

Genetic engineers discover viroids, potato disease test

BELTSVILLE, Md. — A viroid the smallest agent known to cause an infectious disease, has become the subject of genetic engineering by U.S. Department of Agriculture scientists.

By making DNA complementary to potato spindle tuber viroid, which causes a troublesome potato disease, and then cloning it, research chemist Robert A. Owens and geneticist Dean E. Cress made possible the development of a test for detecting PSTV in potato seed and breeding stock.

Such a test could help boost world food supplies considerably, by allowing greatly increased production of the highly nutritious potato in tropical and subtropical regions where viroid diseases are most severe.

Cloning this DNA will also help scientists study how viroids multiply in host cells, say Owens and Cress.

Theodor O. Diener, a USDA research plant pathologist who discovered the first viroid, says that the cloning success of Owens and Cress is providing the basic ingredient for a sensitive and reliable test for PSTV which will aid potato breeders and seedsmen around the world. The potato disease caused by PSTV threatens to hamper current efforts to increase potato production in warm countries. Warm climates encourages viroid replication.

Testing potatoes and other crops for the presence of PSTV is currently a time-consuming, inefficient process, says Diener. The new

test, based on a technique called nucleic acid hybridization, can probably be automated, much like current tests that quickly and reliably screen plant material for the detection of plant viruses.

Viroids are one-fortieth the size of the smallest known virus. Viruses themselves are directly visible only with an electron microscope. They are very simple structures, consisting of a core of nucleic acid surrounded by a protein coat or coats. The nucleic acid is either deoxyribonucleic acid (DNA) or ribonucleic acid (RNA), the two kinds of molecules that carry the genetic information for living organisms. Until Diener identified PSTV, viruses

were considered the smallest infectious agents capable of replicating themselves within living cells.

Although viroids are smaller and have an even less complex structure than viruses, they can replicate independently within infected cells. Actually, viroids are merely small bits of RNA that appear as short strands or rods in the electron microscope.

Owens and Cress used recombinant DNA techniques (genetic engineering) to clone this specific DNA. They first made DNA which was complementary to the RNA of PSTV. They inserted this complementary DNA into plasmids (circles of DNA from a bacterium) by biochemical methods and then put the plasmids back into a bacterium called E. coli. As the bacterium reproduced, the plasmid DNA containing the PSTV-related sequences was also reproduced. The DNA complementary to PSTV was then purified and radioactively labeled.

The final product is a large number of homogeneous, labeled DNA molecules that can be used as molecular probes in experiments to learn how to prevent potato spindle tuber disease and possibly other diseases caused by the elusive viroids.

Two earlier studies were essential to the successful completion of this USDA project. In 1962, USDA's William B. Raymer and Muriel J. O'Brien discovered that the (as yet) unknown causal agent of potato spindle tuber disease could be propagated in tomato plants — thus, the first bioassay for PSTV was discovered. In 1978, German scientists at the Max-Planck-Institute for Biochemistry and at the

Justus Liebig University nucleotides, or subunits) determined the sequence of within the RNA of PSTV.



Governor Dick Thornburgh recently signed House Bill 1608 into law. Seated with the Governor are, left, Rep. Reno Thomas, chairman of the Agriculture and Rural Affairs Committee and Rep. Noah Wenger, vice-chairman and prime sponsor. Standing are representatives from the Pennsylvania farm community.

Governor signs HB1608

HARRISBURG — A measure that would help preserve family farms has been signed into law by the Governor.

Rep. Noah Wenger, prime sponsor, noted the new law will exempt family farm corporations from the state capital stock and franchise tax.

"The tax discouraged many farm families from incorporating their holding," Wenger said. "Incorporating, in some cases, will make it easier to pass the farm from one generation to the next."

Wenger, vice chairman of the Agriculture and Rural Affairs committee said this type of corporation will now

be exempted from the stock tax and therefore, encourage families to benefit from the advantages of being incorporated.

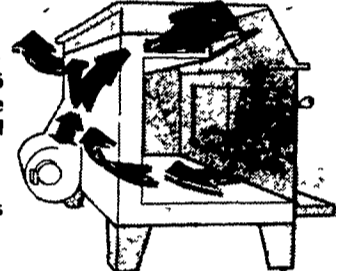
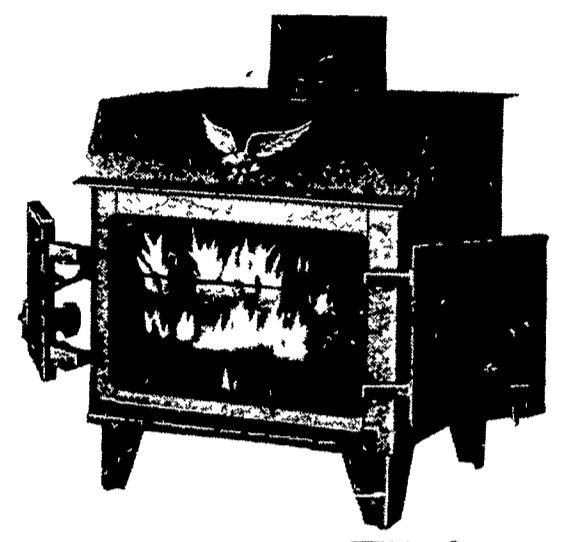
"This law will help keep Pennsylvania as one of the major food producers by preventing family farms from splitting up and the land being used for non-farming purposes," Wenger said.

A family farm corporation, as defined in the bill, must be organized and operated for agricultural land use.

In addition, 75 percent of the corporation's stocks must be owned by members of the family and at least 75

percent of the assets must be devoted to the business of agriculture.

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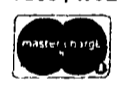
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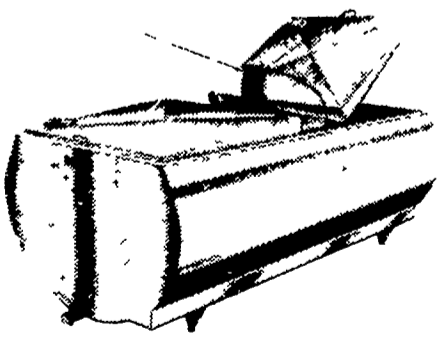
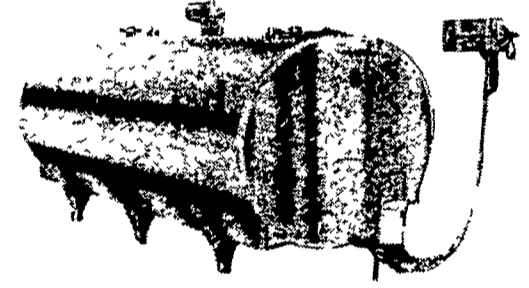


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