Parasitolgy Laboratory, Department of Veterinary Science,
University of Nebraska
Associate Professor George W. Kelley.

EFFICACY OF PARENTERALLY AND ORALLY ADMINISTERED DIPTEREX AGAINST *HAEMATOPINUS SUIS* AND *ASCARIS SUUM* IN SWINE

BY

Fahri Sayın, Ph. D. and George W. Kelley, Ph. D.*

Orally administered Dipterex (Bayer L 13/59), O, O-dimethyl-l-hydroxy - 2,2,2-trichloroethyl-phosphonate, at 100 mg./kg. effectively removed *Ascaris suum* from swine.[1] When applied as a spray at 0.25 and 0.5% solutions it eliminated lice, *Haematopinus suis*, and had a residual protection of six days.[1] The following is a report of experiments in which Dipterex was injected intramuscularly or fed at a low level as a treatment *A. suum* and *H. suis*.

Experiment 1. Effect of Dipterex on *H. suis* and *A. suum* When Injected into 3 Pigs at a Rate of 100 mg./kg.

Five pigs were observed. Three were injected and two were controls. The principals and controls were maintained in separate rooms. Dipterex was injected at the rate of 100 mg. kg. body wt.**

The intensity of low louse infestations was measured by counting all the lice on the body. Higher infestations were rated as extreme because it was not practical to count all the lice. All five pigs had extreme louse infestations prior to the test.

Presence of *A. suum* was determined by detecting characteristic eggs in feces. Egg per gram counts were done on each pig before the injection and at intervals thereafter.

* From the Department of Veterinary Science, University of Nebraska, Lincoln 3, Nebraska. Published with the approval of the director as paper No. 1305, Journal Series, Nebraska Agricultural Experiment Station.

Dr. Kelley is Associate Professor, Department of Veterinary Science, University of Nebraska, Lincoln, Nebraska, U .S .A ., and Dr. Sayin is on the Veterinary Faculty, Ankara University, Ankara, Turkey.

** Parenteral Dipterex was supplied as a proprietary formulation "Dyrex", 800 mg. Dipterex per ml., by Fort Dodge Laboratories, Inc., Fort Dodge, Iowa.

Total red cell, leucocyte, and differential counts were made. Whole blood cholinesterase activity was determined on the principals and controls.[2] (The authors wish to acknowledge the technical assistance of Dr. C. L. Marsh, Dept. Vet. Science, University of Nebraska who did these determinations).

Results of Experiment I. The injected Dipterex completely eliminated the lice from the principals. Lice reappeared on each of the pigs five, six, and seven days, respectively, following the injection. These initial re-infestations consisted of from three to six lice and came from eggs deposited by the former adults. By the ninth day the louse populations were estimated to be 60, 35, and 25 lice on each of the three pigs respectively. The louse population on the controls, housed in a separate room, showed no change throughout the nine-day observation period.

Two adult ascarids were recovered from the feces of the principals two days after the injection. The egg count per gram of feces (e.p.g) diminished correspondingly (Table 1). The principals and controls respectively had average e.p.g. of 468 and 400 before injection; 36 and 110 e.p.g. nine days following the injection.

Whole blood cholinesterase activity was reduced in the principals (average 19 micromoles/ml./30 min. compared to 56 micromoles/ml.30 min. of the controls 24 hours following the injection (Table 2)). Recovery of cholinesterase activity was complete by 72 hours following the injection. Hematology was normal for both the principals and controls. No clinical signs of toxicity was evident in any of the pigs.

Experiment II. Effect of an Injection of Dipterex in one Pig on the Louse Infestation of Other Pigs in the Room.

Four pigs all heavily infested with *H. suis* were housed together. One of these was injected intramuscularly with 100 mg./Dipterex/kg. body wt. while the remaining three received no treatment. The louse population of each pig was estimated at intervals from 12 to 120 hours. Worm egg per gram count was done on the injected pig before and after injection. The treated pig was necropsied five days following injection to evaluate the ascaricidal efficacy of the parenteral Dipterex.

Results of Experiment II. – The injection completely eliminated the louse infestation from the treated pig within 12 hours, and it likewise greatly reduced the number of lice on the other three pigs. Twelve hours after the injection was given one had to search carefully to find lice on any of the pigs. A few lice were present on the injected and uninjected pigs 36

hours following treatment. By the 8th day following treatment enough eggs had hatched to produce a moderate louse infestations on each of the pigs. Dipterex excreted in urine[3] and feces of the injected pig probably killed the lice on the non-injected pigs. It is hardly conceivable that all of the lice would have fed on the injected pig while the drug was present in the blood stream.

Five ascarids were recovered from the feces 36 hours following the injection. The egg count of the treated pig correspondingly diminished from 233 e.p.g. prior to treatment to two e.p.g. five days after the injection. No worms were present in this pig at necropsy seven days following the injection.

Cholinesterase activity was 37 micromoles/ml./30 min. prior to the infection. It decteased to 9 micromoles/ml./30 min. five and one-half hours after the injection . No signs of toxicity were evident duruing the test.

Experiment III. Effect of 10 mg. Dipterex/kg./day
Given Orally, on *H. suis* and *A. suum*

Dylox, a granular formulation of Dipterex, as administered per os to three louse infestated pigs, in gelatin capsules, at 10 mg./kg. daily for an 11-day period. The louse infestation was evaluated daily and fecal egg counts were made.

Results of Experiment III. – All three pigs were heavily infested with lice before the treatment startad. These infestations decraeased until on the fourth day no lice were found on two of the pigs and only two nymphs were found on the third. Only early instar stages were found thereafter. The number of eggs, attached to the bristles, diminished daily. Oral Dipterex at 10 mg./kg. body wt. daily appeared to kill lice as soon as they had their first blood meals.

A single *A. suum* was present in one of the three pigs. This worm was expelled on the sixth day of the test. This infection was too low to lead to any conclusions.

Cholinesterase activity was lower at the end of the 11-day period than at the beginning, but the decrease was within the variation which often occurs in normal pigs. No signs of toxicity were observed.

Table 1. *Ascaris suum* eggs per gram of feces from each of the principals and the controls after injection with approximately 100 mg. Dipterex/kg. body wt.

	Days Following Injection					
Treatment	0	2	3	4	5	9
Principal	924	643	178	398	231	69
Principal	10	4	16	4	1	1
Principal	5	2	8	2	0	2
Control	799	764	825	742	121	220
Control	2	—	1	1	0	0

Table 2. Whole Blood Cholinsterase Activity of Pigs Injected with 100 mg. Dipterex per Kg. Body Wt.

	Hours After Injection			
Treatment	24	48	72	144
Injected	19*	37	54	39
Injected	18	22	42	46
Injected	19	29	48	41
Non Injected	58	69	—	50
Non Injected	53	37	65	36

* Micromoles activity per milliliter of whole blood/30 minutes.[2]

SUMMARY

Dipterex was administered to pigs harboring *H. suis* and *A. suum*. Intramuscular injection of 100 mg./kg. body weight killed all lice on the pigs. They became reinfested by hatching eggs within five to seven days. Intramuscular injection of Dipterex into one pig greatly reduced the louse infestation of it and three other uninjected pigs in the same room; probably because of contamination of the uninjected pigs with urine and feces from the injected pig which contained sufficient Dipterex to be lethal to the arthopods. Re-infestation became intense on all four pigs within eight days.

Granular Dipterex at 10 mg. / kg. day when administered orally for 11 days killed the feeding lice but had no effect on the eggs.

Moderate ascaricidal efficacy occured in three pigs injected with a 100/mg./Dipterex/kg./body weight. Similar treatment removed 100% of the ascarids from a single pig. Ascarid infection was too low to permit an evaluation of ascaricidal efficacy when Dipterex was administered orally at 10 mg./kg.

ÖZET

Haematopinus suis ve Ascaris suum ile enfekte domuzlarda DİPTEREX ile tedavi denemeleri yapılmıştır. Bir kilogram vücut ağırlığı için 100 mg. nisbetinde adele içine enjekte edilen ilaç, domuzlar üzerinde bulunan bitleri öldürmüştür. İlaç verildikten 5 ila 7 gün sonra, yumurtaların inficarı neticesi, bitler yeniden zuhur etmiştir. Aynı padokta bulunan parazitli 4 domuzdan birine, yukarıda zikredilen nisbetde, Dipterex enjeksiyonu yapılmış, gerek bu ve gerekse diğer 3 domuz üzerinde bitlerin öldukça azaldığı görülmüştür. İlaçlanmayan domuzlarda bitlerin ölümünün, bu hayvanların ilaçlanan domuzun idrar ve gaitası ile teması neticesi husule geldiği muhtemeldir. Tedaviden 8 gün sonra 4 domuz üzerinde de bitlerin yeniden artmış olduğu müşahade edilmiştir.

Bir kilogram vücut ağırlığı için 10 mg. nisbetinde ve 11 gün müddetle, ağız yolu ile verilen granüler Dipterex, bitlerin ölümünü tevlit etmiş; fakat yumurtaların üzerine tesir edmemiştir.

Başlangıçda zikredilen nisbetde adeleye enjekte edilen Dipterex'in Ascaris'ler üzerine orta derecede etkili olduğu müşahede edilmiştir. Dipterex'in ağız yolu ile verildiği domuzlarda Ascaris invazyonunun yüksek olmayışı sebebiyle ilacın etkililiği hususunda bir karara varılamamıştır.

Yukarıdaki dozlar dahilinde Dipterex'in domuzlara verilmesi neticesi, kanda cholinesterase activitesinin azaldığı ve tedaviye son verdikten 72 saat sonra normale döndüğü tesbit edilmiştir. Kan tablosunda bir değişiklik ve klinik araz müşahede edilmemiştir.

REFERENCES

1 – DeLeon, D. D., Turk, R. D., Hale, F.: Control of *Haematopinus suis* and *Ascaris lumbricoides* of swine with certain organic phospohorous compounds. J.A.V.M.A. 138, (Feb. 15, 1961) : 179–183.

2 – Biggs, H. G., Shirley, C. and Morrison, D: B.: A simple cholorimetric method for measuring activities of cellular and plasma cholinesterase. Technical Bulletin of the Registry of Medical Technologist 28, (July, 1958) : 137–141.

3 – DuBois, K. P., and Cotter, G. J.: Studies on toxicity and mechanism of action of dipterex. A.M.A., Archives of Industrial Health. 11, (1955) : 53–60.