

A new drug has startling effects on a wide gamut of ills and aches

# DMSO

by ALIX KERR

A fantastic new experimental drug called DMSO has lately been causing a sensation in the medical world. It is hard to talk about it without sounding like an old-time carnival snake-oil salesman. DMSO appears to be good for arthritis, sinusitis, headaches, earaches, sprains and burns. It reduces swellings, suppresses blisters, kills pain, tranquilizes, fights germs. It enhances the action of other drugs. It can be swallowed or injected, rubbed on or dripped in. In a word, it is unbelievable. But some serious and respected medical scientists believe in it. If DMSO (for dimethyl sulfoxide) lives up to their expectations, it will come closer to being the legendary panacea than any drug in all medical history.

These same scientists hasten to point out that there are many major diseases which DMSO does *not* seem to touch (cancer, for instance). Furthermore, none of the medical uses of DMSO can be considered absolutely proven or even safe as of this moment. When a brief preliminary paper on its effects was published last February it was promptly criticized as "the most preposterous article ever to appear in the medical literature." Several of the country's leading drug companies, however, don't see a thing preposterous about it. They have already agreed to pay sizable sums for rights to develop it into products.

DMSO is made from a leftover of the paper-manufacturing process and has been in industrial use for several years as a chemical solvent. Its potential medical uses are now being intensively researched under the joint sponsorship of two unlikely partners: the Crown Zellerbach Corp., second biggest paper producer in the U.S., and the University of Oregon Medical School. So far the researchers cannot explain how DMSO does all it does, but they know that it somehow blocks nerve impulses. Much of its potency may derive simply from its chemical ability to dissolve things, carry them around the body and help them penetrate

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**T**his posed picture shows DMSO's many potential—though still not proven—uses. Starting clockwise at patient's forehead: DMSO is rubbed on for headache, dropped into aching ear, injected into and rubbed on

shoulder for arthritis and bursitis, intravenously dripped in arm to reduce water in tissues, painted on for chest pains, swallowed to help absorb diet supplements, dropped in nose for colds and sinusitis.



## Garlic breath gave researchers a clue

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cell walls. But medicine does not need to understand the mechanisms of drug action in order to exploit it. After more than 60 years of use, doctors still do not fully understand how aspirin works.

Though all the hubbub about DMSO is brand new, DMSO itself is 97 years old. It was synthesized in Germany way back in 1867 but no use was found for it until about 10 years ago, when its powers as a solvent and antifreeze began to be appreciated by science and industry. When Crown Zellerbach discovered that it could easily make DMSO from a compound found in the waste products of paper pulp manufacture, it acquired patents on the most economical method for producing it, then built a DMSO conversion plant.

The therapeutic possibilities of DMSO became apparent only through a series of almost random experiments and accidents. About five years ago an aggressive young Crown Zellerbach chemist named Robert J. Herschler, working at the company's laboratory in Camas, Wash., started looking for new uses for DMSO as a solvent. "We tried it first on notoriously

hard-to-dissolve substances like pesticides," he recalls. "DMSO dissolved them easily. We then checked to see how pesticides in DMSO worked on trees. We found they began to move around with amazing speed—not just in the conducting systems under the bark but right through nonliving layers of wood. The pesticides were colored so we could see them spreading out."

Agricultural experts helped adapt this discovery into a method which may do away with conventional spraying of trees. Pesticides in DMSO are piped into trees the way intravenous drips are put into the arms of patients. They spread to protect leaves and fruit from an impressive roster of mildews, blights, scabs and cankers. DMSO has other agricultural possibilities and even seems to rejuvenate fruit trees that have become barren.

It was during this pesticide research that human experiments began quite by accident. "DMSO almost killed two of us," Herschler remembers. "A technician and I were working on a poisonous insecticide which normally shouldn't

have gone through our skins. We didn't know why then, but the DMSO carried the poison through us just as it did through the trees—and we were awfully sick for a while."

Two years ago, Dr. Stanley W. Jacob, a young surgeon at the University of Oregon Medical School in Portland, got interested in DMSO. He was working on the preservation of organ transplants and thought DMSO might be useful as an antifreeze. Mutual acquaintances put him in touch with Herschler. Their complementary scientific interests led to startling discoveries which went far afield from Jacob's transplant work.

First a lab assistant and then Dr. Jacob got DMSO on their hands. Within minutes they noticed something that the Crown Zellerbach chemists had experienced but never paid any particular attention to. Both of them got a distinctive oysterish taste in their mouths and a strong smell like garlic on their breaths. Dr. Jacob decided this could be due only to DMSO which must have worked its way through their skins and blood streams. Anything able to do that could have tremendous value in medicine, he realized, and he began to explore possible uses.

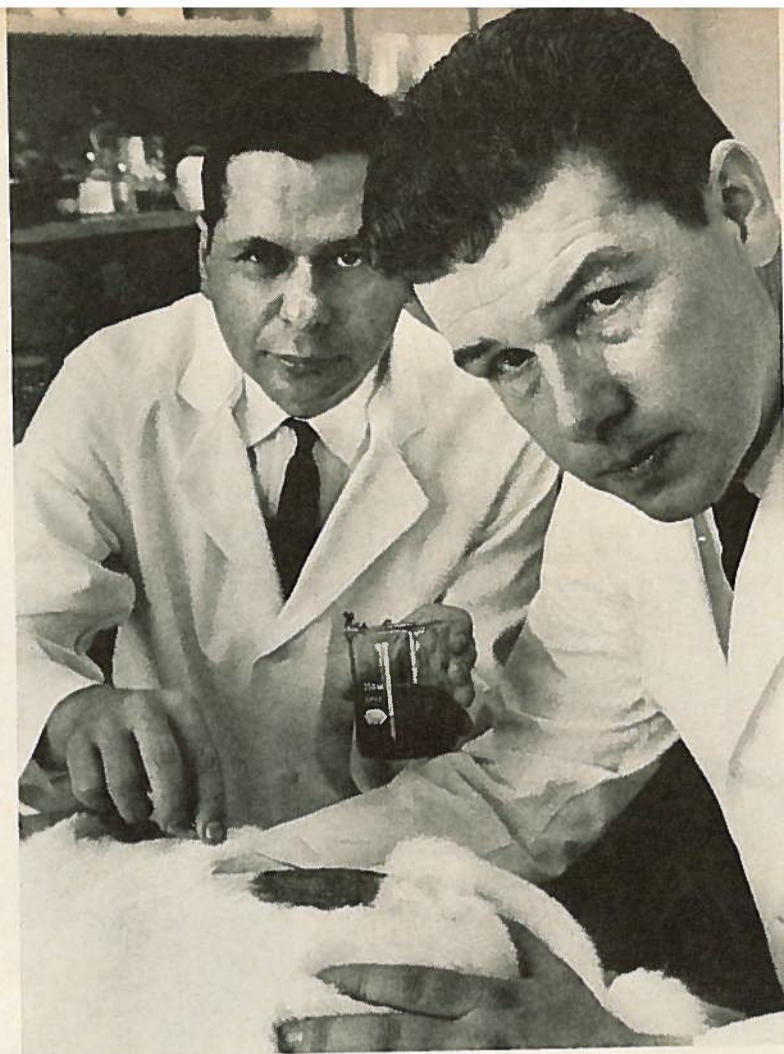
One hard problem in medicine that DMSO's properties might be

able to help. Jacob reasoned, was getting serious burns to heal. He tried DMSO on burned rats. It not only helped heal the burns faster; it kept alive rats that should have died quickly in shock. Moreover the rats seemed to be tranquil and in no pain. But to find out for sure whether DMSO did indeed lessen pain, they needed a human burn victim who could tell them how he felt. Before Jacob had a chance to look for a patient, Herschler called up from his lab. "I've had an accident with beta-chlorosulfide—it's a type of mustard gas. I've got burns and blisters all over my face and arms. And do they ever hurt!"

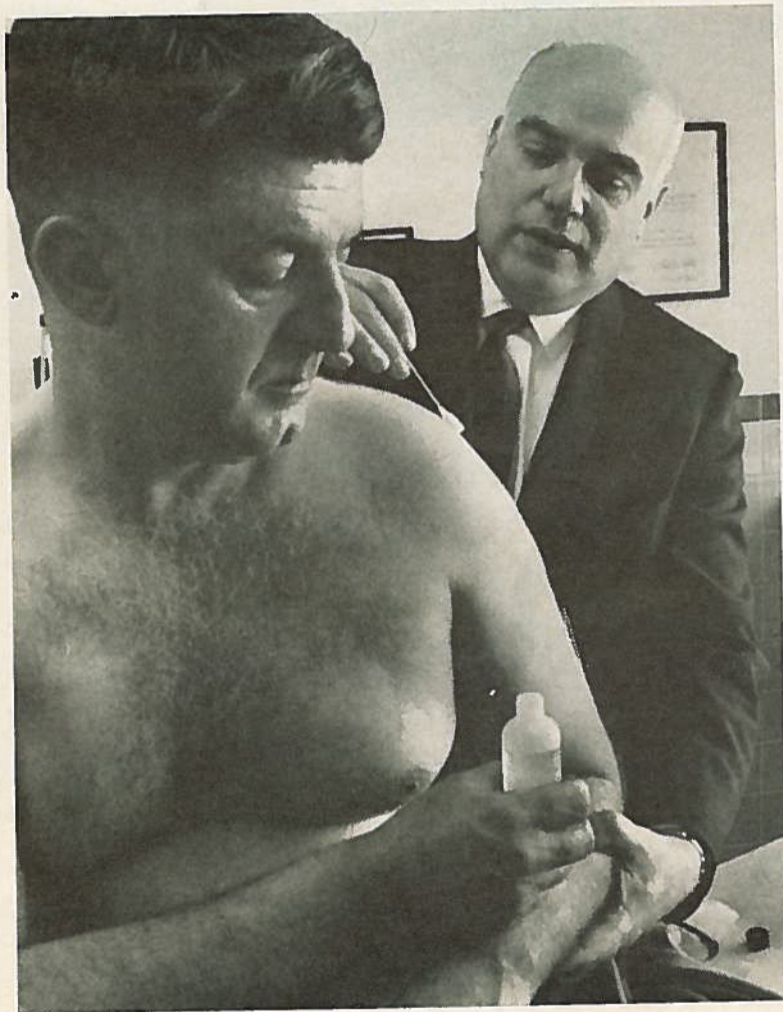
Jacob was sympathetic, but he was also delighted. "Now we can really see what DMSO does. Put it on one side."

Herschler put it on one arm and five minutes later was back on the phone. "Stan, you won't believe this, but it really works." DMSO had relieved the pain of his treated arm and started drying up its blisters, while his face and other arm were not feeling any better.

Next Dr. Jacob discovered that DMSO could considerably reduce surgical adhesions in animals. Since this is something cortisone can also do, Jacob wondered if DMSO might act the way cortisone does



DMSO's co-discoverers, Surgeon Stanley W. Jacob (left) and Chemist Robert Herschler, paint DMSO mixed with blue dye on rabbit's back to measure penetration into skin.



Rheumatologist Edward E. Rosenbaum swabs DMSO on shoulder of patient. He was brought in to conduct tests for bursitis and arthritis.

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## A sore shoulder grows warm and tingling

### DMSO CONTINUED

against the human body's many and varied inflammatory ailments. He tried it on a sprained ankle, a sprained thumb, a mashed finger, a swollen jaw. In each case, pain and swelling quickly subsided.

There were new surprises by the day and week. DMSO helped heal cold sores. DMSO drops cleared up nasal congestion in colds and sinusitis. It even seemed to get rid of headache pains for hours at a time merely by being rubbed on the forehead—a feat unequaled by anything in all the ingenious armamentarium of modern medicine.

By now, Jacob was ready to try DMSO on the really serious inflammatory diseases of the joints such as bursitis and arthritis. Because therapy in these areas is tricky to evaluate, Jacob enlisted the aid of a respected Portland rheumatologist named Edward E. Rosenbaum, who is also a professor at the medical school.

Dr. Rosenbaum tried DMSO on a few cases and was altogether unimpressed with the results until Christmas Eve, when a patient came in complaining of a sudden excruciating bursitis which prevented any movement of his shoulder. Rosenbaum painted on a generous application of DMSO. For 10 minutes nothing happened except that the patient's shoulder grew warm and tingling. Then he started to feel better. In 30 minutes his pain was gone and he could move his shoulder freely. Still unconvinced, Dr. Rosenbaum sent the man home with a prescription for a narcotic to use when the pain returned. He was surprised when he heard nothing from the patient on Christmas Day. On the 26th the man called to say his shoulder was nearly well. Now Dr. Rosenbaum was impressed—acute bursitis generally takes about a week to subside.

After this he treated 15 more cases—sometimes with other doctors as witnesses and once with a doctor as patient—and 13 of the 15 experienced the same dramatic relief. To get this relief required large doses and repeated applications, since DMSO's effects wear off after four to six hours.

Testing DMSO against arthritis was tougher still—the disease comes in several forms and many levels of severity. But though no firm conclusions can be drawn yet

about the value of DMSO for arthritics, some patients with each variety and stage of the disease experienced relief from pain and many had measurable reduction of swelling.

In the meantime, patents on Herschler's and Jacob's discoveries had been taken out by Crown Zellerbach. Last December, the company signed a public contract with the medical school agreeing to split all profits from the patents. Thus the first news of DMSO got out, made headlines and Drs. Jacob and Rosenbaum decided to publish a report on their findings.

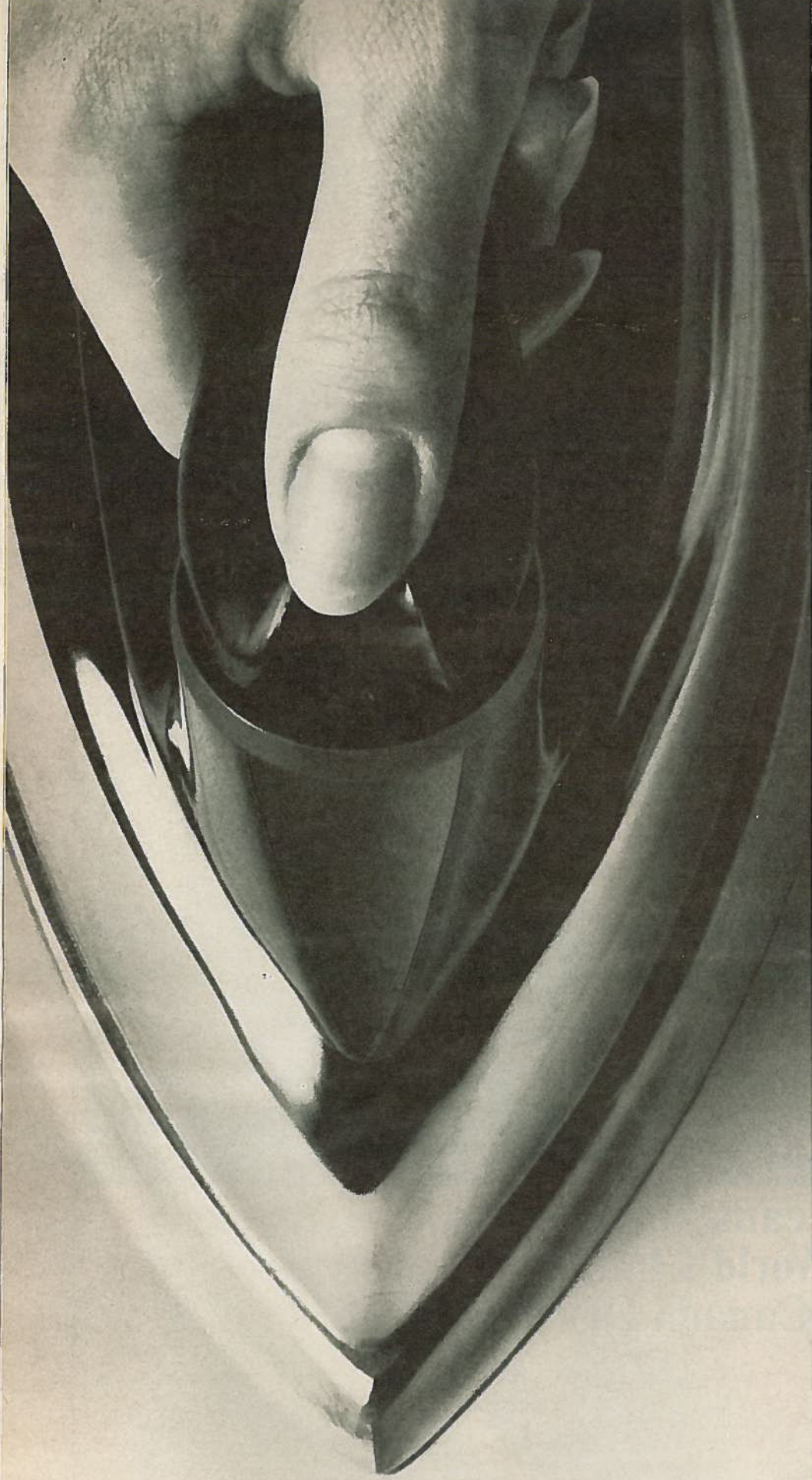
The news stories also touched off a speculative boom in Crown Zellerbach stock. Actually, even vast future sales of DMSO would have no dramatic effect on the company's \$600 million annual earnings. Neither Jacob nor Herschler will get any money from DMSO, and the medical school will use its share for scholarships and research.

The first scientific reports drew wide attention and some sharp criticism, largely directed at the relatively small number of cases on which the reports were based. The critics would like to see more test results confirming the claims of Dr. Jacob and his collaborators. These should soon be coming. Thirty accredited doctors are now conducting rigidly controlled DMSO experiments on patients. Others are conducting a whole range of lab tests on animals.

Testing DMSO entails definite risks. Doctors still do not know what becomes of it in the human body. Some of it gets broken down to dimethyl sulfide, which causes the garlic breath and might have more serious undesirable effects. It will take a great deal more study before DMSO's life history in the body can be declared harmless. Portland researchers are buying a radioactive version of it at \$270 per teaspoon to trace its pathways.

DMSO investigators are never without worries when they test such a new drug on patients. "The big problem," says Dr. Rosenbaum, "is the occasional person—one out of hundreds and thousands—who will have an extreme reaction. You can never pick him out in advance. Whenever the phone rings, I'm afraid it will be a patient who's had a bad reaction to DMSO." To date, DMSO has caused only minor skin rashes and sleepiness in Dr. Rosenbaum's

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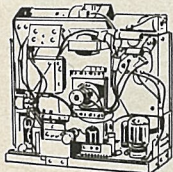
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## Now drug firms will take it from here

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patients. Just the same, he makes them come in for weekly examinations and runs 12 different regular analyses on their blood and urine.

Actually, the best proof that DMSO is safe to use over long periods of time goes back to Herschler's early lab work. Almost every day for several years, he and his assistants washed their hands with DMSO, still thinking that as a solvent it should get things *off* instead of *in*. Except for the one incident of insecticide poisoning, they suffered no ill effects.

**A**ll human tests of DMSO are being conducted under the eye of Dr. Frances Kelsey's Investigational Drug Branch at the Food and Drug Administration. Dr. Kelsey, whose caution kept the U.S. from sharing in the thalidomide tragedy, can veto any human test plan which does not seem safe. She has already placed temporary limits on DMSO trials, restricting them to skin applications until longer animal safety tests are run on other dosage forms.

The real testing of DMSO—that is, the massive, detailed, exacting animal and clinical work required by FDA before any drug can reach the market—will be done by pharmaceutical houses. Their willingness to take on this expensive task is not based on mere

hearsay. They have had the opportunity to do research of their own on DMSO.

The Oregon researchers believe DMSO's potential has only been suggested. Quite apart from the specific DMSO uses he has already talked about, Dr. Jacob says there are others so fantastic that he wants to do a great deal more work before he even mentions them as possibilities. It may be a long time—at least a full year—before the first American patient can go to the drugstore and get a DMSO prescription filled, but when it does start happening, Jacob feels confident that medicine will never be the same again.

**B**ut the new era will have built-in hazards that are not obvious. Dr. Jacob tells a story that illustrates how DMSO could do harm at a time when it appears to be doing good. A doctor friend of his twisted an ankle one day, and Jacob promptly daubed it with DMSO. Later, looking at X rays of the lower leg, both Jacob and his friend were horrified to learn that DMSO had killed the pain so effectively that the man had been walking around for four hours with a broken shinbone.

*Pharmacologist at University of Washington Medical School, Seattle, gives mouse a test dose of DMSO simply by dipping its tail in a test tube.*

