

Viral Genes Can Program Livestock To Resist Disease

WASHINGTON — For the first time, genes of a weak virus inserted in chickens by researchers are being passed from generation to generation, scientists at the U.S. Department of Agriculture report.

This brings closer the day when geneticists can custom-design chickens to resist disease, lay bigger eggs, or have other traits valued by producers, said Lyman B. Crittenden, a geneticist with the Agricultural Research Service's

Regional Poultry Research Laboratory in East Lansing, Mich.

Until now, researchers had succeeded in getting only one vertebrate — the mouse — to pass to its offspring viral genes inserted in the laboratory, said microbiologist Donald W. Salter, Crittenden's colleague.

The scientists actually inserted the virus right through eggshells near 1-day-old embryos that hatched and later were bred with

virus-free chickens. So far, said Salter, the genes have been inherited by three generations of descendants from that first pairing. "With more research," said Crittenden, "turning the avian leukosis virus against itself may be one of the first practical achievements of exploiting its need to use a cell's own genes to reproduce." Consumers and chicken producers will benefit, he said, when scientists find how to

use genes of the virus not only to make it self-destruct but also to transport other useful genes into chickens.

Changing the genetic inheritance of animals is not new, but it's always been done through breeding, by mating animals that have desirable traits. Today many scientists are trying new genetic techniques to make breeding more efficient. Within five to 10 years, Crittenden said, the research should provide harmless virus genes into which other inheritable genes can be spliced for research uses.

The two scientists used the avian leukosis virus because it's a retrovirus, which invades a cell's own genes to "trick" the cell into producing more virus particles.

"Once inside the cell, a retrovirus — unlike other viruses — releases an enzyme that converts the virus' RNA to DNA," Crittenden said. "This DNA seeks out the cell's genes and merges into them. The cell then produces a new virus particle."

The poultry industry is closely following the work of the two scientists and their collaborators, scientists at the Frederick (Md.) Cancer Research Facility and a Veterans Administration facility in Salt Lake City, Utah. Their studies are reported in the March issue of the journal Virology, and patent applications are being processed.

"What we did," Crittenden said,

"was inject the retrovirus into hundreds of fertilized, day-old embryos which we then hatched in an incubator. If tests showed the DNA of a chicken's blood cells contained the virus genes, we bred that chicken with one free of the virus and tested their progeny to find ones that inherited the virus genes from the parent. Then we repeated that step for a second generation of chicks and found that the viral genes had become a stable part of the chick's genetic library."

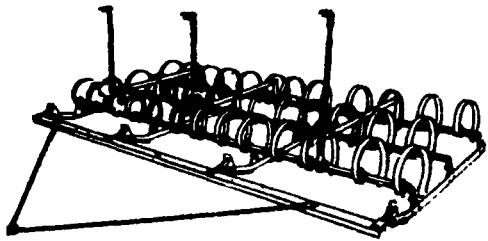
To turn the virus against itself, Salter said, "we would have to insert defective virus genes. These could not produce virus particles but could block similar disease-causing viruses from entering a cell."

Chickens and other animals could someday have custom-inserted genes to control growth and other functions. But this could occur only after much more is learned about which genes or gene groups regulate these functions, said Crittenden, who in 1985 was named one of the research agency's outstanding scientists for his work with poultry viruses.

Retroviruses could provide a much more efficient way to integrate new genes in other farm animals, said Robert J. Wall, member of a research team doing this work at the agency's Agricultural Research Center in Beltsville, Md.

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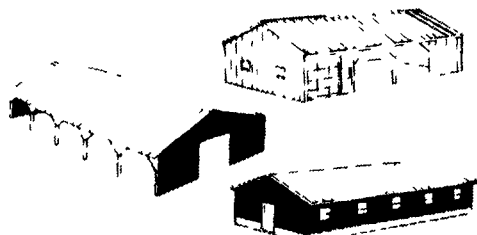
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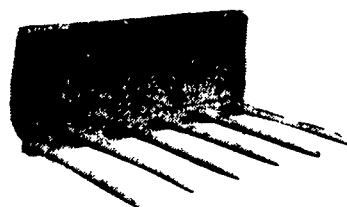
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