lin-sodium monograph" (Washington Conference, 17 February 1944).

The effects of the various rubber samples upon the stability of penicillin and streptomycin solutions are shown in Tables 1 and 2, respectively.

TABLE 1

EFFECT OF SYNTHETIC AND NATURAL RUBBERS UPON THE STABILITY OF PENICILLIN SOLUTIONS*

Description	Type	Unitage at end of 6 hr.	Unitage at end of 24 hr.
White surgical Koroseal	Synthetic	70	36
GN black	"	95	16
Black Koroseal	"	97	73
S black	"	111	86
Buna	"	82	0
Buna white	"	121	114
White plastic	"	111	93
Neoprene black	"	74	0
Pure gum black	Natural	96	0
GRS black	Synthetic	79	0
Buna S	"	50	0
Tygon	"	91	85
Amber latex	Natural	87	94
Crepe rubber	"	105	99
Natural rubber	"	117	93
Anode amber	"	105	93
Glass tubing	.....	108	106

* The solution was made up to contain 100 units/ml.

TABLE 2

EFFECT OF SYNTHETIC AND NATURAL RUBBERS UPON THE STABILITY OF STREPTOMYCIN SOLUTIONS*

Description	Type	μg./ml. at end of 6 hr.	μg./ml. at end of 24 hr.
White surgical Koroseal	Synthetic	37	43
GN black	"	40	49
Black Koroseal	"	40	50
S black	"	40	39
Buna	"	43	50
Buna white	"	46	39
White plastic	"	43	40
Neoprene black	"	43	34
Pure gum black	Natural	40	44
GRS black	Synthetic	34	44
Buna S	"	46	43
Tygon	"	43	50
Amber latex	Natural	46	34
Crepe rubber	"	43	34
Natural rubber	"	40	56
Anode amber	"	40	54
Glass tubing	.....	34	42

* The solution was made up to contain 50 μg./ml.

Of 11 samples of synthetic rubber tested, 4 inactivated penicillin completely in 24 hours. Two other samples caused 64 and 84 per cent reductions in the activity of the penicillin during the same period. Of 5 samples of natural rubber tested, 1 pigmented sample inactivated penicillin completely in 24 hours.

Buna S rubber caused a 50 per cent reduction of penicillin activity in 6 hours. Other samples of synthetic rubber reduced the activity of penicillin 20–30 per cent in the same period.

None of the samples of rubber tubing tested caused any reduction in the activity of streptomycin.

This study is not intended as a complete investigation of the effects of rubber upon antibiotics. It is evident, however, that for continuous drip procedures some attention must be given to the type of rubber used for the administration of penicillin. It is of interest to note that white surgical Koroseal caused a drastic reduction in penicillin activity, while black synthetic Koroseal caused only a moderate inactivation of the antibiotic.

It is suggested that rubber tubing intended for hospital usage be checked for inactivating effects upon antibiotics and that acceptable tubing be appropriately designated.

Reference

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Comparative Toxicity of DDT and Four Analogues to Goldfish, Gambusia, and Culex Larvae

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The large-scale use of DDT in natural areas makes it necessary to study the effects it and related compounds have on all forms of life if control measures are to be developed.

Of beneficial vertebrate groups, fish have already been shown to be very vulnerable to DDT in the laboratory (*2, 3*). Under natural conditions mortality of fish has been observed where large amounts or repeated doses of DDT were used in the control of mosquito larvae (*7*). We have attempted to determine more accurately the comparative tolerance of fish (goldfish and *Gambusia affinis*) and mosquitoes (*Culex apicalis*) to DDT and especially its p-halogen analogues.

Procedures. In addition to the regular DDT or 1-trichloro-2,2-bis(p-chlorophenyl)-ethane (*1*), four analogues were also tested as follows: (1) 1-trichloro-2,2-bis(phenyl)-ethane, which we shall designate as DPT; (2) 1-trichloro-2,2-bis(p-fluorophenyl)-ethane, DFDT; (3) 1-trichloro-2,2-bis(p-bromophenyl)-ethane, DBrDT; and (4) 1-trichloro-2,2-bis(p-iodophenyl)-ethane, DIDT.[1] Summerford synthesized these compounds by condensing benzene or the appropriate halobenzene and chloral with the aid of chlorosulfonic acid, according to a previously described method (*6*).

All tests were run in individual fish bowls containing tap water previously conditioned and oxygenated in a large aquarium containing aquatic plants. One fish and 4 to 10 Culex larvae were placed in each bowl. One ml. of an acetone solution of DDT and its analogues, ranging from 0.0005 to 10 ppm, was added to

[1] The preparation of the p-fluoro and the p-iodo analogues will be described in a subsequent paper, since we have found no published reference to the synthesis of the former compound.

each liter of water. Controls containing 1 ml. of pure acetone in 1 liter of water had no detectable effect on the test animals. A three-day period was selected as a somewhat arbitrary time limit for the experiments, and experiments were repeated two or three times at critical concentrations.

Results. The results of the experiments are shown in Fig. 1, which indicates at a glance the comparative tolerance of the organisms to the various compounds. The solid bars indicate the range of concentrations producing 100 per cent mortality of fish and 95 per cent or greater mortality of mosquito larvae; the broken part of the bars indicates concentration producing partial mortality. It should be emphasized that the resistance of individuals is so variable at lower concentrations that the setting of the lower lethal limits must be somewhat arbitrary. Gambusia proved to be much less resistant than goldfish under these conditions. As far as DDT itself is concerned, the median lethal dose is approximately 0.1 ppm for goldfish, 0.01 ppm for gambusia, and 0.001 ppm for larvae. Therefore, the goldfish were 1/100 and the gambusia were 1/10 as susceptible as the mosquito larvae, provided the DDT was evenly distributed in the water and therefore had equal chances of penetrating the organisms. Mosquito pupae were much more resistant than both the larvae and gambusia. Not only did they survive relatively high concentrations of DDT and DFDT for three days, but many subsequently emerged into normal adults.

As shown in 1B (compare with third bar, 1A), the presence of aquatic plants in the bowls (10 grams wet weight of *Elodea* and *Cabomba*) reduced the toxicity considerably as far as fish were concerned.

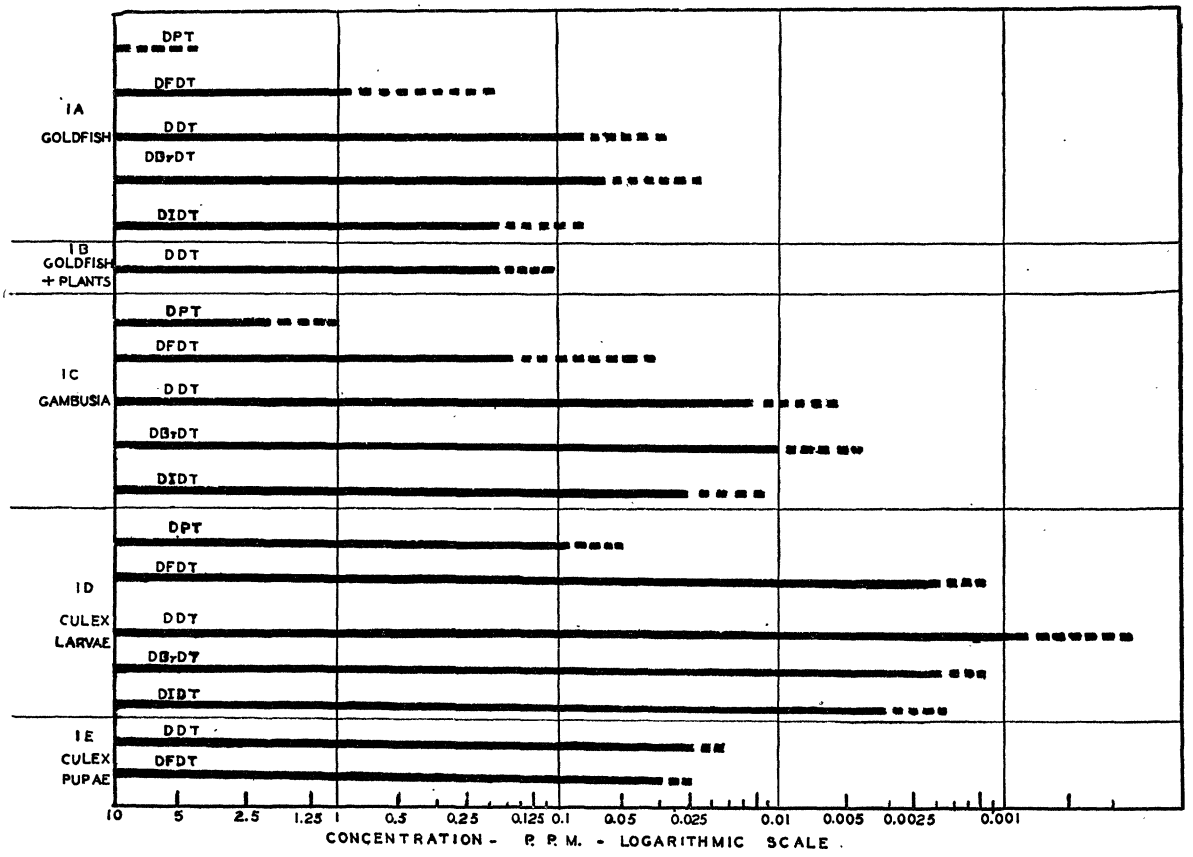

FIG. 1

The plants themselves were unaffected. Some bowls containing high concentrations of DDT developed thriving colonies of common algae, *Scendesmus*. As previously reported (*5*), DDT appears not to be a direct cell poison.

The unsubstituted compound, DPT, was found to be comparatively nontoxic. DFDT was moderately toxic to fish, while DDT and DBrDT were very similar, being about 10 times more toxic to fish. DIDT proved to be somewhat less toxic than DDT. It should be pointed out, however, that since DBrDT and DIDT have a greater molecular weight than the chlorine analogue (DDT) there are actually fewer molecules of the former at any given concentration by weight.

Therefore, molecule for molecule, the DIDT would have to be rated more toxic than DDT; and DBrDT would be the most toxic of all as far as these fish were concerned. Very roughly speaking, the toxicity of this series tends to increase with the weight of the molecule.

Perhaps an even more interesting difference in the series is in regard to speed of action. When concentrations of comparative toxicity were prepared (DFDT, 1 ppm; DDT, 0.1 ppm; DBrDT, 0.1 ppm; DIDT, 0.166 ppm), the average time required to kill gambusia was as follows: DFDT, 4.5 hours; DDT, 7 hours; DBrDT, 16 hours; DIDT, 54 hours. Therefore, the speed of action was inversely correlated with the size of the molecule.

The effect of the p-halogen series on Culex larvae generally paralleled that on fish, with two exceptions. First, DBrDT was relatively more toxic to fish than to mosquito larvae as compared with DDT. Hansen, *et al.* (*4*) found DBrDT to be similar to DDT but less toxic to land insects. Second, DFDT was relatively more toxic to the larvae than to fish (Fig. 1). For this reason, DFDT may have possibilities as a larvicide; at least it seems worthy of field tests, especially in view of its rapid action.

Determinations of the residual toxicity of the analogue series are now being made, and the results will be reported in a subsequent paper.

References

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Association Affairs

Section Q (*Education*) will hold three regular sessions at the Boston meetings. On Friday morning, 27 December, papers will be presented by W. E. Hall, Nebraska; D. D. Durrell, Boston University; P. J. Rulon, Harvard University; C. W. Scott, Vocational Counseling Services of New Haven; and Francis H. Horn, Yale University. The Friday afternoon program will deal with implications of the armed services educational programs, with papers by M. M. Chambers, American Council on Education; Robert John Matthew, College of the City of New York; Elwood C. Davis, University of Louisville; and Howard Rusk, *The New York Times*. The third regular meeting, on Monday afternoon, will relate to various aspects of science teaching, with papers by Robert Stollberg, Wabash College; Paul Blackwood, The Ohio State University; Robert Wickware, Willimantic State Teachers College; Hubert Evans, Teachers College, Columbia University; and Benjamin C. Gruenberg, New York. Sections Q and I will have a joint session on Saturday evening, at which the vice-presidential addresses of the two sections will be given. Section Q is also cosponsoring several other special programs, including a symposium on scientific personnel, Saturday morning and afternoon, with Sections K, I, and B; a symposium on the teaching of ecology, Saturday afternoon, with the National Association of Biology Teachers; and a joint session with Section L, Monday morning, on "The Place of the History of Science."

Pi Lambda Theta, women's honorary educational society, affiliated with Section Q, will hold a dinner for members and guests in the Oval Room of the Bradford Hotel at 6:00 P.M., Monday, 30 December. Tickets may be obtained by writing to Mrs. Dorothy Larned, 154 Maynard Road, Framingham, Massachusetts. The price is $3.25, tax included.

The Section on Botanical Sciences will hold a joint meeting on Friday afternoon, 27 December, with the American Fern Society, American Society of Plant Physiologists, American Society of Plant Taxonomists, Botanical Society of America, Mycological Society of America, and Sullivant Moss Society, at which E. C. Stakman, chairman of the Section, will deliver his address, as retiring vice-president of the Association, on "The Nature and Importance of Physiologic Specialization in Phytopathogenic Fungi." This will be followed by a symposium on plans for union involving workers in the biological sciences. Paul J. Kramer, H. B. Tukey, Ralph E. Cleland, and R. F. Griggs will speak briefly on various aspects of the proposals, after which the meeting will be opened for questions and discussion.

The Society for Research in Child Development will hold meetings on 27–28 December. In addition to a business meeting on Friday, 27 December, there will be two symposia: "Methodological Problems Met in Integrating and Interpreting Physical, Medical, Psychological, and Social Data in Longitudinal Studies of Children," with Wayne Dennis presiding; and "Psy-