BIOLOGY

Germless Animals Are Bred

The hatching of a germ-free chick from a germless laboratory egg conclusively proves that higher animals can live without microbes in the body.

By DR. FRANK THONE

➤ GERMS are not necessary to life in the higher animals. Birds can be hatched, mammals born, live their whole lives, mate and produce new generations of their kind, all without harboring within their bodies the swarming microbial gardens that have long been considered our inevitable, perhaps even our necessary, internal companions.

This has now been conclusively proved by experiments in the laboratories of bacteriology of the University of Notre Dame, carried out by Prof. James A. Reyniers and his co-workers. From germ-free parent bantam chickens they obtained a germ-free egg. From this egg they hatched a chick—also germ-free. Thus a whole germ-free life-cycle has been completed.

As long ago as 1885, Louis Pasteur, father of scientific bacteriology, pointed out that germ-free animals would be useful for experimental purposes. He speculated upon the possibility of producing germ-free chickens, but doubted if life without germs would be possible. The experiments at Notre Dame have shown this conjecture of Pasteur's to be incorrect.

Germ-Free Life

Earlier work by Prof. Reyniers and his colleagues had shown germ-free life to be possible for a wide variety of animals: mice, rats, guinea pigs, cats, monkeys, as well as chickens. Brought up inside aseptic metal cages, supplied with sterilized food and water and with filtered air to breathe, they remained healthy and contented indefinitely.

But they would not breed. When the mammals mated, no young were born. The chickens laid eggs—which did not hatch. So for a considerable while it was necessary to start each germ-free generation from scratch.

This is possible, though difficult and costly. It depends on one long-known biological fact: that chicks and other birds in their shells, as well as mammalian embryos wrapped in their pre-birth membranes, are normally germ-free. Prof. Reyniers developed an elaborate technique for completely aseptic caesarian operation to produce germ-free mammals. Germ-free chicks presented a simpler problem: sterilize the outside of the shells with suitable chemical solutions, then incubate them in sterile surroundings, and they would hatch out germ-free.

However, it would be better from the viewpoint of cost if germ-free animals could be induced to reproduce their own germ-free offspring, living generation after generation in their carefully sealed-in world.

After many failures, the Notre Dame research group succeeded two years ago in obtaining second-generation germ-free rats. Now they have succeeded again, with chickens. The problem of repeating these successes on a large scale, to obtain any desired number of experimental animals without germs, is primarily one of engineering, and is already well on the way to solution.

Producing and breeding germ-free animals is more than an elaborate and interesting scientific stunt. There is a large field of possible usefulness for such animals, especially in the fields of experimental medicine and nutrition.

For instance, when a researcher has a new variety of germ which he suspects of causing a particular disease, he "puts it through a pig." That is, he injects some of the germs into a guinea pig, or gives it to the little animal in its food or water.

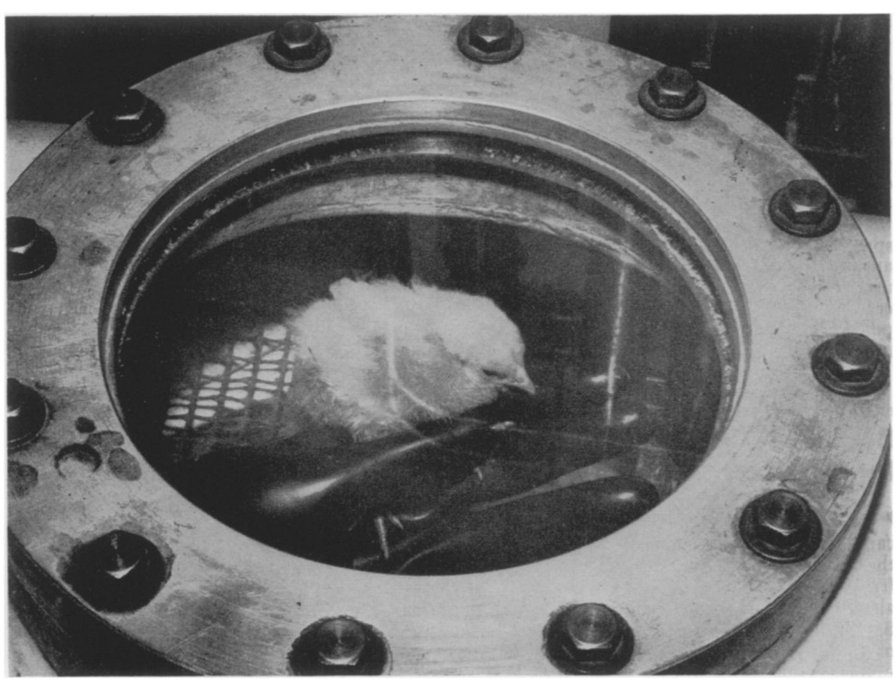
But the guinea pig is already full of other kinds of germs. If his suspected variety fails to have any effect, the experimenter cannot be quite confident in rendering a verdict of "not guilty." The possibility that the new germ's effects are offset by the action of a protective germ already present must always leave a shadow of doubt on his results. But if the experimental animal is germ-free to start with, this doubt can be resolved.

Vitamin Diet

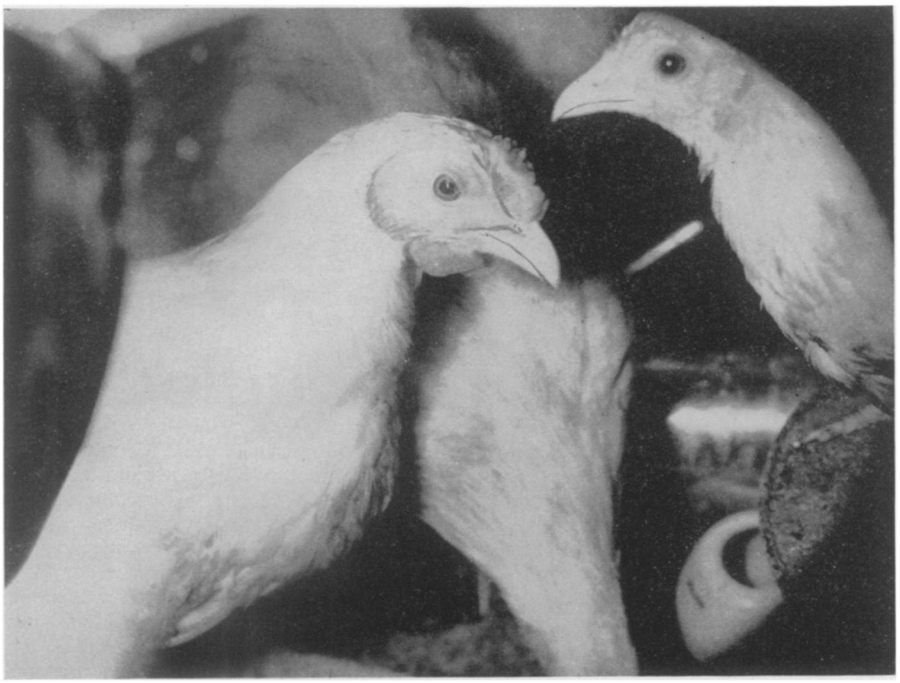
Again, if a nutritionist wants to test a newly discovered vitamin, he may feed a diet containing it (or lacking it) to a white rat. But the rat's digestive tract swarms with germs of a score or more varieties. Perhaps one or more of these will gobble up the vitamin before the rat gets a chance to assimilate it. Or perhaps some of the germs are themselves vitamin-makers—many germs are. The results again are masked, uncertain, unless the test is made with a germ-free animal.

These are only two of the many and varied possible uses of germ-free animals. Research workers from other universities have already beaten a path to the Notre Dame laboratory door. The Office of Naval Research considers the work to be of sufficient long-range significance for our national defense and health to justify the granting of considerable sums toward the partial support of the work.

The cages in which the germ-free ani-



GERM-FREE CHICKEN—Little Innocent is the first chicken to achieve the distinction of second-generation germ-free existence in the Notre Dame bacteriology laboratories.



COMPACT CHICKENS—One of these hens is the mother of Little Innocent. These Wyandotte Bantams make excellent laboratory animals because of their small space and food requirements.

mals are reared at present are hermetically sealed horizontal metal cylinders about the size of a popular washing machine, with germ-tight locks for the introduction and removal of the experimental animals. Windows for observation are gasketed into the wall, and long rubber gloves, similarly gasketed in, permit the operator to reach in and handle the animals without breaking the germ-tight seal. An elaborate network of pipes supplies sterile water, filtered air, and steam for resterilization of the cages between uses.

The new setup, now being prepared for larger-scale production of germ-free animals, is much more spacious, and will permit greater freedom of action on the part of the experimenter.

Nevertheless, space will always be at a premium, so the bacteriologists prefer to use small animals when there is no compelling reason for larger ones. Rats and guinea pigs are chosen rather than rabbits and monkeys.

For the same reason, Prof. Reyniers looked about for vest-pocket-size chickens when he decided to try for second-generation germ-free chicks. Bantams of the White Wyandotte breed proved to be an excellent choice. They not only require much less space than full-sized fowl, but they can live on much smaller portions of the semi-synthetic diet used in the experiments. It is expected that these feathered midgets will be widely adopted as experimental animals.

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MEDICINE

Eating May Heat Up Face

➤ EVERY TIME the patient ate, the left side of his face felt warm and sweat poured off it. The strange, one-sided reaction was brought on by eating any food, especially apples. This had been going on for 25 years.

This patient and two others with the same condition were studied by Drs. A. S. Freedberg, Robert S. Shaw and M. J. McManus of Harvard Medical School and Beth Israel Hospital in Boston.

Some patients with this condition get red on one side of the face as well as feeling hot and sweating on that side. Auriculotemporal syndrome is the medical name for the condition.

In the Boston patients, the reaction started in ten to 15 seconds after starting to eat an apple and while still chewing. In one of them, the same reaction was started by chewing a lemon or even paraffin.

Somewhat over 90 cases of this condition have been reported in medical literature and the Boston doctors point out that the condition is not rare and is repeatedly seen in clinics observing patients after