November 1976

STRYCHNINE

Paul Ochs
U.S. Dept. of Agriculture, Hyattsville, Maryland

STRYCHNINE

Paul Ochs
U.S. Dept. of Agriculture
Hyattsville, Maryland

I was to come here and talk to you today about the status of strychnine. Strychnine, of course, is one of the older poisons in use today; and, according to information from Fitzwater, Strychnine was known for its toxic properties as early as 1640. It was used to destroy crows, pests, stray dogs, etc. Strychnine was also used by natives of South America and Africa to dispose of neighboring tribes.

This material is derived from an extract of the seeds from *strychnos nux vomica* and other species of the *strychnos* genus. The alkaloid form is only slightly soluble in boiling water, about 1 g in 3100 ml H_2O, but relatively soluble in alcohol, chloroform, and benzene. One gram Strychnine will dissolve in 150 ml alcohol and 35 ml boiling alcohol. One gram will dissolve in 5 ml chloroform or 180 ml of benzene. It's only slightly soluble in ether.

The present uses in this country are limited to rodenticides and avicides. The predacide uses were cancelled by EPA in March of 1972, based on the misuse with thallium as a predacide and the resulting deaths of an endangered species--bald eagles. However, since that time, EPA has issued specific exemptions to various states for the use of strychnine for the purpose of suppressing rabies in skunks.

Strychnine is considered highly toxic and has LD_{50}s for mammals ranging from .33 mg/kg in mountain beaver to over 200 mg/kg in horses. The reported LD_{50}s for birds do not show the spread as shown in mammals. They range from 4 mg/kg for House Sparrows to 161 mg/kg for California quail, The LD_{50} for pigeons is reported as 8-11 mg in the toxicology handbook; however, there is some reason to believe that this figure may be high, based on some work by Beck and others in 1963 and 1964 using a 0.25% bait.

The general statement that galinaceous birds are not as susceptible to strychnine is at least in part true. One can look at the margin of safety between the LD_{50} for such a bird as the California Quail with its 161 mg/kg or the turkey, reported as slightly less than 100 mg/kg, in comparison with LD_{50}s for House Sparrows of 4 mg/kg or Redwinged Blackbirds as 6 mg/kg. However, the margin becomes somewhat narrowed if one looks at the LD_{50} for chickens, which is reported as 30-40 mg/kg, or the pheasant, 8.5-27 mg/kg, depending on the reference you cite, or the Chukar partridge, which is 16-27 mg/kg.

Mortality results, of course, from the ingestion of a lethal dose and is reported to occur within 12-30 minutes. Some of you will disagree. The pigeon of course may over-feed, particularly with certain formulations, and get an overdose. Depending upon what's already in the crop and in the stomach, 'the time to death may be slowed.

The current status of strychnine at this time could be answered in one word, unknown. As most of you are aware by now, strychnine is scheduled to undergo the Rebuttable Presumption Against Registration (RPAR) by EPA. This is the review process established by that agency to assure themselves that certain compounds will not cause unreasonable, adverse effects to the environment, which includes man.

By reviewing the criteria for determination of "unreasonable, adverse effects" published in the Federal Register (Vol. 40, No. 129), one might almost predict the areas that will trigger the RPAR. In section 161.11 are about 3 paragraphs which I will refer to here, "any compound which occurs as a residue immediately following application in or on the feed in amounts equivalent to the average daily intake of such respective species at levels equal to or greater than the LD_{50} measured in mammals.

And then the next paragraph, "The pesticide which occurs as a residue immediately following application in or on the feed of an avian species representative of the species likely to be exposed to such feed in amounts equivalent to the average daily intake, at levels equal to or greater than the sub-acute dietary LD_{50} measured in avian test animals."

And the last one, "Can reasonably be anticipated to result in significant local, regional, or national population reductions in non-target organisms, or fatality to members of endangered species." "The lack of emergency treatment (it has no known antidote) or positive first aid treatment for amelioration of toxic effects in man, resulting from a single exposure."

Now before you or anyone else, construes this to say that Paul Ochs says that these things all happen, I haven't said that. Nor have I said that anyone of them will. However, each of you who has used Strychnine knows that the compound has the capacity to produce mortality. If it didn't have, it would have absolutely no utility for bird control.

Styrchnine is registered as an acute toxicant for the use in the control of certain rodents as well as Pigeons and sparrows. You also know that even under the 1947 FIFRA as ammended "a compound must be safe and effective when used according to labe directions." Also, those of you who have registered such materials under the 1947 FIFRA are also aware of the feelings, even at that time, that Strychnine as an avicide should only be used by those individuals qualified by training to use it, for the very reasons EPA now wishes to cancel the compound and uses.

While there are a few compounds to replace Strychnine as an avicide, there is at least one use for gopher control for which Strychnine cannot be replaced. Nor can it be replaced as a predacide, much to EPA's dismay.

Where does all this leave Styrchnine? No one, even EPA, knows for sure. I have been advised by EPA that the RPAR for Strychnine and 1080 is to appear in the Federal Register on November 10, and you have 45 days from then to defend the uses that you may wish to retain, but the data must support your needs and you must be prepared to defend the primary and secondary hazards as well as the antidotal problems. I wish you good luck.

DISCUSSION

Question: What is the exact reference for the published material?

Ochs: Federal Register 40, #129, Thursday, July 3, 1975.

Question: Who is the biggest manufacturer of strychnine?

Ochs: All strychnine is imported. There are quite a few commercial registrations; USDI has registrations. I don't know whether any manufacturer will submit a defense of the material.

Question: Is there a serious problem of secondary kill, as when a dog eats a bird killed by strychnine?

Ochs: There may be a potential problem with pigeons, if you have a gluttonous bird. The potential for that bird to carry some toxicant to the ground exists. The EPA has not addressed that issue. What they're talking about is secondary exposure (or the potential) with rodenticides used for ground squirrels and pocket gophers that fill pouches and die on the surface.

Comment: There is a difference between secondary poisoning and secondary hazard. Strychnine is not a secondary poison. The crop of the pigeon has the strychnine in it and can be eaten by the predator. Actually the flesh has no strychnine in it and can be eaten without hazard.

Comment: There are some labels that state that strychnine can only be used in the winter. Thus it's important to read the label.

Fitzwater: I really believe that both strychnine and Rid-A-Bird are tools that should be saved for industry. We have so few.

Knote: Gene Meester gave you a fine run down on the Rid-A-Bird perch. You heard Paul Ochs just tell you about the problem being faced with strychnine and rebuttable presumptions with EPA. I would like to tell you about the problems faced by Rid-A-Bird perch and solutions within them.

There are two control solutions that are used in the Rid-A-Bird perches - endrin (94% concentration) [EPA in 1975 tested this material on rats as an acute oral material (even though it's not used this way), and it had a LD_{50} = 190 mg/kg and was considered a class 2 toxicant.]. The other material we're using in the solutions is fenthion (11%).

Where do we stand? About 9 weeks ago all the people who had an endrin formulation, including Velsicol which is the only manufacturer of technical endrin, were notified through the Federal Register that they had 60 days to respond to this particular problem of endrin use. One of those notified was

Rid-A-Bird Co. (Muscatine, Iowa) on their 9.4% material. They need to answer Washington as to what kind of response we in industry have had to this particular material in use. First, understand that we're looking at a dermal, contact, acute toxicant. This is picked up by the animal on its feet on the perch and translocated through the body to the nervous system, and some of the birds die. We don't know what proportion dies.

We're looking at Starlings, sparrows, Pigeons and secondary hazards from dead birds being eaten by cats, dogs, or predatory birds, primarily hawks. If you have used this material (endrin) and have seen in the field that cats or dogs or other animals have been around and have not suffered (or have suffered) during its use, report this. We'd like to know also if you've used the materials and have had failures with it. What are the circumstances? Only then will EPA believe what we're looking at. We're telling the truth regardless of the results. Finally, we want to have the successes that you have had in reducing populations of these three species with this perch method.

Not only is Velsicol going to Washington, but Bob Bosch of Rid-A-Bird is going to spend time, energy, and effort to develop the protocols for testing and is going to do all the things within reason to keep this piece of merchandise available for use.

Finally, please wirte your representative in Washington and tell him the same story.

Ochs: You omitted mention of fenthion, or are you going to?

Knote: What should be said?

Ochs: Submit the same kind of information on fenthion, its relative efficacy as related to that pattern of use, particularly if it is less (or more efficacious) than endrin; it should be documented. Fenthion is registered for use, but it is also a potential alternate. In some climates this may not present a problem, in areas with cold climates it might. But it's a point of consideration.

Chemagro: Fenthion is not under RPAR. I don't want to disagree about sending data to Washington. But you also might send data to the Chemagro Documentation Center in Kansas City. You can bet your bottom dollar that Chemagro will spend money to defend Baytex (fenthion) if it becomes necessary.

Ochs: I'm sorry if I left you with the impression that fenthion is under RPAR. It isn't. However it's registered as an alternative for the use of endrin. It's the only reason why this kind of information should be made available to EPA.

Chemagro: If these data are available in the data documentation center, they can be incorporated into the brochure and all presented at one time.