

SURGERY

Drug Makes Surgery Safer

Much of the safety of modern surgery comes from using one of the most deadly drugs known, a muscle relaxant that can paralyze completely in less than a minute.

By JOHN W. ROBINSON

► A DRUG that can kill in 60 seconds is now being routinely injected into the human body to make surgical operations safer than they have ever been in the past.

The drug, and others like it, is known as a muscle relaxant. In non-medical terms, a muscle relaxant is a paralyzer. A surprisingly few drops of it in the blood stream will cause a normal man to collapse in a motionless heap. He will still be able to think and feel, for this drug, though part of modern anesthesia, is not itself anesthetic, but he will be powerless to even lift an eyelid.

A few more drops and his diaphragm, one of the last muscles to go, would slow down and stop and then breathing would be gone.

Probably the best known of these paralyzers is curare, used for hundreds of years by South American head hunters to tip their poisoned arrows. A synthetic drug is now being used, however, that is even more instantly lethal than curare and curare-like drugs. Its name is succinylcholine (SUCK-sin-ill KO-leen).

"For modern surgery," Dr. Joel B. Hoberman, chief of anesthesiology at Suburban Hospital, Bethesda, Md., explained, "succinylcholine does in seconds what it used to take ether anesthetic 10 to 15 minutes to do. It completely relaxes the muscles of the body so that the surgeon can do his job without having to fight them. This complete relaxation is a prime requirement of good surgery."

Before the relaxants came along, and when ether was the main surgical anesthetic, this needed relaxation could be brought about in only one way. That was by putting the patient so far "under" that not only was he asleep, but he was gassed to the point that even his breathing was beginning to fail.

If muscles were too tight when the surgeon was ready, he would tell the anesthesiologist to "pour more on" until he got the degree of relaxation he wanted.

The dangers of ether in the early days were those of time. It may take ten minutes before the "surgical" stage of ether anesthesia is reached, so there was always the chance that the surgeon would go ahead too fast. The body would still be able to fight back and a sudden shock, even as seemingly innocent as painting the skin with alcohol, could bring on sudden heart failure.

Surgical Giant Step

With the development of quick-acting anesthetic drugs like Pentothal, anesthe-

siology took a giant stride forward, but still the amount of relaxation depended on how heavily the patient was drugged.

This has all been changed with the development of muscle relaxants like succinylcholine.

Now, the amount of relaxation has little to do with the depth of anesthesia. Only enough anesthesia is given to put the patient in a light sleep, and once this is done, the relaxation is accomplished by succinylcholine.

The relaxant is injected, drop by drop, until the surgeon has been given all the muscle relaxation he needs.

Before being wheeled into the operating room, today's surgery case may receive first a tranquilizing pill and then just enough of a narcotic to dissolve his fear. Once on the operating table, a needle is inserted into his arm which can carry both the anesthetic and a slow drip from a marked bottle hanging over his head.

A red warning sticker on the bottle indicates that succinylcholine has been added to the dextrose solution it contains.

By controlling the number of drops per minute that enter the patient's blood stream, the anesthesiologist gives the surgeon the exact amount of relaxation needed, not too little, not too much.

"For lung surgery, the drip rate has to

be only one drop more per second than is needed for simple appendectomy, but this relatively slight increase in rate completely stops normal breathing," Dr. Hoberman said.

Respiration is then taken over by the anesthesiologist who can control it to an even finer degree than nature can.

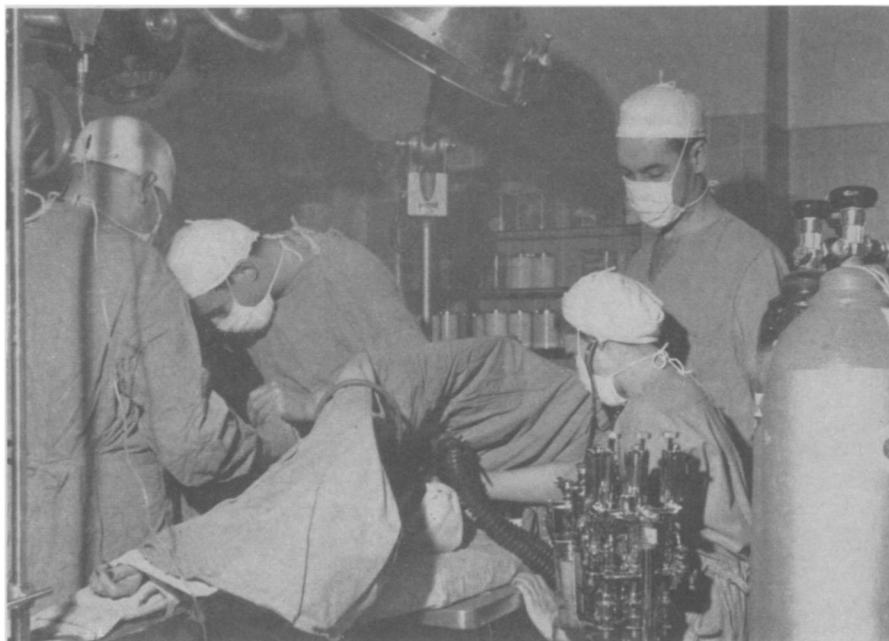
The great value of succinylcholine is that it works extremely fast and disappears from the blood with the same speed. After a single injection of it, complete relaxation occurs in about one minute, lasts for another two, and then is followed by rapid recovery within the next few minutes. A continuous drip is used to prolong the action for as long as needed.

What the drug does in the body is not fully understood, just as the action of ether is not yet completely known. It is known, however, that the drug acts on the spots in the body where the nerves attach to the muscles.

Nerve-Muscle Junctions

These areas are known as myoneural junctions. Here electrical impulses traveling down the nerve pass across and stimulate the muscle. Technically, succinylcholine is known as a depolarizing agent because it causes a change in the electrical polarity of the muscle fibers. As a result of this change, the muscles receive no nervous stimulation and paralysis results.

Luckily, the drug does not paralyze all muscles, for if it affected heart muscle in



NEW DRUG IN ANESTHESIA—Surgery has entered a new era in safety, thanks to the careful use of tiny amounts of a paralyzing drug that is even more dangerous than curare, the Indian arrowhead poison.

the same way it would cause instant death. Its effects are limited to most of the striated muscles, those which are attached to the bones.

Succinylcholine has an important advantage over curare and curare-like drugs in that it will easily relax throat muscles.

The larynx remains tense even after a person has been put to sleep with Pentothal. In fact, Pentothal seems almost to sensitize the laryngeal muscles so that any irritation may set off a spasm of the vocal cords. This tendency can be counteracted by giving other drugs before Pentothal, but once in a while a laryngospasm will occur. Succinylcholine can quickly relieve such spasms. It is also useful in relaxing the throat so that a breathing tube may be inserted.

Curare drugs can be used to relax the throat also but they take longer to act and must be used in heavier doses.

Succinylcholine is remarkably free of any bad side effects, perhaps because its extraordinary power has limited its use to only highly trained anesthesiologists.

In their hands, this powerful paralyzer means a much safer operation and a faster, easier recovery from the anesthetic.

Science News Letter, February 1, 1958

ENTOMOLOGY

Humidity Affects Insect Mortality

➤ MOSQUITOES may be more susceptible to a killing dose of DDT when the weather is dry.

In contrast to some earlier experiments, two Indian scientists found humidity has an inverse relationship to insect mortality. Using two controlled humidity levels, approximately 49% and 88%, they found that mosquito pupae grown in the lower humidity were more likely to be killed when exposed to varying doses of DDT as adults. The lethal dose for these mosquitoes also was lower than for those kept at high humidity.

T. Koshi and S. K. Ranganathan, Technical Development Establishment Laboratories, Kanpur, India, explain their results as indicating a difference between the effects of insecticide availability and the variations in insect susceptibility due to humidity. Earlier reports of greater mortality following greater relative humidity may have simply represented more available insecticide.

The new research is reported in *Nature* (Jan. 18).

Science News Letter, February 1, 1958

METEOROLOGY

Bureau Will Use New Storm Warning Signals

➤ THE WEATHER BUREAU has begun using a new, simplified system of flags and lights for warning of storms along the sea-coasts and the Great Lakes.

The system requires only four separate flag or light signals instead of the previous seven.

Explanation of the new signals:

Small Craft Warnings: One red pennant

displayed by day, and one red light above one white light at night to indicate that winds up to 38 miles per hour and/or sea conditions dangerous to small craft operations are forecast for the area.

Gale Warning: Two red pennants displayed by day, and one white light above one red light by night to indicate that winds ranging from 39 to 54 miles per hour are forecast for the area.

Whole Gale Warning: A single square red flag with a black center displayed by day, and two red lights at night to indicate that winds ranging from 55 to 73 miles per hour are forecast for the area.

Hurricane Warning: Two square red flags with black centers displayed by day, and one white light between two red lights at night to indicate that winds 74 miles per hour and above are forecast for the area.

Introduction of the new system is reported in the *Monthly Weather Review*, a Weather Bureau publication.

Science News Letter, February 1, 1958

● **RADIO**

Saturday, Feb. 8, 1958, 1:30-1:45 p.m., EST. "Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio network. Check your local CBS station.

Mr. George E. Probst, executive director, Thomas Alva Edison Foundation of New York, will discuss "Edison's 111th Birthday."

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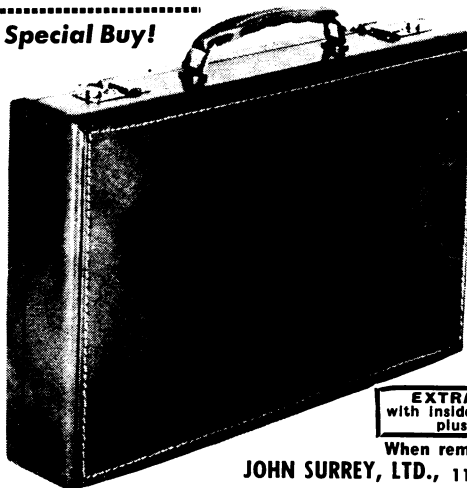


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