DMSO, HOW TO USE/WHAT IS IT

DMSO is the common name for Dimethyl Sulphoxide. This chemical, in its ointment form, can be used as a pain killer that is rubbed on the skin. The actual chemical DMSO consists of two methyls, an oxygen molecule and a sulfur all stacked in a pyramid: H-C-H | H (Methyl looks like this) (if the picture is difficult to see, please brighten your screen)

Anyone can buy DMSO at a local drug store for arthritis or aching muscles. Hardware stores also sell DMSO to be used as a powerful degreaser. DMSO is a powerful healing agent that can ease the pain of arthritis or aching muscles. It can also help to heal burns, wounds and frostbite. DMSO has even been known to restore the sight of victims of blinding diseases and improve the behavior of retarded children.

Although DMSO seems to act like a miracle drug, it has a downside. When two more oxygen atoms are added to the DMSO, it becomes dimethyl sulfate which is a lethal substance that can kill cells in exposed tissue. Also, when the dimethyl sulfate is absorbed in the bloodstreams, it can cause convulsions, delirium, paralysis and possibly a coma. In severe cases the vapors can also be lethal. Dimethyl sulfate has been used as a war gas.

When on uses DMSO to ease pain, they are at risk of oxidation, which produces dimethyl sulfate. In one extreme case, a woman, who at the time was in treatment for cancer, collapsed on her floor at home. She was rushed to the hospital in an ambulance and the paramedics put an oxygen mask over her face while on the ride. Earlier that day, the woman had spread some DMSO on her chest to ease some pain. With the oxygen mask, the DMSO was transformed in to dimethyl sulfate. This entered her blood stream and she fell in to a coma. Just a few hours later, the woman died.

The paramedics that had tried to help her were also harmed by the fumes of the dimethyl sulfate. One doctor was hospitalized for ten days after inhaling the fumes. The entire floor of the hospital that the woman was on had to be evacuated because of the fumes. Many doctors and nurses were ill or faint and had to go home.

Although the FDA has not banned DMSO, as of 1979, it is large risk to use. DMSO should not be used because of the risk. Oxidation is very easy because one obtains oxygen just by breathing.

DMSO is a simple chemical made from wood pulp that penetrates the skin and and has demonstrated the ability to promote the healing of pockets of inflammation. DMSO is an acronym for dimethylsulfoxide and can cause a minor and temporary irritation of the skin.

The U.S. Food and Drug Administration has not granted approvals for all of DMSO’s many applications. Despite monumental medical research in support of DMSO’s effectiveness in the treatment of soft tissue damage the FDA has restricted DMSO’s application to the treatment of interstitial cystitis (bladder wall inflammation). Due to the FDA’s restrictions, thousands of Americans suffering from arthrosis (joint disease) have crossed the border to receive therapeutic treatment and to purchase their own supplies of DMSO.

Many European medical communities advocate the use of DMSO as a treatment for arthritis and bursitis. In the United States, veterinary practitioners have made liberal use of DMSO for decades in the treatment of connective tissue damage, dermatological disorder, and certain immunological therapies.

Why is FDA approval withheld?

Despite decades of medical research establishing the curative power of DMSO and its free radical scavenging antioxidant properties, the FDA has not granted broad approval for its use. A close examination of the practices and policies of the FDA consistently lead to three explanatory theories.

1) In several of the instances where research has established the medical effectiveness of DMSO, the researchers have been unable to determine the exact process by which the effectiveness was achieved. In other words, they know it works but they don't all the reasons why.

2) The topical application of DMSO is followed, shortly thereafter, by a distinct "garlic like" taste in one's mouth. The inability of researchers to develop a placebo which emulates this characteristic prevents the satisfactory completion of a "double blind" study. The lack of a "double blind" study has previously been cited by the FDA as reason enough to withhold approval of a drug.

3) Sheer economics work against the widespread use of DMSO and the dissemination of information about it. Pharmaceutical companies spend millions of dollars developing, gaining approval for, and then selling drugs which remain their exclusive product for a number of years. The enormous expense of gaining FDA approval is far overshadowed by the outrageous profits a newly approved medication can generate. DMSO, however, is the relatively inexpensive by-product of the wood pulping process and has been in the public domain too long to be subject to proprietary claims. Pharmaceutical companies therefore have no incentive to bring DMSO through the approval process. In fact, the larger pharmaceutical companies, would likely prefer that DMSO were not made available so as not to interfere with the sale of their more expensive forms of therapy.

Who uses DMSO and why?

Outside of the United States DMSO is openly used, in whole or in part, in the treatment of a wide variety of ailments such as:

arthrosis (joint disease)
bursitis (the inflammation of the bursa sac)
muscular pain
interstitial cystitis (bladder wall inflammation)
tissue necrosis resulting from chemotherapy
connective tissue damage

In addition to DMSO's direct use in the treatment of the above infirmities it is also very often used as a vehicle to deliver other drugs to afflicted areas. DMSO's is widely considered ideal for this purpose because of its ability to penetrate the skin and its preferential scavenging of hydroxyl radicals.

Although spoken of in hushed tones and closed circles, DMSO is a popular form of therapy for professional athlete's suffering from bruises, swelling, and the joint pain that results from repetitive participation in their particular sport.

For many years arthritis, tendonitis , and bursitis sufferers have anecdotally reported tremendous pain relieving benefits and vastly improved range of motion derived from the topical application of DMSO to afflicted areas.

What research has been done?

Decades of exhaustive research at major institutions has incontrovertibly established the free radical scavenging properties of DMSO as an antioxidant and its ability to swiftly and safely penetrate the skin. Research also reveals that DMSO has remarkably low toxicity and that healing effects remain after DMSO has metabolized or been expelled.

Reported in 1994 by the American Physiological Society is a study conducted by Michael B. Reid and Melanie R. Moody of the Pulmonary and Critical Care section, Department of Medicine at the Baylor College of Medicine which observed that DMSO inhibits acute low frequency muscular fatigue and found that DMSO depresses contractile function of directly stimulated curarized muscle.

In November of 1995 an unrelated study was reported by Klinische Pharmakologie, Institut fur Klinische Forschung in Germany, in which 112 patients suffering from joint disease participated. 56 patients received DMSO Gel applied over a period of 3 weeks and 56 patients received a Gel Placebo applied over the same time period. The patients maintained a pain diary and ongoing medical assessments were made relating to joint pain while going about daily activities, pain at rest, and mobility were also assessed. The study conclusively found that compared to the placebo, DMSO treatment proved to have a clinically relevant analgesic (pain relieving) effect on the intensity of pain during everyday activities, at rest, and under pressure.

Yet another German study conducted by medical doctors Kneer, Kuhnau, Bias and Haag in April 1994 focused on DMSO gel in the treatment of acute tendopathies. 157 patients were randomized to treatment with either DMSO Gel applied 3 times daily or the placebo Gel excipient. Treatments were begun 72 hours after the onset of acute symptoms. Pain of movement under loading and the mobility of the joints were significantly improved after 3 days for the DMSO group. After 7 days even more significant improvements were noted. After 14 days using DMSO, 44% of the patients were completely pain free, as compared with just 9% for the placebo group. The study concluded that topical DMSO is suitably reccomended for use in the treatment of acute tenopathy since producing clinically measurable results with very little risk to the patient.

What forms of DMSO are available?
Fortunately one does not have to go to Europe or Mexico in order to acquire DMSO. DMSO is now permitted to be sold strictly as a solvent. Of course, the choice of the process used in the various applications is the sole responsibility of the user.
DMSO is available as a Gel, a Liquid, or as a Roll-on.

SYNONYMS: A 10846, Deltam, Demeso, Demasorb, Demavet, Demsodrox, Dermasorb, Dimethyl Sulphoxide, Dimexide, Dipirartril-Tropico, DMS-70,DMS-90, DMSO, Dolicur, Domoso, Dromisol, Durasorb, Gamasol 90, Hyadur, Infiltrina, M 176, Methylsulfinylmethane, NSC-763, Rimso-50, Somipront, SQ 9453, Sulfinylbis(methane), Syntexan, Topsym

PHYSICAL PROPERTIES:
Appearance: Clear, colorless liquid. Note: This product's melting point is near room temperature. It may come as a solid instead of a liquid. DMSO can be remelted at approximately 30°C without affecting the product's performance.
Molecular formula: C_2H_6SO
Formula weight: 78.13 (anhydrous)
Melting Point: 18.45°C (supercools easily)[1]
Boiling Point: 189°C @760 mm Hg[1]
Specific gravity: 1.100 @20°C with respect to water at 4°C
Autoprotolysis constant = approx. 33 @25°C[2]
Viscosity: 1.1 cp @27°C[1]
Refractive Index: 1.4795 @20°C[1]
Dielectric constant = 45[1]
STABILITY / STORAGE AS SUPPLIED:

This product should be stored at room temperature and protected from exposure to moisture. DMSO is a very hygroscopic liquid. Sigma has assayed similar material (Prod. No. D5879) that was stored for approximately 3 years at room temperature. The purity of the material was essentially unchanged per gas chromatographic analysis.
DMSO is thermally stable. It can be heated to 150°C for 24 hours with less than 0.1% loss in purity.[3]
DMSO reacts violently with acyl halides, metal alkoxides, metal oxosalts, perchloric acid and sodium hydroxide.[4]

SOLUBILITY / SOLUTION STABILITY:

DMSO is soluble in water, ethanol, acetone, ether, benzene and chloroform.[1]

DMSO is stable up to 100°C in alkaline, acidic and neutral conditions. At temperatures approaching its boiling point of 189°C, DMSO is stable in neutral or alkaline conditions.[3]

APPLICATIONS:

DMSO is a highly polar substance with exceptional solvent properties for organic and inorganic chemicals and is widely used as an industrial solvent. DMSO is also used to protect living cells during cold storage.[5]
To prepare a sterile solution, use a teflon or nylon membrane to sterile-filter the DMSO; do not use a cellulose acetate membrane.

DMSO is **incompatible** wih polysulfone, flexible and rigid PVC tubing and polycarbonate.[6]
It is **moderately** compatible with polystyrene and ECTFE/ETFE.[6]
It is **compatible** with LDPE, HDPE, polypropylene, PPCO polypropylene copolymer polymethylpentene, nylon and teflon FEP.[6]
Among its many other uses, DMSO has been used in the oxidation of thiols and disulfides to sulfonic acids[7] and as a painkiller[8].

The acute toxicity of DMSO by all routes of exposure is very low. Inhalation of DMSO vapor can cause irritation of the respiratory tract, and at higher concentrations may cause vomiting, chills, headache, and dizziness. The material is only slightly toxic by ingestion and may cause vomiting, abdominal pain, and lethargy. Dimethyl sulfoxide is relatively nontoxic by skin absorption, but can cause itching, scaling, and a transient burning sensation. Dimethyl sulfoxide can increase the tendency for other chemicals to penetrate the skin and so increase their toxic effects. Contact of DMSO liquid with the eyes may cause irritation with redness, pain, and blurred vision.
Chronic exposure to dimethyl sulfoxide can cause damage to the cornea of the eye. Dimethyl sulfoxide has not been found to be carcinogenic or to show reproductive or developmental toxicity in humans.

Flammability and Explosibility

Combustible when exposed to heat or flame (NFPA rating = 1). Carbon dioxide or dry chemical extinguishers should be used to fight DMSO fires.

Reactivity and Incompatibility

DMSO reacts violently with strong oxidizers, many acyl halides, boron hydrides, and alkali metals. DMSO can form explosive mixtures with metal salts of oxoacids (sodium perchlorate, iron(III) nitrate).

Storage and Handling

Dimethyl sulfoxide should be handled in the laboratory using the "basic prudent practices" described in Chapter 5.C.

Accidents

In the event of skin contact, immediately wash with soap and water and remove contaminated clothing. In case of eye contact, promptly wash with copious amounts of water for 15 min (lifting upper and lower lids occasionally) and obtain medical attention. If dimethyl sulfoxide is ingested, obtain medical attention immediately. If large amounts of this compound are inhaled, move the person to fresh air and seek medical attention at once.
In the event of a spill, remove all ignition sources, soak up the dimethyl sulfoxide with a spill pillow or absorbent material, place in an appropriate container, and dispose of properly. Respiratory protection may be necessary in the event of a large spill or release in a confined area.

Disposal

Excess dimethyl sulfoxide and waste material containing this substance should be placed in an appropriate container, clearly labeled, and handled according to your institution's waste disposal guidelines. For more information on disposal procedures, see Chapter 7 of this volume.