

MEDICINE

# Healing With Maggots

## How Clean Larvae of the Blowfly are Carefully Bred To Destroy Disease Germs Rather Than Spread Them

By JANE STAFFORD

**L**ITTLE grubs or maggots crawling in an open wound probably sounds pretty terrible to you, but they are the newest assistants of the modern surgeon.

Actually, it is not as bad as it sounds, although you may have to cultivate your small son's attitude toward worms and bugs and such creepy things, in order to appreciate this latest advance of surgery. As a matter of fact, even small girls, whose distress over insect life is as well-known as Miss Muffet and her spider, make no objection to the use of the maggots in treating their wounds.

The adult reaction, however, is clearly seen in the case of a Cleveland workman. This man was injured during the course of his work for one of the local public utilities companies. The company's surgeon, being an up-to-date doctor, used the maggot treatment to clean up the workman's wound. Now the workman is suing the company, on the grounds that the company's doctor did not treat him properly.

The feeling about maggot treatment is not much different from the feeling your eighteenth-century ancestors had about smallpox vaccination. Even now, a large part of the population objects to vaccination, while another large part goes in heavily for protective vaccination not only for smallpox but for typhoid fever, diphtheria, measles and scarlet fever, while germs of various kinds are being injected to treat a host of other ailments, from colds to rheumatism.

The objection to vaccination came from both physicians and public. The doctors opposed Jenner's method of inoculating against smallpox partly because of jealousy and partly because of fear at so radical a measure. Vaccination or inoculation against smallpox had been tried by various men before Jenner, but none of them succeeded in making it generally popular as he did.

All sorts of arguments against vaccination had to be refuted. Some people did not think it would give protection.

Others thought it was too dangerous. Then there was the idea that it might make human beings take on certain bovine characteristics, because material for the original vaccination was taken from cows suffering from cowpox, the bovine counterpart of smallpox. Children might grow up cow-faced, might grow horns and learn to moo and low, instead of to talk, some of Jenner's opponents argued. Of course, this silly idea has been refuted by the thousands and millions of healthy, normal individuals who were vaccinated in childhood during the last hundred and thirty years.

### Forgot Their Fears

While many people talked that way about vaccination when they were in little danger of getting smallpox, they forgot their fears of the method when threatened with the much more frightful disease during epidemics, just as they do today.

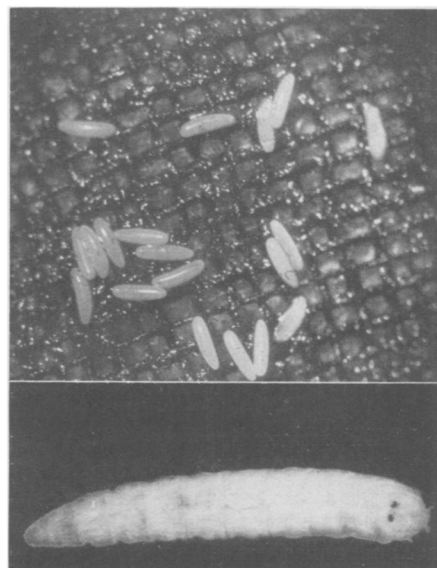
In much the same way, you would probably lose your repugnance to the idea of maggots in wounds, if you were faced with the alternative of a tedious illness, lasting months and years. For the maggots take just six weeks to clear up a condition that otherwise might drag on for months, even with the best medical and surgical care.

The use of maggots, tiny crawling larvae of blow flies, to fight infections in wounds and to clear up the bone disease, osteomyelitis, was developed from observations made during the World War by an American surgeon, Dr. William S. Baer of Baltimore. Dr. Baer was one of the leading orthopedic surgeons of America and at the time of his death in April of this year was clinical professor of orthopedic surgery at the Johns Hopkins Medical School. The maggot treatment will probably not meet as much opposition among physicians as did Jenner's vaccination method, because of Dr. Baer's high standing in the medical profession and the esteem with which physicians both in Baltimore and elsewhere regarded him.

During the war, Dr. Baer served in France as lieutenant colonel in the medical corps. One day two men were brought into his dressing station who had been lying in No Man's Land for seven days without food or water. They suffered from abdominal wounds and from compound fractures of the thigh bone. The wounds were covered with maggots, tiny larvae of flies. The men were hungry, but otherwise their condition was good, Dr. Baer noted.

In the hands of the best surgeons, the mortality for compound fracture of the thigh bone was 80 per cent., Dr. Baer knew. In other words, four-fifths of the persons who suffered from that condition died, even when given expert care. In the hands of the maggots, the mortality for those two men was nothing, Dr. Baer found. Instead of the dangerously bad infections commonly found in such injuries, Dr. Baer found only a few harmless organisms.

Further investigation of this unexpected state of affairs disclosed that the maggots were eating the dead tissues, bone and flesh, and thus destroying the material that would have furnished good breeding ground for bacteria. The bacteria or germs which might have gotten into the wound and set up an



### INFECTION HUNTERS

*The top part of this picture shows the eggs from which the maggots hatch; below, the full grown maggot, actually about one-half an inch long.*

infection were unable to exist in the wound which the maggots had cleaned up.

For ten years after the war Dr. Baer puzzled over these cases, particularly when treating children suffering from osteomyelitis. This disease is an inflammation of the bone, more common in children than in adults. It is the result of an infection which may have its focus elsewhere in the body, as in the tonsils or ears. Or it may result from a local infection in a compound fracture, in which the skin as well as the bone is broken. The condition requires prompt surgical treatment. Recovery is often delayed for years if the disease reaches the chronic stage.

In order to hasten the healing of the wound after operating on this condition, Dr. Baer began using maggots. In six weeks the children were entirely well. Dr. Baer used the method on 300 patients. All the children recovered entirely. With adults the treatment was successful in four-fifths of the cases.

Dr. Baer's faith in the maggots' ability to overcome infections in wounds was strengthened by some investigations with guinea pigs and the deadly gas gangrene germ. Three guinea pigs that became infected with this germ died within 32 hours. Three more guinea pigs were infected in the same way, but after 12 and 24 hours, the infected wounds were opened and the maggots were put in on top of the gas bacilli. Every one of these maggot-treated pigs stayed alive and well.

At first it was thought that the success of the maggots in cleaning and healing wounds was due to scavenger action. The tiny larvae ate up the dead tissue about the wound and the bacteria which had been causing the infection soon died from lack of sustenance. More recently, Dr. Baer thought that something more than scavenger action was responsible for the success of the treatment. He suggested that a specific reaction between the serum of the body and the maggot itself was the probable cause of the healing of wounds to which maggots were applied. Just what this reaction is has not yet been announced.

The investigations with maggots were abruptly halted during the first winter when the cold weather killed the flies in Baltimore and so cut off the supply of maggots. As a result, Dr. Baer started breeding flies so as to insure a

plentiful all-year-round supply of the tiny creatures.

The latest step was the breeding of sterile flies. To a modern surgeon, the idea of putting into a wound anything that has not been sterilized is abhorrent. While the maggots apparently cleared up infections, and no case of fresh infection due to the larvae had occurred, Dr. Baer was taking no chances. Flies and their larvae are commonly associated with filth, and some kinds of flies have been incriminated as carriers of disease germs. So a race of sterile, germ-free flies is being bred and used for the maggot treatment at Dr. Baer's Children's Hospital School.

Since the method has been taken up by surgeons in other parts of the country and at some of the U. S. Veterans' Hospitals, the supply of maggots is not enough to meet the demand. For this and other reasons, the Bureau of Entomology of the U. S. Department of Agriculture has undertaken the breeding of sterile flies and maggots. While the bureau does not expect to supply maggots, it has developed a method of breeding sterile larvae, and is investigating other phases of the situation now.

As carried on at the bureau under the direction of Dr. G. F. White, the maggots are bred in the following way: Eggs hatched from ordinary blow flies, or meat flies, as they are sometimes called, are disinfected chemically. These eggs, which are now considered sterile or germ-free, are carefully put onto sterilized meat in the center of a sterile dish. This dish is surrounded by shavings contained in an outer dish, and there is a cover for the whole affair, with a cheesecloth-covered outlet for gases and moisture. The entire affair is sterile, free from germs.

#### Feed on Meat

The eggs hatch out into larvae or maggots which feed on the meat for four or five days and then, when full-grown, crawl over onto the shavings. They bury themselves in these shavings where they change into pupae. It is from the pupae that the race of sterile flies is bred.

Pupae, shavings and all, are transferred to sterile cages. In about five days the flies emerge. These sterile flies are fed on sterile food. Eggs obtained from them are disinfected in turn and are carefully transferred to sterile tubes in which they hatch overnight. At the bottom of the tubes is sterilized meat on which the newly-hatched larvae or maggots get their breakfast. These mag-



**THE LATE DR. BAER**

*The distinguished American surgeon who discovered the healing role of maggots during the World War.*

gots are then tested for sterility or freedom from germs, and at this stage are ready for the surgeon to use.

The flies, Dr. White explained, are only relatively sterile, but the maggots are absolutely germ-free according to careful bacteriological tests.

The flies are fed on approved diets, with a plentiful supply of vitamins, and investigations are now being made to determine whether they will need ultraviolet ray treatment during the winter. Their food consists of meat and bananas, this being their favorite fruit, and water. All of it is kept free from harmful germs or bacteria before being put in the cages. A cabinet in which the temperature and humidity are kept just right, and into which filtered, clean air is pumped, has been devised, so that the breeding can go on at any time of the year.

Maggots may be obtained commercially now for this treatment. The cost is \$7.50 for enough maggots for one treatment. While this seems high, in view of the fact that treatments are given every five days for six weeks, it is not much if the cost of the usual course of the illness, which may be months and years, is considered.

The maggots are applied directly to the wound. They are about one-half inch long and can stretch a bit longer. They burrow down into the wound, just as they would burrow into the ground, breathing through two spiracles

at their rear end. The wounds are kept covered with a bit of wire gauze, the whole arrangement looking somewhat like a cage.

The greater success obtained with children in this treatment was largely due to the better cooperation of the children, Dr. Baer thought. Adults are more squeamish than children, and for this reason, or because of some pain attendant on the first day or two of the treatment, often would not allow the maggots to be kept on the wound long enough to be effective.

The success of the treatment depends on the maggots staying in the wounds, but sometimes they get up around the edges. They cannot stand light, however, so Dr. Baer gave each of his little patients at the Children's Hospital School a flashlight, and taught them to chase the maggots down into the wound by turning the flash on them. The children thought it great sport, he reported.

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#### PHYSICS

## Molecules From Caesar's Last Gasp Still Being Inhaled

**T**HE NEXT TIME you breathe you will probably inhale a dozen molecules of air that left Caesar's lungs 2000 years ago with his dying gasp, "Et tu, Brute?"

This is one of the striking illustrations used by Dr. A. H. Compton, Nobel prize physicist, in a radio talk given over a nation-wide network of the Columbia Broadcasting System and sponsored by Science Service.

Dr. Compton, who is professor of physics at the University of Chicago, wanted to emphasize the fact that atoms are small, so small, he said, that in a little thimble filled with helium gas at atmospheric pressure the number of atoms is about "one with nineteen ciphers after it." In spite of the fact that in the intervening milleniums the air from Caesar's last breath has been blown around the world in ocean storms, washed with rains, warmed by sunshine and dispersed to the ends of the earth, Dr. Compton told his hearers the chances are there was still a small fraction of these molecules in each room where they were listening to the radio.

"Perhaps the best way to find out how something is made is to look at it," Dr. Compton said. "If it is like a watch we can hold it in our hands. This is comparatively easy. If it is the cell structure of a muscle that we wish to examine, we put it under a microscope. By using ultraviolet light of a wave length shorter than ordinary light, we can photograph such things as typhoid bacilli with increased sharpness. But atoms are too small even for this.

"Now X-rays have a wave length only

a ten thousandth that of light, and if we could use them in a microscope it would be possible for us to observe even the tiny atoms. Unfortunately we cannot make lenses that will refract X-rays, and if we could our eyes are not sensitive to X-rays. So it would seem that we should never be able to see an atom directly."

Although scientists have not been able to look at an atom, it was explained, by round about methods they have been able to get the same information concerning this tiny particle of matter as if they could see it directly

*Science News Letter, August 22, 1931*

#### FROM PAGE 119

platform by means of a reel, as described above, movable to any height required to suit the grain, and the platform to hold the grain until a sufficient quantity shall have been collected for a sheaf, more or less. Likewise the mode of changing the machine for cutting either high or low, as described above; also the method of dividing and keeping separate the grain to be cut from that to be left standing, and the method of attaching the tongue, when behind, to the breast of the horse, to enable him to guide the machine with accuracy.

In testimony that the above is a true and correct description of the use and construction of my machine as invented by me I have hereunto set my hand this 19th day of June, 1834.

CYRUS H. McCORMICK.

Witnesses:

HENRY STONE, ROBT. CLARK.

*Science News Letter, August 22, 1931*



#### GREAT SPORT

*Is what children think of the idea of using a flashlight to chase maggots down into the wound.*

#### MATHEMATICS

## Ruler-Compass Angle Trisection Impossible

**T**RISECTING the angle with ruler and compass alone is just as impossible today as it was in the days when the ancient Greek mathematicians worried over the problem centuries ago, mathematicians have commented in connection with recent reports that this problem had been solved.

A simple exercise in the theories of numbers which is worked by juniors and seniors in college mathematics courses demonstrates the impossibility of trisecting angles in general without the use of complex curves. There are a few special angles that can be trisected by use of the straight line and circle alone. When claims are made that the angle has been trisected by plane geometry, it turns out that one of these special angles has been used or there is some mistake in the work.

During the centuries many thousands of attempts have been made to solve the trisection problem.

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