

MEDICINE

Made in America—Tularemia

Disease of Hunters and Ranchers Was Discovered, And the Germ Was Isolated in the United States

By JANE STAFFORD

IN THE baggage car, rabbits and guinea pigs stuffed with germs. Behind in the Pullman, their doctor-custodian, suffering from the same disease. Both were being borne rapidly eastward by a transcontinental express. They were racing against time. They must reach Washington before the animals died and the germs in their bodies were lost to science.

It did not matter that "Eddie" Francis, the doctor-custodian, was so sick he could hardly hold his head up. He might risk his own life by disobeying his doctor's orders and making the journey from Utah to Washington when he should have been in bed. But he could not and would not take any chances with those germs that were growing nicely in the rabbits and guinea pigs, ahead in the baggage car. They were the germs of a brand-new, all-American disease. He had spent all of that long, hot summer in a combination garage-coalshed-laboratory, finding them and coaxing them to grow in the guinea pigs. Now he was taking them back to his chief at the old Hygienic Laboratory of the U. S. Public Health Service in Washington. There he and Uncle Sam's other disease fighters would spend the winter finding out what sort of germs they were and just how they could be tamed. Then, the following spring, the ranchers and hunters of Utah and neighboring states could be saved from the menace of deer-fly fever.

Sickness Mustn't Interfere

That was the plan. A mere trifle like his being desperately sick with the fever himself could not be allowed to spoil it, nor to make useless his entire summer's work. So he lay in his berth, aching and tossing with fever, and worrying about his pigs and his germs. At intervals, he stumbled out to the baggage car to see how the pigs and rabbits were getting along, and dragged himself back to his berth feeling worse and more worried than ever.

But you may be sure that his worry

was all for his animals and their germs, not any of it for himself. For "Eddie" Francis—Dr. Edward Francis, Medical Director, U. S. Public Health Service, to you—was and is a dauntless disease-fighter who has lived only for his work of hunting and taming germs. His associates in the Service will tell you that he is "wedded to his work." When other men are playing with their children, he is thinking about his work and the Service. Nor are devotion to his work and determination his only qualifications for research. He has the enthusiastic, vivacious type of mind that is stimulating to others working with him. Just as he is unafraid of the physical dangers of his job, he is fearless and ruthless in assaulting traditional, established beliefs and opinions. He believes in proving everything, leaving nothing to chance.

"Prove it in animals," is his watchword and his constant advice to younger scientists.

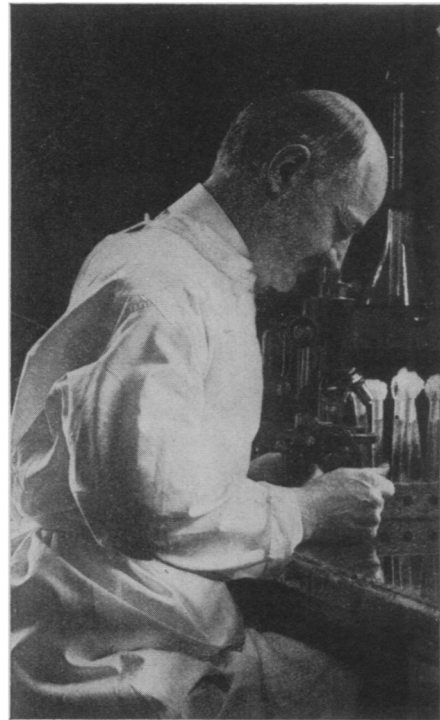
Distinguished From First

He was a young man himself when he joined the Service, fresh from an eighteen months' internship in a general hospital. He distinguished himself on his very first job. At that time immigrants at Ellis Island, where he was assigned, stood in line to be inspected by the medical officer for signs of smallpox, yellow fever, plague and other ailments that Uncle Sam's disease fighters are ever on guard against. The health inspection process is done somewhat differently today.

One morning as young Dr. Francis walked past the line of immigrants, he noticed a peculiar sore on the foot of a big strapping West African negro, member of a band of "torture dancers" bound to the Buffalo Exposition for show purposes.

"Guinea worm disease," he pronounced immediately, and he was correct.

Probably not one doctor in ten, with his limited experience, would have noticed the queer-looking sore on the foot of that strong, healthy-appearing black fellow. Not one doctor in ten,



DR. EDWARD FRANCIS

A RACE WITH DEATH

The story of how one of Uncle Sam's disease fighters raced across the country, hastening to reach his laboratory before death claimed his germ-laden animals and before he succumbed to the fever raging in his own body. This dramatic incident lends color to another of the *Pioneers of Medicine* series.

with more experience than his, would have recognized at once that the sore was due to an unusual parasitic worm of India, Arabia and the West African Gold Coast.

His chiefs in the Service began to take notice of this keen young recruit. They ordered him to the old Hygienic Laboratory, now the National Institute of Health, and set him at some research work. They found that he took to it like a duck to water. Later, when he was assigned to duty at the Mobile quarantine station, he moved practically all his part of the Hygienic Laboratory down there with him, so he could con-

tinue his bacteriological studies. Every minute that he was not actually on the ships making his quarantine inspections, he worked in his improvised laboratory.

So it is not surprising that he was picked to make the fights against "the first American disease," tularemia. However, in 1919, when he was assigned to a study of deer-fly fever, no one knew that he was going to discover a brand-new, all-American disease and risk his life in the course of his investigations.

Deer-Fly Blamed

All that was known, officially, was that for many years ranchers and hunters in Utah had been afflicted with a disease which they called deer-fly fever, because they thought it came from the bite of the blood-sucking deer-fly commonly found on horses and cattle in that part of the country. A few days after the bite of the fly, the small lymph glands in the region become swollen and painful. The patient suffers severe chills and then fever lasting for several weeks. Some patients died, all were disabled for weeks or months during midsummer, the busiest season on ranch or farm.

In 1910, a physician of Brigham City, Utah, Dr. R. A. Pearse, had described six cases of this disease at a meeting of the Utah State Medical Association but it had been known for several years before that. By 1919 the situation had become so serious that the State Health Commissioner called on the Surgeon General of the U. S. Public Health Service for aid. In July, 1919, Dr. Francis was on his way to Utah, accompanied by 30 guinea pigs, 30 white mice, 30 white rats and 30 rabbits from the Hygienic Laboratory.

When he arrived at Salt Lake City, the Health Commissioner told him that the disease was most prevalent around the town of Delta, about 100 miles to the southwest. Accordingly, Dr. Francis went to Delta, where he was welcomed by the town's physician, Dr. H. L. Charles. In Dr. Charles' garage, which was also a coalshed, Dr. Francis set up his cages of animals and his laboratory.

Shortly after Dr. Francis' arrival, Dr. Charles was called to see a patient who had been taken sick while mowing alfalfa and had gone to bed with fever and pains in his head, neck and shoulders. He had had a small sore on the right side of his neck which, by the time Dr. Charles, accompanied by Dr. Francis, saw him, had a black center about one-eighth of an inch in diameter and was surrounded by a yellow zone an eighth of an inch wide. Dr. Charles diagnosed the ailment as deer-fly fever.

Transferred the Germs

While he gave directions to the sick man's wife, Dr. Francis drew a little blood from the patient's arm. He took this blood back to his garage-coalshed-laboratory and injected some of it into two of the guinea pigs and two of the rabbits. Five days later, all four animals were dead. Dr. Francis performed very careful autopsies on those animals. He found many whitish spots of dead tissue on their livers and spleens. This was something familiar.

About ten years before, another of Uncle Sam's disease fighters, Dr. G. W. McCoy of the Public Health Service, had found the same sort of spots in the livers and spleens of ground squirrels in

California. They were very much like the sort of spots found in animals that have died of plague. Dr. McCoy was looking for plague in the squirrels and rats of California, where an epidemic of this dread rat-borne disease had raged. In the course of his investigations he found that some of the squirrels were suffering from a disease very much like plague, but which was not plague, and which could be given to guinea pigs. Guinea pigs, you know, belong to the rodent family as well as squirrels.

Same as McCoy's

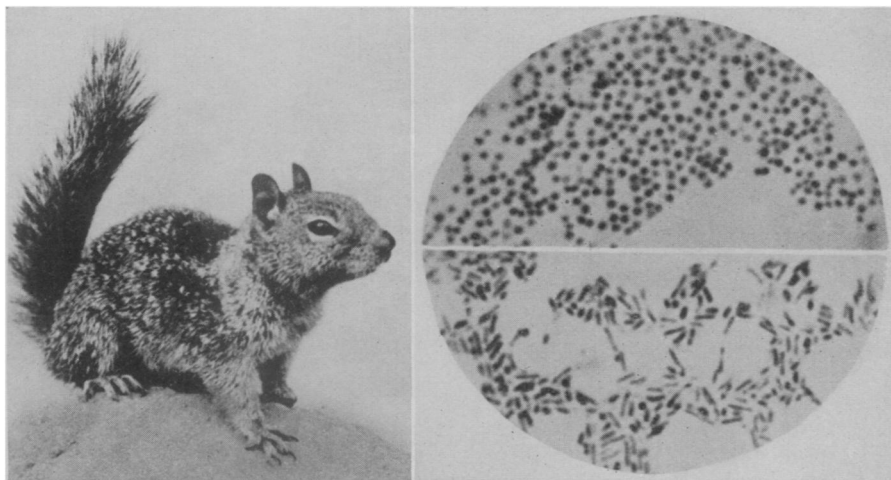
Dr. Francis saw at once that the disease his guinea pigs and rabbits had died of, after having blood from the sick rancher injected into them, was the same as McCoy's plague-like disease of rodents. Dr. McCoy had been able to isolate a micro-organism, or germ, in this disease which he called *Bacterium tularense*, after Tulare County, California, where he found it. But it was rather a fussy germ and would not thrive on the ordinary laboratory fare of plain bouillon and plain agar. He had to cook up a special culture medium for it using egg-yolk.

That was why Dr. Francis was so worried about the germs he was taking back to Washington. He didn't have any of the special medium for them and he knew he had to keep them alive in guinea pigs. If the pigs died, the germs would be lost.

Twenty-six days after he had been taken sick, the rancher had died. Dr. Francis was allowed to look at his liver and spleen. There he found many of the same sort of tiny white spots that he had seen in all the guinea pig and rabbit livers and spleens when the animals died after being injected with blood from the sick rancher. He cut tiny bits from the spleen of the dead rancher and inoculated them into guinea pigs, too. From these pigs he obtained McCoy's *Bacterium tularense*.

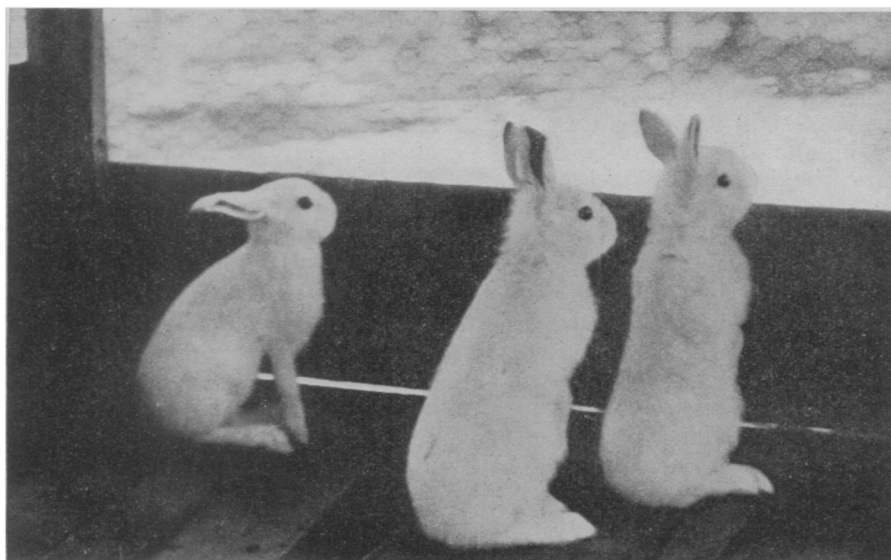
A Victim Himself

Then, just at that exciting moment, and five days after the rancher had died, Dr. Francis began to have chills himself. His temperature rose rapidly, and Dr. Charles ordered him to bed. But instead Dr. Francis made plans for his return journey. He knew that if he was sick in bed for three or four weeks, all the germs from this strange new disease would have died and he, or someone else, if he himself died, would have all the work to do over again. So, sick as



GERMS AND THEIR HOST

This is the original California ground squirrel from which the germ of tularemia was first isolated, and, on the right, two forms of the germ, Bacterium tularense.



BEAUTIFUL VICTIMS

The snowshoe rabbits of Montana are animal hosts of the disease—tularemia has killed thousands of wild rabbits—hunters and others may get the disease from handling the rabbits unless they wear gloves.

he was, he dragged himself around the garage-coalshed, packing his laboratory equipment and getting his animals into travel-cages. It took him two days of arduous effort to get everything ready, but he finally departed, Dr. Charles still protesting.

When he got to Chicago, though he could hardly hold his head up, he bundled the animals and himself into a taxi and rode far out to the north side, to the U. S. Marine Hospital. There he got some fresh, healthy guinea pigs and rabbits and somehow he managed to draw blood from the dying guinea pigs he had brought from Utah, and to shoot this blood, full of deer-fly fever germs, into the healthy guinea pigs and rabbits. Once more he bundled the animals and himself into a taxi and rode back to the railroad station. He was on the last lap of his journey, and he wasn't quite so worried. The germs would thrive in the new animals until they got to Washington the next day.

Gave Up at Last

When he finally arrived, he took the animals to the laboratory, made his report, and explained how the germs must be kept thriving in successive animals. He even tried to do some work himself, but had to give up at last and go to the hospital. It was three months before he was fit for work again.

While he was laid up, he mulled over the facts he had learned about this disease. He decided to call it tularemia,

since it was caused by McCoy's *Bacterium tularense*.

The following summer, he went right back to Utah, taking with him an expert on insects, Dr. Bruce Mayne of the U. S. Public Health Service. Back at the Washington laboratory, Dr. G. C. Lake kept the original germs alive by successive animal passages. Both Dr. Lake and Dr. Mayne became infected and suffered attacks of tularemia that summer. Ten years before, Chapin, who had helped McCoy isolate *Bacterium tularense* from California ground squirrels, had suffered an attack, though it was not recognized as tularemia or deer-fly fever at that time. Almost every other man who has worked with it in the laboratory has suffered an attack.

Must Wear Gloves

In the course of his investigations the second summer, Dr. Francis found that the disease occurs in wild rabbits, and that it may be carried from sick to healthy rabbits or to men by the deer-fly. A little later he found that men may get the disease simply from handling the infected rabbits, without being bitten by the fly and without having even a tiny scratch on the skin through which the ordinary germ could pass. This was the way Mayne and Chapin and probably Francis himself and Lake all became infected. After that discovery, Dr. Francis warned all laboratory workers to wear gloves when handling the infected animals or the germs in the

test tubes. The same warning was passed on to hunters, market dealers and housewives when it was found that these people, too, had been suffering from the disease, which they had called rabbit fever. Thorough cooking of the rabbit meat, even if it has been infected, makes it safe to eat.

Dr. Francis is a striking example of the dictum that a person can contract tularemia only once—or, as the doctors say—one attack confers permanent immunity as in smallpox or yellow fever. To him there is no longer the slightest danger from the bite of the deer-fly, from the bite of the wood tick, from skinning infected rabbits, or from dissecting the most highly infected guinea pigs, rabbits or white mice in his laboratory.

Worked With Bare Hands

His advice to others to wear rubber gloves when dressing wild rabbits is totally disregarded by himself because of his solid immunity acquired fourteen years ago by passing through an attack of the disease. Since that time he has deliberately courted infection by working without protective rubber gloves.

If by chance some virulent germs occasionally find lodgment in a crack or cut on his hands the worst that can follow is a small sore which is well in a week's time without causing any illness, or fever, or interruption to work. While the contents of such a local sore is harmless to his resistant immune body, it is deadly in five days to a guinea pig, rabbit, or white mouse into which it is injected. Such a local sore has occurred on his hands three times since his original attack of tularemia and is learnedly termed by the doctors as a "reaction of immunity."

When Dr. Francis first reported the new disease to the world of science, it was considered a strictly American product. No cases had ever been reported in any other country. It is still an all-American disease in the sense that it was discovered in this country and that Dr. Francis and other American investigators are entirely responsible for finding the germ and the way in which the disease is transmitted. But soon after Dr. Francis' first report was published in 1921, investigators in other countries began finding cases of it.

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