectant  
- DMSO and Sulphur (DMSO is sulphur)  
- **DMSO Health Benefits in a Nutshell**  
- **DMSO Health Benefits in more detail**  
- Inflammation, pain and swelling  
- Interstitial cystitis or Bladder Inflammation  
- **Musculoskeletal System Diseases**  
- Soft tissue injuries  
- Stroke  
- Head and spinal cord injury  
- Heart attack  
- Cancer  
- **DMSO Potentiation Therapy**  
- DMSO as a standalone cancer treatment  
- **Immunity**  
- Microbial Infections  
- Scleroderma and other connective tissues disorder  
- Alzheimer’s disease
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down’s Syndrome</td>
<td>27</td>
</tr>
<tr>
<td>Complex Regional Pain Syndrome (CRPS -1)</td>
<td>28</td>
</tr>
<tr>
<td>Ulcerative colitis</td>
<td>29</td>
</tr>
<tr>
<td>Radiation exposure</td>
<td>29</td>
</tr>
<tr>
<td>Ocular diseases</td>
<td>30</td>
</tr>
<tr>
<td>DMSO Controversy</td>
<td>31</td>
</tr>
<tr>
<td>Application</td>
<td>34</td>
</tr>
<tr>
<td>Toxicity</td>
<td>35</td>
</tr>
<tr>
<td>Side-effects and concerns with DMSO application</td>
<td>36</td>
</tr>
<tr>
<td>Precautions</td>
<td>37</td>
</tr>
<tr>
<td>Disclaimer</td>
<td>38</td>
</tr>
<tr>
<td>References</td>
<td>39</td>
</tr>
<tr>
<td>More information and where to buy DMSO</td>
<td>43</td>
</tr>
</tbody>
</table>
DMSO: The Wonder Drug – but really a Natural Healing Compound

Hailed as a wonder drug, Dimethyl Sulfoxide or DMSO is a simple by-product of paper manufacturing. Nobody could ever imagine that this peculiar organic compound, commonly used as an industrial solvent, would find its way into medical community until a research team – headed by Stanley W. Jacob – chanced upon its remarkable penetrating properties in 1963.

With its extraordinary anti-inflammatory, analgesic and antioxidant properties, DMSO holds great promise in treating and managing a wide range of health conditions. But despite being backed by decades of studies and thousands of published articles, DMSO has been mired in controversies, which Dr. Stanley Jacob, also known as father of DMSO, described as “bureaucratic and economic rather than scientific.”

DMSO is available in 125 countries around the world – including Canada, Great Britain, Brazil, Germany and Japan – where it is prescribed for over a range of ailments such as pain, inflammation, arthritis, interstitial cystitis, head trauma, spinal cord injury, stroke, scleroderma, bursitis, cancer, increased intracranial pressure, scar tissue softening, wound healing, heart disease and much more. Despite this and the fact that DMSO is actually seven times less toxic than aspirin, Food and Drug Administration (FDA) has only approved it to preserve stem cells, bone marrow cells and organs for transplant; and to treat interstitial cystitis, a painful urinary bladder inflammation.

The purpose of this book is to explore the medical and clinical implications of DMSO in various conditions. On this journey we will find that DMSO indeed has well-documented benefits in a range of ailments and that this wonderful chemical compound not only helps in relieving pain and inflammation but also shows extraordinary promise in saving lives of people who have suffered stroke, and trauma to central nervous system.
What is DMSO?

DMSO (Dimethyl Sulfoxide) is a colourless, sulfur containing organic compound. It is formed as a by-product of kraft pulping – a process where wood is converted into wood pulp. Basically, DMSO can be extracted from lignin, a complex polymer that occurs naturally in wood and binds cells and fibres together in plants. It was discovered by a Russian scientist Alexander Saytzeff in 1866 who noted that this chemical compound would dissolve almost anything combined with it.

Use of DMSO in medicine began when Dr. Stanley Jacobs, former head of the organ transplant department at University of Oregon Medical School, was introduced to DMSO while looking for ways to preserve organs for transplants. He discovered that DMSO could penetrate skin, membranes and connective tissues without causing any cellular damage; and that it could also carry other compounds into biological system. This intriguing discovery flourished into his lifelong passion and he dedicated all his life researching DMSO’s role in many biological and medical implications. His dedication towards the research and the discoveries that he eventually made earned him the title of ‘father of DMSO.’

DMSO penetrates skin and membranes

DMSO’s extraordinary ability to pass through skin and other membranes was the first quality that caught Dr. Jacob’s attention. DMSO can easily penetrate skin and tissues and can even cross blood-brain barrier. Another interesting fact about DMSO application is that it has systemic effects, meaning when applied to one affected area, it is quickly absorbed through the skin and into the bloodstream thus reaching other areas of the body.
DMSO carries other compounds alongside

DMSO can also carry other substances, for example drugs and other chemicals, across the membranes while also increasing their rate of absorption and efficacy – making it a very effective drug delivery system. In fact, certain drugs, such as corticoids, antibiotics and insulin, when dissolved in DMSO are known to be used in lower doses than when used alone. This method also helps in reducing the adverse side effects exerted by these drugs while increasing their therapeutic capacity. And its property to be able to pass through the blood-brain barrier makes DMSO even more special as a drug ferrying solvent.

DMSO as a cryoprotectant

DMSO is used as a cryoprotectant, a substance that protects biological tissues from freezing. DMSO is an important part of cryoprotectant vitrification mixtures used to preserve organs and tissues as it prevent the cells from dying or becoming inactive during multiple freezing and thawing procedures. Due to its penetrating properties, it enters the cells and prevents the formation of ice crystals that would otherwise rupture or damage the cell membrane. That’s why DMSO is particularly useful in freezing and long-term storage of embryonic stem cells and hematopoietic stem cells.
DMSO and Sulphur (DMSO is sulphur)

DMSO is a sulfur compound and as such draws some of its properties from this non-metallic element. Sulfur is the third most abundant mineral in the body and it is so important that it’s deficiency is considered a possible contributing factor in the progression of diseases like obesity, heart disease, Alzheimer’s and chronic fatigue. Let’s look at some of the important functions of sulfur in the body:

1. Important part of many important amino acids such as cysteine and methionine. Cysteine is an important constituent of protein keratin, present in the skin, hair, and nails.
2. Helps in enzymatic reactions and protein synthesis.
4. Sulfur-containing amino acids helps in lipid metabolism.
5. Helps in detoxification; aids liver in producing bile and eliminate toxins.
6. Collagen in connective tissues contains amino acids held together with flexible sulfur bonds.
7. Provides protection against radiation exposure.
8. An important part of insulin, an hormone that regulates carbohydrate metabolism. Insulin molecule is made up of amino acids that are held together by sulfur molecules.
9. Part of heparin, an anticoagulant.
10. As a part of cysteine, it helps in cellular respiration.
DMSO Health Benefits in a Nutshell

1. Inflammation, pain and swelling
2. Interstitial cystitis (bladder inflammation)
3. Musculoskeletal System Diseases
   - Arthritis, osteoarthritis and rheumatoid arthritis
   - Costochondritis
   - Tendonitis
   - Fibromyalgia
   - Bursitis
4. Soft tissue injuries - Burns
5. Stroke
6. Head and spinal cord injury
7. Heart attacks and angina
8. Cancer
9. Microbial infections
10. Toenail fungal infection
11. Herpes
12. Scleroderma and other skin ailments
13. Alzheimer’s disease
14. Down’s Syndrome
15. Complex Regional Pain Syndrome (CRPS -1)
16. Ulcerative colitis
17. Radiation exposure
18. Macular degeneration and other retinal disorders
DMSO Health Benefits

DMSO Health Benefits in more detail

DMSO has a myriad of medicinal and therapeutic applications. And some benefits are indeed dramatically effective that are difficult and in some cases even impossible to achieve with other therapies. But considering the long list of properties, it is easy to see why DMSO is used in conditions where other traditional therapies wouldn’t just work as fast, as effectively or without any serious side-effect, for example in scleroderma, arthritis, cancer, stroke, injury to spinal cord and brain, psoriasis, toenail fungal infection, heart attacks, pain, inflammation, herpes, Alzheimer’s disease and even Down’s Syndrome. Before we explore how DMSO plays an important role in these far-ranging, diverse conditions, let’s sum up its pharmacologic actions:

1. Natural compound with very low toxicity or harmful side-effects.
2. Penetrates in to deeper tissues.
3. Carries drugs and nutrients across cell membranes; and enhances of the action of a drug administered in parallel
4. Blocks pain, promotes healing and reduces inflammation.
5. Neutralizes hydroxyl radicals (OH), one of the most reactive oxygen species and known to cause chronic degenerative diseases.
7. Reduces the formation of clots in the blood vessels.
8. As a vasodilator, relaxes blood vessels and improves blood circulation.
10. Strengthens immune system
11. Acts as a diuretic
Inflammation, pain and swelling

DMSO is most widely used as a topical analgesic. It is a very effective pain killer, one of the most potent anti-inflammatory and has a unique ability to penetrate into deeper tissues – making it very effective in reducing pain, swelling and inflammation in wide-ranging conditions such as:

- Burns, cuts and wounds.
- Muscle and skeletal disorders – including arthritis, osteoarthritis, rheumatoid arthritis, gout, tendonitis, bursitis, tic douloureux, fibromyalgia
- Headache
- Soft tissue injuries such as muscle sprains and strains.

Millions of people rely on nonsteroidal anti-inflammatory drugs (NSAIDs) like aspirin and ibuprofen to treat chronic pain. These standard treatments, focusing on symptoms and not the root cause, do more harm than good in the long run. Adverse side effects associated with using NSAIDs and steroids such as nausea, drowsiness, gastro-intestinal ulcers and even bleeding make the situation go from bad to worse, not to mention the toxic load on kidneys and liver.

As a topical pain relief therapy, DMSO is a better and a safer anti-inflammatory than steroids, aspirin and other NSAIDs. It is also convenient to apply and provides faster relief as it is quickly absorbed into deeper tissues. Studies suggest that DMSO is able to cut pain by blocking peripheral nerve C fibers, which mediate pain sensation in our body [1]. DMSO reduces inflammation through several mechanisms.

As a powerful anti-oxidant, it scavenges free radicals accumulated at the site of injury. During inflammation, inflamed tissue fill up with fluid and this additional pressure results in increased pain, inflammation and tissue damage. DMSO facilitates the drainage of these fluids from the inflamed tissues – reducing swelling while accelerating the repairing and healing process.
Interstitial cystitis or Bladder Inflammation

Interstitial cystitis, also known as painful bladder syndrome, is a chronic condition where one experiences recurring discomfort and pain in bladder and the surrounding pelvic area. The symptoms may include discomfort and pressure in bladder, mild to severe pain in bladder, lower back, lower abdomen and pelvis, urgent need to urinate and frequent need to urinate. The pain may get worse as the bladder fills with urine; during menstruation or during sexual intercourse.

Studies prove that washing or bathing the bladder with DMSO solution reduces pain and other symptoms in people with chronic bladder inflammation [2] [3] [4] [5]. In fact, DMSO is the first and the only drug approved by the U.S Food and Drug Administration to treat interstitial cystitis.

The treatment, also known as bladder instillation or bladder wash, involves using a catheter to pass a measured amount of DMSO up the urethra and into the urinary bladder. The solution is held for about 10-15 minutes before it is expelled. DMSO is believed to work through several mechanisms to bring relief and comfort in interstitial cystitis [6]:

- Reduces irritation and pain in bladder as an anti-inflammatory and analgesic
- Improves blood supply and aids healing as a vasodilator
- Relaxes bladder and pelvic muscle by reducing contractions
- Reduces pain by lowering the levels of substance P from the bladder nerves. Substance P or SP, a neuropeptide secreted from sensory nerve endings and inflammatory cells, is known to trigger pain.
- Increases bladder capacity by softening collagen, thus dissolving scar tissue.

Besides interstitial cystitis, DMSO has also been used to treat many other inflammatory genitourinary disorders – including radiation cystitis, chronic prostatitis, Peyronie’s disease and acute epididymitis.
It is seen that orthodox therapy such as hydrodistention and fulguration used to treat certain chronic genitourinary conditions may actually result in more fibrosis and ends up aggravating the situation. DMSO eliminates these complications and prove to be an effective therapeutic approach to not only improve the symptoms but also avoid the need for surgery often needed to treat these conditions.

**Musculoskeletal System Diseases**

With its remarkable pain-relieving, anti-inflammatory, collagen-softening and deep tissue penetrating characteristics, it’s hardly any surprise that DMSO shows action in treating and managing a range of musculoskeletal diseases – those affecting muscles, bones and joints [7] [8].

It is believed that DMSO’s capability in managing joint degenerative diseases comes from being a sulfur compound. DMSO is rich in sulfur, an element that is one of the important constituent of collagen. Collagen is a fibrous, structural protein that is integral to the formation of connective tissues found in skin, tendons, ligaments, bones, cartilage, and blood vessels. Many studies show that people afflicted with arthritis have low levels of sulfur in their cartilage.

**Arthritis, Osteoarthritis and Rheumatoid arthritis**

DMSO is a master scavenger of hydroxy radicals, reactive oxygen species dominant in arthritis and rheumatoid arthritis. These free radicals contribute to tissue damage and inflammation by destroying the cartilage and also the synovial fluid in the joints. DMSO neutralizes these free radicals – preventing them to break down the fluid and bringing down the pain, swelling and inflammation in arthritis patients. It is also beneficial in improving mobility in the joints and managing pain in osteoarthritis. It is an age related condition where wear and tear starts to degenerate the cushion between the joints and resulting in pain, swelling and restricted joint mobility, begins to degenerate due to wear and tear.
DMSO also proves to be effective in treating rheumatoid arthritis, an autoimmune disorder in which immune system produces antibodies that attack the joint tissues, an action that leads to chronic joint inflammation and manifests in the form of tissue damage, pain and immobility. DMSO not only reduces the antibodies but also affects free radical generation – two dominating aspects contributing to continuous tissue damage and resulting in inflammation. And DMSO application has been found to be effective in reducing pain and inflammation in many other joint degenerative disorders such as:

- **Costochondritis**: It is the inflammation of cartilage at the junction where it attaches the rib to the breastbone (sternum).
- **Tendonitis**: It is the inflammation of tendon – strong, fibrous connective tissue that connects muscle to the bone.
- **Fibromyalgia**: This is a rheumatic condition with hallmark wide-spread musculoskeletal pain and symptoms like incapacitating muscle pain, joint tenderness, fatigue, sleep disturbances, depression, headaches and general feeling of not being well.
- **Bursitis**: A bursa is a small sac of fluid that acts as a cushion or a shock absorber – minimizing the friction and strain when bones, tendons and muscles move at the joint. In bursitis, bursa gets inflamed possibly due to repetitive movement, prolonged stress or any acute or chronic infection such as staphylococcal or tuberculosis.

DMSO has been found to have particularly positive effect in treating acute bursitis. This miracle compound with so many pharmacological and therapeutic implications has showed remarkable improvement in people with chronic bursitis with calcium deposits. DMSO helps to dissolve the calcium deposits and bring fast relief that is not possible to achieve with other conventional therapies.
Soft tissue injuries

DMSO is a popular therapy to reduce pain and inflammation associated with soft tissue injuries, common in professional athletes. Most people rely on anti-inflammatory medicines like aspirin, ibuprofen and naproxen to deal with the pain, swelling and inflammation associated with injuries such as muscle sprain, strain, bone fractures and whiplash. But these medicines, though effective, takes time to heal and relieve pain while exerting toxic load on kidney and liver especially if used for prolonged durations.

DMSO, a natural compound with exceptional healing properties and very low toxicity profile, works wonders in soft tissue injuries and that too without any worrying side-effects. It works in many ways to accomplish almost immediate results:

- Reduces pain and swelling
- Gets into the system fast and speeds up the healing process
- Dilates blood vessels and reduces blood platelet stickiness – improving the flow of blood to the site of injury and increasing delivery of oxygen and nutrients for faster healing.
- Removes cellular debris and damaged tissue from the site of injury.
- Shows systemic effects as it will reach throughout the body irrespective of the region it is applied to.
- Effective for wounds and burns and significantly reduces scar formation

Stroke

Ischemic stroke is one of the leading causes of death, suffering and serious disabilities in the world and especially highly prevalent in elderly. This type of stroke occurs when a blood vessel supplying blood to the brain is blocked by a clot, thereby interrupting the flow of blood to brain. Lack of oxygen and nutrients begin to damage the brain cells within minutes.
The treatment of stroke is, therefore, aimed at restoring circulation as soon as possible, preventing further damage to the neuronal tissue and whenever possible getting the damaged brain cells to function normally. DMSO can dissolve the blood clots and stops the cascading biological effects of stroke if administered within 4 hours of the stroke and achieve even better results if given within the first crucial 90 minutes. DMSO restores the blood circulation and prevents paralysis.

DMSO is a powerful anti-oxidant and anti-inflammatory and thus targets the formation of free radicals while reducing swelling, inflammation and cerebral edema through its many properties.

For example, a 2002 study published in Neurological Research [9] reports that DMSO is known as “sodium channel blocker, microvascular platelet de-aggregator and cell membrane stabilizer.... Additionally, DMSO has the ability to increase cerebral blood flow (CBF) when given for a variety of vascular insults and to reduce intracranial pressure in humans following severe head injury.” The study concludes that a combination of dimethyl sulfoxide-fructose 1, 6-disphosphate (DMSO - FDP) can help in reducing neurologic disability after stroke. FDP plays an important role in increasing the production of ATP, thereby restoring the loss in cellular energy following stroke.

Neurosurgeon Dr. Jack de Ia Torre and Dr. Jacob believed that “DMSO should be in every ambulance and emergency room so as to start giving it intravenously to stroke victims in the ambulance as soon as picked up or, at the latest, as soon as the patient arrives at an emergency room. If such were the established practice, the number of people dying or incapacitated from strokes would plummet.”
Head and spinal cord injury

The number one challenge in severe head trauma is the elevated intracranial pressure, also known as cerebral or brain edema. With this type of injury, the brain swells against the hard skull bone creating pressure that constricts the blood vessels reducing the flow of blood into the brain, thus depriving it of the oxygen and other nutrients. What makes matter worse is that swelling also block other fluids from leaving the brain, increasing the swelling even more. It can lead to paralysis and even death.

Studies show that DMSO significantly reduces the intracranial pressure. In fact DMSO has many important properties that help in treating and managing head and spinal cord injuries and their cascading effects [10] [11] [12] [13]. DMSO is a powerful hydroxyl radical scavenger, an anti-inflammatory agent, a diuretic and a vasodilator. When administered intravenously in patients suffering from severe head and/or spinal cord injuries, DMSO:

- Dilates blood vessels – increasing the carotid artery blood flow to the brain.
- Protects cell membranes integrity in ischemic injury by reducing the blood platelet adhesion or stickiness – preventing the damage to the cerebrovascular endothelial surface occurring due to platelet adhesion.
- Reduces inflammation and edema in brain tissue
- Crosses the blood brain barrier, picks up fluid from the site of injury rushing it out of the system and providing instantaneous relief from elevated intracranial pressure.
- Increases urine output
- Stabilizes blood pressure
- Improves respiration rate
- Is shown to be effective in patients whose intracranial pressure remained high despite using mannitol, steroids, and barbiturates.
A study by Jacob and Torre [13] explores the pharmacological uses of dimethyl sulfoxide in cardiac and central nervous system damage. It reports that “effects of dimethyl sulfoxide (DMSO) administration include some desirable properties...... such as effects of DMSO on impaired blood flow, suppression of cytotoxicity from excess glutamate release that may result in lethal NMDA-AMPA activation, restriction of cytotoxic Na(+) and Ca(2+) entry into damaged cells, blocking tissue factor (TF) from contributing to thrombosis, reduction of intracranial pressure, tissue edema, and inflammatory reactions, and inhibition of vascular smooth muscle cell migration and proliferation that can lead to atherosclerosis of the coronary, peripheral, and cerebral circulation.”

In fact, researchers at the forefront of DMSO research, including Jacob and Torre, point out that no other drug works as fast in reducing the swelling and reversing the damage caused by ischemic stroke and central nervous system trauma as DMSO.

According to Dr. Jacob, “DMSO is a potent free-radical scavenger and diuretic that reduces swelling and improves blood supply to the brain. This improves blood oxygenation to brain tissue. Injured brain cells often aren’t dead. When these cells get increased blood supply and more oxygen, and when the free radicals are scavenged, dying cells can recover, and brain swelling is reduced very rapidly.”
Heart attack

If used promptly in a heart attack, DMSO can help prevent damage to the heart muscle. DMSO’s role in heart attack is attributed to the same properties through which it manages trauma to the central nervous system. DMSO dilates blood vessels and reduces platelets adhesion – improving blood circulation and maintaining the strength of endothelium (cells that lines the inner surface of blood vessels) in cardiovascular system.

A 2009 study by Jacob and Torre reports that the “effects of DMSO make it potentially useful in the treatment of medical disorders involving head and spinal cord injury, stroke, memory dysfunction, and ischemic heart disease.”

Cancer

Numerous studies indicate that DMSO displays antitumor activities [14]. It is known to be helpful in cancer treatment both by itself and also when used in combination with certain chemotherapy drugs.

Cancer cells builds a protective fibrin layer, a sticky protein coating, that prevents toxins of chemotherapy drugs from getting inside these cells – destroying them or stopping them to grow. This layer also keeps the cancer cells hidden from the body’s immune system. DMSO dissolves this fibrin cover, exposing the cancer cells to the effects of anti-cancer drugs as well as to the immune system attack.

DMSO Potentiation Therapy

DMSO not only carries certain anti-cancer drugs but also enhances their efficacy in isolating and killing cancer cells, which means it allows administration of extremely low doses of chemotherapy drugs to be effective in scavenging cancer cells. What makes this possible? DMSO has the ability to direct chemotherapy drugs to the specifically target cancer cells.
When it is mixed with certain anti-cancer drugs like adriamycin, vinblastine, 5-fluorouracil and cisplatin, DMSO chemically binds to these drugs, ferries them along while directing them to kill cancer cells. A 1968 study [15] showed that dimethyl sulfoxide (DMSO) had a very high affinity for cancer cells. The study showed that DMSO bound to the dye and dragged it into the cancer cells.

The benefits of using DMSO Potentiation Therapy or DPT are found to be manifold, for example far less chemotherapy is required to kill cancer cells and there are virtually no side effects because of low doses of anti-cancer drugs used in the therapy. DMSO, as a drug carrier, is considered especially effective in treating brain tumours which are otherwise difficult to reach.

**DMSO as a standalone cancer treatment**

In addition to increasing the effectiveness of chemotherapy, DMSO has also been shown to revert cancer cells into normal, healthy cells [16]. There is evidence that DMSO can arrest or slow down the growth of certain cancer cell lines such as prostate, breast, ovarian, lung, bladder, skin and colorectal cancer.

DMSO also possesses radio-protective properties and protects cells against radiation damage. DMSO is therefore used to reduce the toxic side effects in cancer patients undergoing radiation therapy.

A 2011 study [17] published in the Journal of Pain & Palliative Care Pharmacotherapy showed that infusion of dimethyl sulfoxide-sodium bicarbonate (DMSO-SB) showed remarkable improvement in symptoms and quality of life. The conventional therapy for metastatic prostate cancer includes chemotherapy, radiotherapy and androgen manipulation – approaches that are linked with severe side effects to the extent of increasing the risk of non-cancer related morbidity and death, and declining the quality of life. The study strongly suggested “therapy with DMSO-SB infusions could provide a rational alternative to conventional treatment for patients with MPC.”
Another 2014 study [18] published in the Journal of Pain & Palliative Care Pharmacotherapy showed that combination of dimethyl sulfoxide-sodium bicarbonate (DMSO-SB) infusion and ademetionine improved pain control, blood biochemical parameters, and quality of life for the patients suffering from adenocarcinoma of the gallbladder and biliary tract carcinoma, that particularly shows high fatal malignancy and poor response to chemotherapy and target drugs.

**Immunity**

DMSO boosts the immune system by several mechanisms. It increases the production of white blood cells and stimulate the production of MIF (migration inhibitory factors) of macrophages.

Macrophages are a type of white blood cells that detects, engulfs and digests cellular debris and pathogens such as bacteria, fungi and viruses. These specialized cells can even swallow cancer cells.

MIF guides the macrophages to move more quickly to the site of infection and fight harmful foreign organisms. In fact, MIF serves as a body’s own natural chemotherapy to fight and destroy cancer cells in the body. DMSO enters the cells and activate the pathways that are involved in the production and release of MIF. DMSO also increases cell membranes permeability, allowing toxins to flush from intracellular to extracellular where they can be excreted out of the system.

**Microbial Infections**

DMSO possesses anti-bacterial, anti-viral and anti-fungal properties and helps us fight even the deadliest of infections. Much of the infection fighting properties come from its ability to deeply penetrate the membranes without causing any damage to tissues, increase build-up of white blood cells, activate macrophages’ actions, relieve pain, promote wound healing and reduce inflammation.
There are other mechanisms through which it proves deadly to bacteria and viruses. DMSO contains oxygen. Healthy cells in our body needs oxygen to survive. On the other hand, most of the primitive bacteria and viruses – for example found in cancer, AIDS, Ebola, tuberculosis, arthritis, herpes etc. – can’t stand oxygen. They can’t protect themselves against the oxidizing effects of oxygen unlike our normal cells that use their own anti-oxidant coating to limit the damage of oxidation.

- **Anti-bacterial properties**
  - DMSO shows anti-bacterial activity against a wide range of bacteria including Escherichia coli, Pseudomonas aeruginosa, and Bacillus megaterium [19].
  - In concentrations of 30 to 50 percent, DMSO inhibits the growth of bacteria and fungus. [20]
  - A study showed that 12.5-25% concentration of DMSO inhibited the growth of highly pleomorphic bacteria regularly isolated from human tumours and blood from leukaemia patients and that too without affecting the intact blood cells [21].

- **Increased sensitivity to antibiotic resistant bacteria**
  - DMSO restores and enhances the sensitivity of antibiotic-resistant bacteria. Antibiotics – that seemed not effective against certain strains of bacteria – have been shown to have inhibitory effect on the growth of bacteria in a medium containing DMSO.
  - A study (Kamiya et al) reported that all four strains of pseudomonas showed increased sensitivity to colistin, when mixed with 5 % DMSO.
  - Tubercle bacillus, that is resistant to 2000μg of treptomycin or isoniazide, became sensitive to 10μg of either drug when the drug was treated with 0.5 5% DMSO. (Pottz etal 1967)

- **Increased reach of antibiotics**
  - DMSO shows remarkable use in carrying antibiotics to the areas of the body that are otherwise hard to reach, such as bone marrow and brain (Sanders, 1967).
• **Anti-fungal properties and toenail Fungus**
  DMSO is frequently used in anti-fungal medications and proves particularly effective in treating resilient toenail fungus. Commonly caused by candida species, toenail fungus penetrates deeply into the tissues. DMSO is combined with anti-fungal medications or herbal remedies, carrying them deeper into nail bed and target the fungus. Besides allowing the medication to reach the remote and ‘otherwise hard to reach sites’, DMSO also increases the rate of absorption of these compounds, providing fast relief.

• **Anti-viral properties**
  - Viruses lack the genetic material to sustain on their own and can only replicate within a living host cell. Once a virus is able to invade a cell, protein coating of the cell protects it against the immune attack and also from the effects of anti-viral drugs. DMSO can penetrate the cell membranes and digest the protein coating around a virus, leaving its nucleic acid exposed to the attack.
  - DMSO in 80 percent concentration deactivates several RNA viruses – including Influenza A, influenza A2, Newcastle disease virus, Semliki Forest virus – and also DNA-Virus. [22]

• **Herpes**
  Herpes is a sexually-transmitted disease caused by herpes simplex virus. This contagious disease causes cold sores around the mouth and genitals. DMSO not only helps to reduce the symptoms but also kills the virus. DMSO contains oxygen and herpes virus can’t survive in an oxygenated environment. Oxygen in DMSO prevents the virus cells from replicating – thus helping to contain the outbreak while healing it faster. It can also be mixed with other herbal anti-fungal medicines to enable them to penetrate herpes virus cell and kill it from within but caution is advised as DMSO will quickly draw this mix into the blood system.
Scleroderma and other connective tissues disorder

Scleroderma is a rare autoimmune disorder that scientists believe is caused by an overproduction and excessive build-up of collagen in body. It results in thickening, hardening and tightening of skin and other connective tissues.

While scleroderma is not contagious, cancerous or malignant, it is still a serious chronic disease that accompanies painful, disabling symptoms impacting the quality of life. In some cases, it can even cause life-threatening damage to internal organs affecting their capacity to function normally. Symptoms typically include fatigue, shortness of breath, swelling of hands and feet, ulcers in fingers, calcium deposits on fingers and joints and joint inflammation.

While scleroderma can’t be cured completely, DMSO helps to reduce the associated symptoms in patients such as providing relief from pain and stiffness and healing of ulcers on the fingertips [23] [24]. Dimethyl sulfoxide is specifically approved to treat scleroderma in Canada and Russia. DMSO’s collagen softening and anti-oxidant properties are believed to be involved in managing scleroderma and its diverse symptoms.

A Russian study [25] showed that applying 50% solution of DMSO for 30-40 minutes produced the following results: “dense skin edema lessened, increased mobility of interphalangeal joints of hands due to regression of indurative changes, decreased permeability of capillaries, increased blood flow in skin and muscles.”
The study further reported that “DMSO has a curing effect on the skin with systemic scleroderma, decreasing clinical symptoms of affected skin and inflammation processes in it. The working concentration of DMSO should be considered the 50% solution, which corresponds to the preliminary results of the researches conducted earlier in the Institute of Rheumatology AMS USSR. The 10% solution of DMSO does not have any therapeutical effect. Use of the higher concentration of this drug (more than 50%) might relate to some risk of local skin irritation. It should be noticed that patients reacted very well to the concentration used of DMSO.”

Besides systemic scleroderma, DMSO is beneficial for many other skin conditions such as shingles, psoriasis and in softening scar tissue.

Multiple research and studies show that topical DMSO can also soften the abnormal thickening of connective tissue present in Dupuytren’s contracture, Peyronie’s disease and keloids. These conditions, though different, share excessive collagen and fibrous tissue accumulation leading to hardening and thickening of connective tissue. In addition, DMSO carries other nutrients like Vitamin E or copper deeper into tissue where Dupuytrens contraction nodules and cords are present. It also helps in quick absorption of these nutrients so integral to Dupuytrens contracture protocol.

**Alzheimer’s disease**

Oxidative damage and inflammation are known to trigger the production of amyloid-beta (Aβ) proteins. This insoluble fibrous protein forms sticky plaques and neurofibrillary tangles in the brains – contributing to functional loss and subsequent death of surrounding nerve cells (neurons) in brain and leading to symptoms of Alzheimer’s disease such as memory loss and other cognitive problems.
These plaques and tangles aggregate in highest numbers in hippocampus and the neocortex, regions of the brain that plays an integral role in maintaining memory and cognitive functions. That’s why these functions take a particular hit in Alzheimer patients. A special neurotransmitter, acetylcholine, mediates memory functions in hippocampus and the neocortex and is found to be depleted in Alzheimer’s disease.

These amyloid plaques and tangles also activate immune system cells in brain, called microglia to gobble up damaged neurons and amyloid plaques. This immunological response, if prolonged, results in chronic inflammation and also starts killing healthy bystander cells, aggravating the disease even further.

A study published in the journal Brain [26] and funded by the Medical Research Council and Alzheimer’s Research UK also suggests that the progression of Alzheimer’s disease can be stopped by aiming it at the inflammation caused by microglia.

DMSO, as a very aggressive scavenger of hydroxyl radicals, helps to reduce inflammation in the brain while also dissolving amyloid proteins. It is also known to regenerate nerves.

DMSO also possesses cholinesterase properties (Sams, 1967) as it inhibits an enzyme that breaks down acetylcholine, thus increasing the levels as well as the duration of action of this neurotransmitter. As noted above, acetylcholine maintains the learning and memory functions in brain while also producing calming and relaxing effects. Acetylcholine also acts as an immune-modulator and controls inflammation in body at that level.
There is another mechanism through which DMSO helps in managing Alzheimer’s disease. The combination of DMSO and fructose diphosphate has been shown to be very beneficial in stroke and brain and spinal cord injuries. Now, this combination also proves to be effective in treating and managing the dreaded Alzheimer’s disease. DMSO helps to carry fructose diphosphate across the blood brain barrier, thus helping the sugar to restore energy to the declining brain.
Down’s Syndrome

DMSO can cross the blood brain barrier and is able to carry amino acids and other nutrients directly into the brain. These nutrients are an important part of biochemical processes that regulate and affect cerebral metabolism.

In fact, neurologists and paediatricians in several Latin American and European countries use DMSO amino-acid therapy to treat many cerebral diseases such as Down’s Syndrome, mental retardation and learning disorder. Since DMSO also improves blood flow to brain, when used with vasoactive substances, it is shown to have beneficial effects in patients with dementia.

A study [27] shows that when children with Down’s Syndrome were treated with DMSO and certain amino acids like GABA, GABOB, acetylglutamine, and arginine, they showed marked improvements in both physical and development attributes. The result included “appearance of a nasal bridge, hair becoming thicker and the eyes losing their epicanthal folds.” The study also reported advances in motor and social skills.

The authors stated "It seems to us that DMSO aminoacid therapy in trisomic children and children with severe mental retardation offers an evident advance in the therapy of this syndrome. Fundamentally, it can be observed that children aged less than three-and-a-half years react in the psychic sphere with greater receptiveness to stimulation, showing a major interest in their environment; there is an increase in their activity, and muscular tonus. A notable improvement is also noted in the adaptive and social phase. Besides, muscular coordination and statics also show a significant improvement.”
Another study showed improvements in patients suffering from cerebrovascular diseases such as infarct, cerebral embolism, hardening of the arteries of the brain and other conditions, when treated with DMSO therapy with Ipran ampoules and capsules. The researchers Dr. Grismali and Dr. Barrios summed up their therapeutic results as “recovery from the general symptoms was positive; there were favorable changes which were reflected in a feeling of wellbeing, the recovery of agility, changes of mood from depressed to gay, improvement of sleeping, and clearer speech. As regards the 'focal' results, accelerated recovery from hemiplegia and hemiparesia was registered. A speedier recovery of speech in cases of defined or indicated aphasia took place.”[28]

Complex Regional Pain Syndrome (CRPS -1)

Complex Regional Pain Syndrome, also known as reflex sympathetic dystrophy, is a chronic pain condition caused by damage to peripheral and central nervous systems functions. This damage or dysfunction usually develops after any injury, surgery, stroke or other form of trauma and is characterized by a group of symptoms such as excessive burning pain, tenderness, swelling and change in colour and temperature of the affected area. Some patients also report tremor, involuntary movements, muscle spasms, and muscle and bone atrophy.

Due to its hydroxyl scavenging ability, DMSO has been found to have a positive effect on patients with CRPS 1. In a randomised double-blind study [29] to evaluate the therapeutic efficacy of DMSO, RSD patients were given DMSO locally 5 times a day during one week and a placebo during another. It was found that DMSO improved the range of motion of all joints in the affected areas. The study concluded that “the efficacy of the hydroxyl radical scavenger DMSO indicates that RSD primarily involves an inflammatory process rather than a sympathetic reflex.”

In another study, DMSO was shown to be more effective than the conventional ismelin block therapy in reducing pain [30]. Many other studies also prove that DMSO plays an integral role in reducing symptoms associated with CRPS 1 [31] [32].
Ulcerative colitis

Ulcerative colitis is a form of inflammatory bowel disease (IBD) that causes inflammation and ulcers in large intestine (colon). Though the exact cause is not yet established but experts believe that it might be caused when body’s immune system overreacts to normal bacteria and other substances in the colon mistaking them for harmful, invading pathogens. The body sends white blood and other proteins to fight the supposed infection – producing chronic inflammation and ulceration in the intestines. Long-standing ulcerative colitis can increase the risk of colon cancer and can also can cause inflammation in spine, joints, spine, eyes, skin, and the liver.

Since DMSO destroys hydroxyl radicals, it plays an important role in reducing the inflammation experienced in ulcerative colitis. In addition, DMSO also increases the number of transferrin receptor sites. Transferrin is an iron binding protein that transports iron from the intestines into the bloodstream. By activating this iron transport mechanism, DMSO helps to remove iron from the intestine, an underlying challenge in people suffering from ulcerative colitis as well as Crohn’s disease.

How this mechanism helps is that iron acts as a catalyst in Haber-Weiss reaction, one of the important pathways that generates highly reactive hydroxyl radicals and thus a source of oxidative stress and resulting inflammation. Studies show that Haber-Weiss reaction is associated with many degenerative diseases including Alzheimer’s [33]. DMSO indirectly helps to restrict the iron-mediated Haber-Weiss reaction by removing iron from the intestines while directly scavenging OH radicals.

Radiation exposure

The radio protective properties of DMSO have been known for many years. DMSO is an organic sulfur compound and sulfur has long been used as an antidote for severe exposure to radioactive substances.
DMSO Health Benefits

DMSO not only prevents the radiation damage from X-irradiation but also offers protection from high levels of radiations present in the atmosphere, such as caused by nuclear power plant disasters.

Ionizing radiations generate free radicals that are known to damage fragile cellular structures like proteins, DNA, lipids and carbohydrates through mutation. These radiations alters the structure of these biological molecules and disrupt their ability to function normally. These destructive changes affect tissues and organs throughout the body – manifesting in the form of chronic inflammation, premature aging, birth defects, cancer and a host of other chronic degenerative diseases.

With its aggressive ability to scavenge hydroxyl free radicals, DMSO helps in reducing radiation toxicity. This property is particularly useful in patients undergoing conventional radiation therapy to treat cancer. A study published in the Russian Radiological Journal Meditsinskaia Radiological [34] showed that when cervical cancer patients were applied DMSO prior to the radiation treatment, they didn’t experience expected toxic effects like radiation burns.

While prior studies indicated that DMSO provides radio-protective benefits through an indirect action of suppressing free radicals, a 2010 Japanese study [35] shows DMSO works directly too. The study conducted at Kyoto University shows that even low concentrations of DMSO facilitates DNA double strand break repair, thus providing protection against the cellular damage caused by radiation. The study concluded that “low concentration of DMSO exerts radio-protective effects through the facilitation of DNA double-strand break repair rather than through the suppression of indirect action.”

Ocular diseases

DMSO is beneficial in treating eye disorders such as macular degeneration and retinitis pigmentosa [36].
One of the main causes of blindness in elderly, macular degeneration is a condition where the centre of the retina, called macula, starts to disintegrate. Macula plays an important role in maintaining central vision and any damage to it leads to blurred or complete loss of central vision.

Retinal Pigmentosa is a rare, genetic disorder causing degeneration and loss of cells in the retina – leading to gradual loss of vision. Retina is light sensitive tissue at the back of the eye and contains photoreceptor cells (rods and cones).

DMSO’s possible role in retinal diseases was inadvertently discovered when some retinitis pigmentosa patients taking DMSO for their musculoskeletal disorders sensed an improvement in their vision (Morton, 1993).

As Haley reported in his book, “When several patients treated with DMSO for muscular problems reported to Dr. Jacob that their vision had improved, he sent them to Dr. Robert O. Hill, ophthalmologist at the University of Oregon Medical School. Confirming the favorable changes, Dr. Hill began his own experiments with DMSO (after it was known that the lens changes did not happen in humans). His research showed drops of 50% DMSO to be effective in retinitis pigmentosa and macular degeneration, and presented a report on this at the New York Academy of Sciences symposium in 1971. (Haley, 2000)”

DMSO, diluted in saline solution, and used once or twice per day is also considered useful for cataracts (clouding of lens) and glaucoma (excessive pressure inside the eye that damages the optic nerve). It is also helpful in other eye inflammations such as pink eye from viral invasion.

**DMSO Controversy**

Dimethyl sulfoxide, DMSO, has decades of research and thousands of studies to its credit. And despite monumental evidence pointing to its therapeutic benefits, FDA has only approved to treat interstitial cystitis, a painful bladder inflammation and to preserve stem cells, bone marrow cells, and organs for transplant.
DMSO has a long and controversial history of being faded out of limelight and even ostracized and yet it has helped millions around the world in getting rid of pain and other debilitating conditions, thus improving the quality of their lives. It is abundant, natural, inexpensive, non-toxic and one of the most effective analgesic and anti-oxidant ever known. It is extremely relevant in serious, disabling and life-threatening conditions like heart attack, cancer, stroke, and spinal cord and brain injury. But not many people, especially in the United States, know about it.

A New York Times editorial on April 3, 1965 called DMSO the closest thing to a wonder drug. However, this fame was followed by lots of negative publicity and controversy. It all began when FDA abruptly held back its research and human application in 1965 when some animal experiments revealed that DMSO might impact the vision by changing the eye lens.

On the contrary, DMSO has been effectively used to treat many retinal degenerative disorders including macular degeneration, retinal pigmentosa, cataract and glaucoma. As Dr. Walker points in his book Nature’s Healer many drugs including “aspirin can cause death in some patients, yet no one suggested these drugs be taken away. Adverse eye findings have been reported with all the arthritis drugs, such as Anaprox, Naprosyn, and Motrin (as per their package inserts) yet no one has suggested that these minimally effective drugs be taken off the market.”

Clinical research begun again in 1972 when the National Academy of Sciences (NAS) published favourable findings and in 1978 use of DMSO was approved by FDA to treat interstitial cystitis. In 2007, the FDA allowed "fast track” progress on clinical studies to determine DMSO’s application in reducing brain tissue swelling experienced in severe brain injury.
On asked who would gain the most from DMSO, this is what Dr. Stanley Jacob, the father of DMSO, had replied, "Quadraplegia is the saddest thing that happens to people. It occurs most often to the young and healthy, to soldiers fighting our wars, to youngsters driving, to athletes in personal contact games. As a quadraplegic, you lie in bed, a total vegetable. Your mind functions but you cannot pass urine or have a bowel movement without help... So many of them eventually say to me 'Dr. Jacob, I couldn't even commit suicide.'"

It is sad and extremely frustrating to see that FDA reticence and interference has bereft so many people of putting an end to or minimizing their sufferings. What is ironic is that surgeons uses DMSO to soak and preserve tissues such as the bone marrow which will be eventually placed in human bodies. With its illustrious ability to penetrate tissues, these transplants are literally drenched in DMSO. Why then not approve it for clinical applications? Why not allow mainstream doctors to leverage its remarkable properties and use it as a prescription drug?

Clearly, the issue of FDA approval is related to pure economic reasons than anything else. The fact is DMSO is a natural product and can’t be patented by pharmaceutical industry, hence a no money spinner. This spells no profit for Big Pharma, which wouldn’t care to invest their money in to large-scale studies and clinical trials.
Application

DMSO can be used in a myriad of ways; topically as a gel, cream or liquid, orally, intravenously, intramuscularly and subcutaneously. It can be also applied directly on mucous membranes and put into eyes as drops and instilled into the urinary bladder. The concentration and dosages depends on the condition and its severity.
Toxicity

The extent of DMSO’s nontoxic nature can be estimated by the fact that it is used to preserve organs and tissues used in transplants. LD-50 test for DMSO shows that it is seven times less toxic than aspirin. LD50 is a classic test that determines the toxicity level of a substance and LD50 is the dose at which 50 percent of the test animals dies.

Since it is popularly used as a drug carrier, it is feared whether it can carry viruses and bacteria into cells. According to Dr. Stanely Jacob, “DMSO will not carry anything with a molecular weight of over 1000. Now, the molecular weight of a virus is one million. A bacterium has a molecular weight in the millions.”
Side-effects and concerns with DMSO application

1. DMSO is one of the least toxic substances known but its side effects come from the contaminants it can carry with itself. It is important to remember that since DMSO will penetrate the skin and even cross the blood brain barrier with ease and speed, extreme care must be taken as to what you are mixing it with. It can carry not only target medicines but undesirable chemicals due to its solvent and penetrating properties.

2. DMSO can trigger microbial die-off reactions such as headaches, drowsiness, sedation, nausea, vomiting etc. These reactions, though a result of detoxifying effect of DMSO and beneficial in long-term, still needs to be properly understood and accordingly managed.

3. Another very important and challenging side-effect is the garlic-like body odor and taste in the mouth. It is because DMSO is very quickly metabolized into a compound DMS, dimethyl sulphide that is also present in onion and garlic. DMS is expelled through lungs as a gas. Drink enough water to help diffuse the smell.

4. Only use purified and properly diluted DMSO. Remember contamination of DMSO with acetone or acid can lead to serious health repercussions. How to check if the DMSO solution you have bought is reliable and pure? A pure DMSO solution will turn ice solid in the refrigerator within 2 hours. If you turn the bottle of frozen DMSO upside down and find little streams of water flowing through the ice, it means you may have veterinary grade DMSO in your possession with only 90 percent concentration of DMSO in ten percent distilled water.
Precautions

As with any standard or alternative therapy, always consult your health practitioner before you decide to go the DMSO route. Be pro-active in sourcing pure, quality product and equally important is to seek advice from a relevant expert in reviewing your condition, strength you may want to use and the protocol you follow.

Thoroughly review your overall health condition, allergies, medical history and any other medication you may be currently taking with your doctor before using DMSO in any form.

1. Always thoroughly clean the hands and the site before applying DMSO. This will prevent the contaminants to be absorbed and transported within the tissues.
2. Your skin must be clean, dry and free of any infection or wound if you are applying topical DMSO.
3. The region around face and neck is more sensitive so don’t apply DMSO with any concentration higher than 50%.
4. When DMSO with 60 to 90% concentration is applied to the skin, it can cause warmth, redness, itching or burning sensation. While this will usually disappear within a couple of hours of application, applying aloe vera on it will help.
5. Be careful if you are taking any drugs like steroids, blood thinner, sedatives and any heart medications. DMSO increases the efficacy of these drugs.
6. Even though DMSO is used to preserve frozen embryos, DMSO is not recommended for pregnant or lactating women.
7. Wait for about a week before you go for a liver function test as DMSO can interfere with this test and might end up giving a false reading.
8. Never use DMSO on an infected wound.
9. Don’t use DMSO for poison ivy or for insect bites. It may help spread the toxin or poison throughout the body.
10. Stay away from any undesirable and possibly toxic substances during and after DMSO application. 3 hours after the application is considered completely safe.
Disclaimer

The information or the statements contained herein have not been evaluated by the U.S. Food & Drug Administration (FDA). This data is only intended for education and information purposes only while not intended to diagnose, treat, cure, or prevent any aforementioned disease. It is not in any way intended to diagnose, prescribe or substitute the advice or treatment recommended your physician or other health care professionals.
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DMSO Health Benefits


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General References: https://www.youtube.com/playlist?list=PL557FE6FD0033B580
More information and where to buy DMSO

High grade DMSO is becoming more and more difficult to purchase on the internet due to authorities protecting the corporate interests of pharmaceutical companies who are unable to patent DMSO and therefore are unable to charge exorbitant amounts for this natural compound. If you wish to find out more about DMSO, and where to buy it, visit www.DMSO-Benefits.com