

OPEN DISCUSSION

Moderator: Dr. Smith

Dr. Fox: One of the great virtues of DDT was its long-lasting effect. I would like to know about the relative stability or persistence of these hormone compounds. I suppose they differ among themselves, but are there some that do have a long-lasting effect?

Dr. Vinson: I don't have any data on the stability of Stauffer JH-1, but I do have some data about Williams' original mixture. We impregnated woolen pads with his mixture and kept them in the dark for two months, at the end of which they were just as active as at the beginning.

Dr. Schoof: I agree with Dr. Fox about DDT as a lousicide. It is also a quite cheap insecticide—18 to 20 cents a pound. There have been reports that some of these hormones would run \$10 a pound, but Dr. Robbins says they are cheap. What do you mean by "cheap"?

Dr. Robbins: I mean less expensive compared to other types of hormonal chemicals; for example, the cecropia juvenile hormones and the ecdysones, as compared to the later developments in juvenile hormone chemistry. Incidentally, there are very few insecticides that are as low in price as DDT.

Dr. Schoof: No compound is going to be as cheap as DDT. Do you feel that \$10 a pound is a reasonable figure, though?

Dr. Robbins: During a conference with one of the industrial firms, their representatives indicated that some of the aromatic terpenoid ether compounds might be produced at a cost generally comparable to that of certain insecticides in current use.

A problem with many of the juvenile hormone compounds is that they were not very stable when tested in the field. This was

recognized very early and an attempt has been made to eliminate the labile groups that brought about this instability. The labile sites in many of the juvenile hormone compounds are the ester linkage, the epoxide group, and the unsaturation. Two of the active compounds Mr. Cole worked with are ones Zoecon developed in an attempt to stabilize the juvenile hormone chemicals.

Dr. Smith: There have been reports that JH-1 was absorbed in synthetic plastic material, and that as a mosquito larvicide it still released the effective material for a long time. Whether this could be applied to a louse powder or not, I don't know.

Dr. Perry: I might add that some of the synergists that synergize some of the organophosphates and carbamate insecticides will also synergize the juvenile hormone mimics. This clearly indicates that the juvenile hormone mimic itself undergoes metabolic changes and that the synergist inhibits such biotransformations. Some of the Zoecon compounds completely failed when tested under field conditions just last summer in California. That was because they were very unstable and are broken down by ultraviolet light. Before they can be put on the market there has to be assurance that they last at least several days.

Dr. Robbins: I thought Dr. Charles Schaffer found these compounds to be effective against mosquitoes in field tests in California and Panama.

Dr. Schoof: You are right as to the good results he obtained in testing microencapsulated Zoecon 515. The Z-515 emulsion used in our tests was ineffective, and Dr. Schaffer also got similar results with the emulsion formulations. Because of such results, the

Zoecon Company has more or less given up on its Z-515 emulsifiable concentrate as far as mosquito larvae go.

Dr. Smith: Dr. Vinson, I gathered from your talk that there are two JH-1 effects. One is the ovicidal effect on females, and to achieve this you have to retreat with the compound every three days; the other is that it blocks molting from third-instar nymphs to adults. Would you tell us what treatment you would use in your proposed field test? Would the clothing have to be retreated every three days? How long do you think it would take to eliminate an infestation of all states of lice?

Dr. Vinson: In the first place, I didn't recommend a field test of juvenile hormone-like compounds right away. I suggested that they be started on that long, tortuous three-year journey toward field testing that Drs. Steinberg and Gratz described.

The data I presented were obtained from topical application of the compound to individual lice. It is perfectly feasible to impregnate cloth with the juvenile hormone-like compound and keep the lice on the cloth. Since they will then be continuously exposed to the effects of the hormone, there is no need to keep retreating them at three-day intervals. I would assume that in a field test the clothes would be sprayed with an emulsion or dusted with a powder.

Dr. Busvine: Isn't our discussion of field trials of these compounds a little unreal? On seeing the people in Burundi in their wretched clothing, one wonders if it would not be cheaper to provide them all with new sets of underwear every six months. This is not to say that I do not regard this hormonal research with great interest and anticipation. But if we have the hormone mimics, we may also have antihormones. We may find compounds that interfere with the degradation of these hormones, and there are quite a lot of possibilities I think we still have to look at in the laboratory before we consider field trials.

Dr. Fox: I would like to come to Dr. Vinson's support. It seems to me that the problems Dr. Busvine mentions really fall into the two or three years that necessarily precede field trials, and that what is lacking is a commitment to see some of these compounds pursued to the field-trial stage. I think a number of different investigative lines could probably be pursued, with the idea that if one or more of them succeeds in passing all the various hurdles, it will get a field trial.

Dr. Gratz: WHO is testing two hormone-like materials against mosquitoes in highly polluted waters in Bangkok, and so far the results have been very interesting. But before we consider them for routine use, we would have to have much more information about mammalian toxicity in all its various manifestations.

That is likely to be a long process, and I would be interested in hearing if either Dr. Robbins or Dr. Vinson knows what the mammalian toxicity of most of these compounds is.

Since the use of these compounds is likely to be quite expensive, it seems to me that their use will be limited, particularly that of the juvenile hormones. If they were used to control an epidemic they would still leave the adult stages alive, which would allow disease transmission to continue.

Dr. Robbins: The preliminary acute oral and dermal toxicity data about many of these juvenile hormone compounds on vertebrates look quite good. Some of our more potent juvenile hormone compounds such as aromatic terpenoid ethers have acute oral LD₅₀'s of 4 g/kg or greater, and certain other commercial juvenile hormone compounds are nontoxic at a dose of 10 g/kg or greater.

Dr. Vinson: In typhus epidemics, such as Dr. Wisseman has described in Burundi and as Dr. Snyder has described in Egypt, people are usually heavily louse-infested and the

rickettsiae remain alive quite a long time after the lice are killed. The rickettsiae are viable in the feces of the lice as well as in the dead louse bodies, and the potential for infection continues after the lice are killed.

It is true that with juvenile hormone the lethal effect on lice would take a few days longer, but I am not sure that this would contribute significantly to keeping an epidemic going.