(iii) The coupling of the metabolic energy supply is explicit (the conversion of S to P). (iv) The specificity of ion transport can be interpreted in terms of the specific binding properties of the enzyme and/or enzyme-substrate complex.

C. A. THOMAS, JR.*
Lilly Research Laboratories, Indianapolis, Indiana

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* Present address: Department of Physics, University of Michigan, Ann Arbor.

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Rodenticidal Effect on Pine Mice of Endrin Used as a Ground Spray

For many years, poison baits have been the basis for control of mice in orchards. World War II stimulated research involving bioassays on toxicity of hundreds of potential bait type rodenticides (*1*). In orchard practice, zinc phosphide, with all its limitations, is still rated above the newer materials. However, the lack of effectiveness of zinc phosphide led Kalmbach (*2*) to anticipate its replacement by other more suitable rodenticides.

Experience has shown that the sublethal acceptance of poisonous bait by numerous mice, coupled with the high reproductive capacity of these animals, places the dependability of poisoned baits for orchard mouse control in great doubt. One large Virginia orchardist loses about 600 to 700 apple trees annually, even though he uses poisoned baits close to maximum advantage. Since numerous reasons exist for such failures (*3*), the need for more effective mouse control is evident.

Since 1949, a number of potential ground spray rodenticides have been tested in orchards of Virginia, including endrin, the coined name for an insecticide. Endrin has been 100-percent effective in each of the past 3 years as a pine mouse control.

In the experiments in apple orchards reported here, the chemicals were applied as a ground spray to heavily mouse-infested plots that contained 42 trees each. All replicated plots were six rows wide and seven tree spaces long, or about 1.2 acres per plot. Since the range of pine mouse colonies is reported to be about ¼ acre (*4*), test plots nearly 5 times the maximum colony area were selected. The six center trees in each such treated plot appeared to be well protected from mouse invasion by the sprayed strips of orchard 70 or more feet wide and occupied by two surrounding "guard rows" of trees. A uniform ground spray was applied to a continuous straight strip 11 feet wide on each side of each row of trees. Preferably the treated strip reached to the trunk. For large trees, only 11 feet inward from the limb ends could be covered. Because pine mouse activity was concentrated in the tree rows (*3*), alleys between rows were not sprayed. The spray coverage was usually about 65 percent of the total orchard floor.

Table 1 indicates that there was a rapid decline in mouse activity to near final levels in 6 days or less during 1954. For 1953, a period of 3 to 6 weeks was required for a similar action. Apparently the difference in response is associated with moisture differentials in soil and cover. In 1953, the spraying was done under extremely dry conditions, which continued for some time. In 1954, at the time of spraying and subsequently, the orchard floor litter was moist, and the surface soil moisture was near field capacity.

As is the case with numerous other recent organic pesticides except DDT, the effect of endrin ground sprays on human beings and wildlife has not been well evaluated. The evidence that exists indicates that the orchard use of endrin as described here causes little or no evident deleterious effect on men or game animals. In the fall of 1954, one orchardist with extensive fruit plantings sprayed with a gun about 1000 acres of apple orchard. Members of the spray crews felt no ill effects. Neither was there any apparent reduction in numbers of quail or deer. None of the pets that had free range of the orchard died. A dog that closely followed one workman during the spraying was not visibly injured. In another 6-acre orchard area that was treated with endrin, active rabbits were observed during the period when mouse activity declined to zero. No increased vulture activity following endrin application was observed.

Table 1. Decline in pine mouse activity following endrin ground sprays in apple orchards. Mouse activity before the spraying was considered to be 100 percent.

Chemical	Endrin per 42-tree plot (lb)	Post-treatment mouse activity (%)		
		After 3–7 days	After 21–25 days	After 43–51 days
Plots sprayed 26–29 Nov. 1954				
Controls		67	83	58
(3 plots)		55	73	73
		90	91	91
Emulsifiable	2.50	0	9	0
endrin	2.50	0	10	0
(3 plots)	2.50	0	0	0
Emulsifiable	3.25	0	8	0
endrin	3.25	0	0	0
(3 plots)	3.25	8	8	0
Wettable endrin	2.50	0	0	0
(2 plots)	2.50	27	0	0
Plots sprayed 13–18 Nov. 1953				
Emulsifiable	1.5		30	40
endrin	1.5		0	30
(4 plots)	1.5		33	42
	1.5		8	33
Emulsifiable	2.5		25	0
endrin	2.5		0	0
(4 plots)	2.5		25	0
	2.5		33	0

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An indication of the relative safety in the use of endrin is its acceptance for the control of insects on food plants. A label has been issued by the U.S. Department of Agriculture for the use of endrin on cabbage plants. This material was accepted earlier for tobacco insect control. As presently used against rodents, endrin is not applied either to the tree or to its fruits. Moreover, the treatments have been fully effective only in the dormant season when surface contamination of fruits could not occur.

FRANK HORSFALL, JR.
Horticulture Department, Virginia Polytechnic Institute, Blacksburg

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Citation Indexes for Science

Eugene Garfield's article, "Citation indexes for science" [*Science* **122**, 108 (1955)], is interesting beyond doubt. If we had in our library a citation index such as he proposes, I should use it to advantage.

Amid today's overwhelming difficulties in scientific communication, however, this index would solve too few problems to justify its surely great cost at this time.

Even though all the cited references in a given article were indexed, those ideas and key words not covered by the cited references would remain excluded, according to Garfield's system. The most