

THE USE OF VOLCK AGAINST EXTERNAL  
PARASITES OF DOMESTIC ANIMALS

by

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## INTRODUCTION

The object of this investigation was to determine the insecticidal value of Volck Oil Emulsion against certain insects and mites which affect domestic livestock. If found to be adapted to such usages, it was planned to determine the most effective methods of application, both as to means and the interval between applications.

This work has been done under the supervision of the Crop Protection Institute and under the immediate direction of Dr. R. C. Smith of the Department of Entomology of the Kansas State Agricultural College of Manhattan, Kansas.

It is my pleasant duty to offer my sincere thanks to Dr. R. C. Smith for his timely and valuable counsel; to Professor G. A. Dean, Dr. E. J. Frick, Dr. H. W. Brubaker, Mr. H. R. Bryson and Dr. R. H. Painter for their many helpful suggestions, and to my colleagues A. I. Balzer and C. B. Wisecup for their friendly cooperation.

Volck has been used extensively and successfully as a spray on greenhouse plants and various fruit trees, including citrus trees. The success of the material in this field led the manufacturers to believe that there

was a possibility for its efficiency against certain external parasites of domestic animals. Accordingly the project was linked up with the Crop Protection Institute and an outline drawn up by Dr. F. C. Bishopp of the United States Department of Agriculture.

The experimental work was started in June, 1927, and continued for one year.

#### Nature of Volck

Volck is a product of the California Spray-Chemical Company. According to H. E. Woodworth, assistant general manager of the company, "Volck is an emulsion of white oil and differs from ordinary oil emulsion in the relative purity of the oil". It is pure white in color and has the consistancy of a thick cream. A newly opened container of Volck has a faint odor of ammonia. Solutions of 10 per cent or less break down in a few days and cannot be brought back to their original form. Volck mixes readily with both hard and soft water, and adheres very well to the hair of animals. In no instance has this material had any harmful effect upon livestock. Dogs and chickens have been permitted to drink a ten per cent solution of the material, and Dr. E. J. Frick

administered a one ounce capsule of undiluted Volck to a dog without noticeable effect upon the animals.

Another type of Volck, designated as special emulsion No. 2, has been used for most of these tests. Mr. Woodworth states "The oil is the same as in all our samples, and it is called Special Emulsion because the emulsifier has been changed in order to do away with any possible irritation."

It is not known exactly how Volck kills insects, but presumably it is largely by the stoppage of the spiracles. However, this does not explain entirely the rapidity with which oils of this type work as is so well shown by Shafer (1911, 1915).

## DISCUSSION

### Chicken Lice

Lice cause considerable injury to poultry, the injury being due chiefly to the irritation caused by the insects. This results in the general discomfort of the bird, improper digestion, and a decrease in egg production.

Various substances have been used in combatting poultry lice with varying results as shown by Abbott (1920).

Several species of lice were present on the fowls used in the tests with Volck, namely the large hen louse, Goniocotes abdominalis Piaget; the body louse, Menopon biseriatum Piaget; and the shaft louse, Menopon pallidum (Nitzsch). The most abundant of these being the shaft louse and the body louse.

The method of applying Volck was by dipping the birds in a one-half bushel tub of the solution. The birds were immersed, the solution being worked well into the feathers with the fingers and the head of the bird submersed two or three times.

A flock of lousy chickens, belonging to Mr. William Sylvester of Riley, Kansas, was used in these experiments. Four hens were used in a preliminary test to ascertain the effect of Volck upon the birds as well as on the lice (see Table, Exp. No. 2). These birds were dipped in an 8% solution of Volck, special emulsion No. 2, diluted with cistern water, warmed to about 100° F. and were then confined to a pen for observation. The hens recovered rapidly from the wetting and dried in about two hours at which time they were examined. No live lice were found, except in a small patch of feathers on the thigh of one hen. Evidently this portion was not thoroughly wetted.

The following day the four hens were reexamined, no live lice being found except on the thigh of the bird noted above. Especial attention was given to the effect of Volck upon the birds but no harmful effect was noted.

Three other hens were then dipped in a 7% solution of Volck at 102° F., tagged and allowed to run with the rest of the flock (see Table, Exp. No. 3). Although the birds were dipped at 5:30 p. m., they dried in about one hour. One day later the three hens were examined and no live lice were found.

The remainder of the flock, except for some twenty-five cockerels that roosted in trees, consisting of 175 birds was dipped in a 7% solution at about 104° F. (see Table, Exp. No. 4). Two operators started dipping the flock at 8:15 a. m., and completed the work in less than two hours. The temperature began to rise at this time and the birds dried in about an hour.

Fifteen to twenty hens were examined at intervals of one week for ten weeks during which time no live lice were found. At the end of the tenth week a few lice were found. Presumably this reinfestation came from the untreated cockerels.

The solution of Volck has no harmful effects upon the treated birds. For two weeks after treatment the

feathers were ruffled and the white feathered birds had a creamy color, but this discoloration disappeared after the third week. Egg laying was not affected by the treatment, and the farmer reported very good egg production throughout the winter. Two weeks after treatment the chickens appeared healthier and more vigorous as shown by the color of the comb and wattles, and their general activity.

On a nearby farm another lousy flock of chickens was located and one test was made, subsequent tests being prevented by bad roads and cold weather. Four hens were dipped in a 6% solution on Volck at 102° F. (see Table, Exp. 13). These four hens were tagged and permitted to run with the flock. Three days later the hens were examined and no live lice were found.

In these tests with the special emulsion of Volck all the lice were killed.

### Poultry Mites

The common poultry mite, Dermanyssus gallinae Redi, is, according to Herms (1923), one of the worst enemies of the poultry raiser in the Southern States and California and is a serious pest in many other parts of the world. The presence of these mites often causes complete cessation of egg production as shown by Repp (1903). Results



of experiments with miscellaneous substances against this mite are shown by Davidson (1924).

Tests with Volck, special emulsion No. 2, were made against the common poultry mite (see Table, Exps. 5, 15, 16 and 17). In spraying poultry houses for the mite, all roosts were loosened and trash removed in order to afford complete coverage of the spray material. Instructions called for the use of undiluted Volck to be sprayed in poultry houses, however, this was found to be too thick to be forced through a sprayer.

A solution of 60% was used in the first test and 50% in the remainder as this dilution was found to give a better spray. The Volck was applied with a compressed air sprayer, forcing the material into all cracks and crevices, the dilution being made with city water and not warmed. The size of the spray cone was lessened by a specially devised spray disk which afforded less waste and greater force. With heavy infestations, the spraying was repeated in ten days.

The poultry houses used in these tests consisted of a series of pens in an old army barracks at the College that housed experimental birds.

Upon examination before the second application of the spray, no mites were found, except in one pen where the

infestation had been exceedingly heavy and the pens were littered with old boxes and boards. Further examinations at intervals of one to two weeks for four months failed to reveal any mites.

A greater dilution of Volck may be effective and additional tests should be made to determine the proper dilution to be used.

The solution of Volck, applied as a spray in the poultry house leaves the roosts, walls and floor slightly oily, but on the whole this condition is not objectionable.

#### Tropical Fowl Mite on Chickens

The tropical fowl mite, Liponyssus bursa Berlese, is a comparatively new pest in the United States. The introduction of this mite into the United States and methods of control are recorded by Wood (1920).

Two roosters from the flock at the Kansas State Agricultural College were found to be heavily infested with the tropical fowl mite, these mites being especially abundant in the fluff where as many as fifty mites were found on a single feather. The roosters were kept in a pen in the Veterinary Hospital of the College where the test was made (see Table, Exp. No. 1). The vitality of the birds was at a low ebb, apparently due to the

presence of the mites, as was shown in the sluggish movements of the birds and their general appearance.

An 8% solution of Volck, special emulsion No. 2, diluted with city water and not warmed, was applied as a dip, the material being worked into the feathers with the fingers. The unused material was strained and applied to the pen as a spray.

After one day some live mites were found on the birds and a kill of 80% was estimated. Two days after dipping approximately 1% of the mites were alive and thereafter for twelve days no live mites could be found. At the end of this time the birds appeared greatly improved physically as was shown by increased activity, color of comb and wattles and in their general appearance.

Careful search failed to reveal other birds infested with tropical fowl mite, hence further tests were not made.

#### Lice on Cattle

Lice have long been considered a pest of cattle. They are especially injurious during the winter months when the skin of animals is dry, and when the animals are in poor condition. Methods of control have been shown by Lamson (1918) and Imms (1918).

The species of lice present on the cattle used in these tests were the long-nosed ox-louse, Linognathus vituli (Linn.), and the biting louse, Trichodectes scalaris Nitzsch, the former being found on calves and the latter on cows. The lice were especially numerous on the withers and neck of the animals. Tests with cattle were started with caution, due to the possibility of the oil burning the skin of the host as is the case with most oils used for this purpose (see Table, Exps. 6, 7, 11, 12, 37, 38, 39, 40 and 41).

An area of about one square foot on the side of a louse infested calf was sprayed with an 8% solution of Volck, special emulsion No. 2, and the animal kept in the barn for observation. Upon examination one day later a good kill was recorded and no burning of the skin noted. A similar area on the opposite side of the calf was then sprayed with an 8% solution and the animal exposed to the sun for three hours. Examination the following day showed a good kill and no harmful effects to the skin and hair were noted.

This was followed by spraying the entire side of a calf, working the material into the hair with the fingers, the animal being kept in the barn for one day. Examinations daily for ten days failed to reveal any live lice

or any harmful effect to the hair or skin. It was noted, however, that the hair was benefited by the treatment as shown by its soft texture and glossy appearance.

Another louse infested calf was sprayed with a similar solution, the material thoroughly rubbed into the hair and the animal exposed to the sun for three and one-half hours. Four days later two live lice were found on the calf and again it was noted that the hair was in fine condition. The tests continued on other calves and cows, increasing or decreasing the dilution according to the results. All tests were made with the special emulsion No. 2, except numbers 37 and 41.

The results obtained show that not less than 10% will kill all the long-nosed ox-lice; that at most an 8% solution will kill all the biting lice and that Volck is not harmful to the animal, but that a fine coat of hair is obtained.

#### Fleas on Dogs and Cats

Fleas are common pests on dogs and cats having been known since the latter were first used as pets. Fleas have long been known to be carriers of disease and as parasites or annoyers of man and animals. The control of these pests has been adequately studied by Bishopp (1924).

Varying dilutions of Volck, special emulsion No. 2, were used in the tests against fleas, Ctenocephalus canis Curtis and Ctenocephalus felis Bouche (see Table, Exps. 8, 9, 10, 14, 20, 21, 22, 23, 24 and 25). This material was warmed to about 100° F. and applied as a dip to the smaller animals and as a spray to the larger ones. In either case it is essential to apply the material thoroughly. The tests were started with a 5% solution which gave approximately a 10% kill. The strength was increased gradually to 10%, the mortality being noted each time. Where a 10% solution of Volck was thoroughly applied and the animals kept in flea-free quarters, a 100% kill was obtained. It is important to note here that the eggs of the flea do not remain on the host but fall off and hatch in the resting place of the animal, in about one week. The larvae feed upon animal and vegetable debris reaching maturity and transforming to an adult flea in about one month. Hence, it is necessary to eliminate this source of infestation in addition to treating the host.

Dogs and cats treated with a solution of Volck appeared in much better condition in that the hair was soft and glossy. Dr. E. J. Frick of the Veterinary Department of the College was impressed with this fact, and it also attracted the attention of dog breeders.



## Lice on Hogs

One of the more important sources of losses to the hog raiser is due to the presence on his swine of the hog louse, Haematopinus suis (Linn.). The biology of this louse is shown by Florence (1921) and the various methods of control have been given by Imms (1920).

An 8% solution, special emulsion No. 2, was used on thirty-eight hogs infested with hog lice (see Table, Exps. 19 and 27), the lice being especially abundant around the neck and ears of the host. The Volck was diluted with tepid well water and applied with a compressed air sprayer, the material being rubbed in and around the ears and into the creases about the neck. In using the sprayer on hogs it was found to be difficult to reach all parts of the animal. Dipping is much to be preferred as it would be more thorough and less wasteful. Upon examination one week later, it was found that a kill of approximately 95% was obtained.

Additional experiments could not be made because of inclement weather.

### Lice on Asses

Lice are not common on horses but appear to be quite prevalent upon asses. The control of these lice is described by Imms (1926).

A Jack, having been brought to the Veterinary Hospital of the College for treatment for tumor, was found to be very heavily infested with lice of the species Haematopinus asini (Linn.), and Trichodectes parumpilosis Piaget. This Jack was completely covered with lice and twenty per square inch was a conservative estimate. The hair from one side of the animal was clipped in order to offer a means of comparison as to the penetration of the liquid into the hair. A 10% solution of Volck, special emulsion No. 2, was sprayed on the animal and thoroughly worked into the hair with the fingers and a stiff brush (see Table, Exp. 34). The clipped area required much less material and labor than did the unclipped side.

About one hour after the treatment one hundred fifty lice were counted out and all found to be dead. Further examinations on three consecutive days failed to reveal any live lice. This animal was also examined by some veterinary students and no live lice were found. Due to a rupture of the tumor the Jack suffered such loss of



blood as to cause his death, hence additional observations could not be made. At the time of spraying the Jack, some hair, with eggs of the lice attached, was clipped and placed in an open dish for one week and then examined for viability. No live embryos could be found. This, however, was not an accurate test of the ovicidal value of Volck as the eggs were kept under artificial conditions.

A Jennet and her half-grown colt were sprayed with an 8% solution of ordinary Volck (see Table, Exp. No. 42), and the material thoroughly rubbed into the hair. These animals were as heavily infested as the Jack and had the same species of lice. Examinations daily for five days showed no live lice present. At the end of this time the animals were butchered for dog meat, so additional observations could not be made.

This appeared to be an outstanding set of tests with Volck against lice. The very heavy infestation and the thick shaggy hair of the animals did not prevent a 100% kill of the lice.

#### Ox-Warbles

Hugh sums of money are lost annually from the depreciations of the ox-warble. Their presence in the animal causes loss of flesh, decrease in milk production,

damaged hides and the production of "licked" beef. Considerable work has been done on ox-warble control by Bishopp, Laake and Brundrett (1926).

A total of sixty-nine warbles, Hypoderma lineatum Villers, were treated with a 50% solution of Volck, special emulsion No. 2, (see Table, Exps. 30, 31, 32 and 36). About one cubic centimeter of the material was injected into each cyst by the use of a small oil can. After six or seven days the warbles were extracted by hand and the mortality recorded. Difficulty was experienced in determining whether or not the warbles were alive. This was overcome by the use of a dry battery and a resistance coil which enabled the operator to shock the warble and thereby produce sufficient movement to determine its viability.

The results of these experiments show that the Volck had no effect upon the warbles. Of the sixty-nine warbles treated only seven were found to be dead, this is probably the natural mortality of the grubs. At any rate the mortality was so low that it was considered inadvisable to continue this phase of the research. The condition of the cysts at the time of extracting the warbles was noted and found to be soft, pliable and not inflamed.

### Eggs of Bot Fly on Horses

The habits and control of the horse bot has been amply discussed by Bishopp and Dove (1926).

Undiluted Volck, special emulsion No. 2, was applied with a rag to the eggs of bot flies, Gastrophilus intestinalis DeGeer, on the legs of two horses (see Table, Exps. 26 and 27). Immediately after treatment some hair with eggs attached was clipped from the treated and untreated areas and kept in open dishes. After six days the eggs were hatched with a needle and moisture and their viability determined. In one test the results showed that of the treated eggs, 117 were dead and 13 alive; of the untreated eggs four were dead and 101 alive. In the other test, of the treated eggs 119 were dead and nine alive; of the untreated eggs 160 were alive and 34 dead. The larvae in the treated eggs were oily, soft and partially disintegrated. The treated horses were on pasture and no harmful effect to the skin or hair was noted, in fact the hair was soft and silky.

Subsequent tests with weaker solutions were not made due to the scarcity of bot flies at that time.

### Head Lice

Only one opportunity presented itself for the use of Volck against head lice, Pediculus capitis DeGeer (see Table, Exp. 33). Four Mexican children, attending the grade school in Manhattan, were found to have head lice. The heads of these children were perfectly clean but each had ten or more lice. The children were taken to their home and a 10% solution of ordinary Volck was applied as a wash to the heads of the three boys and one girl. One day later the hair of the boys was combed and one was found to be free from lice while the other two yielded four and six live lice, respectively. Upon questioning, it was found that the two boys who had live lice after the treatment had washed their hair soon after Volck was applied. The girl's hair was not combed, but careful search failed to reveal any lice.

The application of Volck had no harmful effect upon the skin or hair of the children. Previous to this experiment, the writer had used a 50% solution of Volck, special emulsion No. 2, as a hair dressing for three months, applying it on an average of twice a week without harmful effect, in fact, it was a very satisfactory hair dressing.

### SUMMARY

1. A 7 per cent solution of Volck, special emulsion No. 2, when applied as a dip and thoroughly worked into the feathers was effective against the common lice of poultry.

2. A 50 per cent solution of Volck, special emulsion No. 2, when applied as a spray was effective against the common poultry mite.

3. An 8 per cent solution of Volck, special emulsion No. 2, killed all the tropical rowl mites of two roosters.

4. An 8 per cent solution of Volck, special emulsion No. 2, when applied as a spray and thoroughly worked into the hair was effective against the biting lice of cattle .

5. A 10 per cent solution of Volck, special emulsion No. 2, applied as a spray gave satisfactory results against the long-nosed ox-louse of cattle.

6. A 10 per cent solution of Volck, special emulsion No. 2, thoroughly applied as a spray or dip eliminated the fleas from dogs and cats when the animals were kept away from flea infested quarters.

7. An 8 per cent solution of Volck, special emulsion No. 2, gave satisfactory results against hog lice.

8. An 8 per cent solution of ordinary Volck and a 10 per cent solution of special emulsion No. 2, killed all

the lice on three asses.

9. A 50 per cent solution of Volck, special emulsion No. 2, injected into the cyst of the warble, had no noticeable effect on the ox-warbles.

10. Undiluted Volck, special emulsion No. 2, gave satisfactory results against the eggs of bot flies on horses.

11. Volck was absolutely harmless to the animals and chickens treated in these experiments.

12. Volck produces a fine coat of hair on dogs, cats, cattle and horses.

The writer does not consider this work as conclusive and further work is regarded as necessary to verify the results obtained here. A larger number of animals should be treated before Volck can be recommended as an efficient insecticide against the external parasites of domestic animals.

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TESTS WITH VOLCK AGAINST EXTERNAL PARASITES

Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
1	6-7-27	Kansas State College	Tropical Fowl mite on 2 roosters, Liponyssus bursa	50 on one feather	8%	1 qt.	Dipped	Clear, warm Temp. 80 Humidity 77	Penned in Vet. Hosp.	Approximately 80% kill	After two days no live lice	Volck had no harmful effect on skin, eyes or feathers of birds. Examined daily for 12 days, no mites found.
2	6-24-27	Riley, Kansas	Goniocotes abdominalis, Menopon biseriatum, Menopon pallidum on 4 hens	20 per square inch	8%	1 qt.	Dipped	Hot, dry, windy. Temp. 84	Penned up	No live lice	No live lice	No harmful effect on birds. Dried in 1 1/2 hours. Examined weekly for 10 weeks, no live lice found.
3	6-25-27	Riley, Kansas	G. abdominalis, M. biseriatum, M. pallidum on 3 hens	20 per square inch	7%	1 qt.	Dipped	Clear, hot, windy. Temp. 80 Humidity 84	With other chickens	No live lice	No live lice	Examined weekly for 10 weeks, no live lice found.
4	6-26-27	Riley, Kansas	G. abdominalis, M. biseriatum, M. pallidum on 175 hens.	20 per square inch	7%	7 qts.	Dipped	Hazy, slight wind.	In yard	No live lice	No live lice	Examined weekly for 10 weeks, no live lice found. No decrease in egg production, chickens looked healthier.
5	6-27-27	Kansas State College	Dermanyssus galinae in poultry house	Heavy	60%	8 qts.	Spray	Temp. 60 Humidity 85		22 mites on wire (See notes)		3 roosters occupied pen where mites were found the following day. These roosters harbored some mites and those found on wire leading to roost likely came from these birds.

Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
6	7-12-27	Kansas State College	Linognathus vituli on calf	1 per square inch	8%	1 qt.	Spray	Temp. 95	In barn	No live lice	2 days later	To determine effect of Volck on skin and hair of calf, about one square foot on side of calf sprayed. Calf kept in barn 18 hours.
7	7-13-27	Kansas State College	Linognathus vituli on calf	1 per square inch	8%	1 qt.	Spray	Cloudy, Temp. 77, Humidity 80	In corral with calves	No live lice	10 days later	About one square foot on opposite side sprayed and rubbed in. No effect on hair or skin. Calf exposed to sun.
8	7-13-27	Manhattan	Fleas on cat	3 per square inch	5%	1 pt.	Dipped	Temp. 77, Humidity 80	Ran away for two days	Probably 10% kill		Fleas appeared stunned. After 20 minutes cat was washed with Ivory soap. Many fleas washed off.
9	7-14-27	Kansas State College	Linognathus on calf	1 per square inch	8%	1 qt.	Spray	Temp. 90, Humidity 50	In stall	No live lice	No live lice	Left side of calf sprayed. Kept in barn 1 day. Examined daily for 10 days. No live lice and no effect on hair or hide.
10	7-18-27	Riley	Fleas on 4 dogs	4 per square inch	7%	2 qts.	Dipped	Hot, sultry, Temp. 92, Humidity 50	Penned up	75% kill	75% kill	Volck not harmful to dogs. Fleas appeared stunned but some recovers, mostly females.
11	7-28-27	Riley	Fleas on 9 dogs	3 per square inch	9%	4 qts.	Dipped	Temp. 85, Humidity 98	In yard	90% kill	90% kill	Remarks same as Exp. 10

Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
12	7-25-27	Kansas State College	Linognathus vituli on calf	1 per square inch	8%	1 qt.	Sprayed once	Temp. 88: Humidity 38	In corral with calves	No live lice	Second day, no live lice	Calf exposed to sun for 3½ hours. No effect on hair or hide. After 4 days 2 live lice found.
13	7-27-27	Riley, Kansas	Goniocotes abdominalis, Menopon biserialatum, M. pallidum on 4 hens	10 per square inch	6%	2 qts.	Dipped once	Temp. 97: Humidity 42	With other chick-	No live lice	Three days later	Birds dried rapidly. Necessary to apply Volck thoroughly to all parts. One week later no live lice.
14	8-8-27	Manhattan	Fleas on dog	2 per square inch	10%	1 pt.	Sprayed once	Temp. 78: Humidity 59	Turned loose	No live fleas	2 days later	Dog kept out of house. Later found to visit cellar heavily infested with fleas.
15	8-11-27	Kansas State College	Dermanyssus galinae in poultry house	Light	50%	12 qts.	Sprayed twice	Hot sultry		No live mites	No live mites	Sprayed again 8-22-27 same as before. No live mites found then or five months later.
16	8-16-27	Kansas State College	Mites	Heavy	50%	12 qts.	Sprayed twice	Temp. 78: Humidity 85		No mites	No mites	Sprayed again 8-26-27 same as before. No mites found at that time.
17	8-17-27	Kansas State College	Mites	Very heavy	50%	12 qts.	Sprayed twice	Temp. 78: Humidity 50		No mites	See re-marks	Heaviest infestation yet observed. Pens littered with old boards, boxes. Sprayed again 8-27-27. Few live mites found in one pen.



Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
18	:8-16-27	:Kansas State College	:Cock-roaches	:Heavy	: 50%	:1 qt.	:Sprayed once	:Temp. 78: Humidity 85	:Killed all out-right	:Killed all out-right	:Roaches encountered accidentally, but results noted.	
19	:8-25-27	:Olsburg, Kansas	:Lice on 35 hogs	:1 per square inch	: 8%	:6 qts.	:Sprayed once	:Temp. 77: Humidity 50	:On range	:95% kill	:Lice immediately stunned. Time 3 hours. Satisfactory kill.	
20	:9- 1-27	:Manhattan, Kansas	:Fleas on 3 cats	:2 per square inch	: 10%	:1 pt.	:Dipped once	:Temp. 80: Humidity 68	:Free	:2 days no live fleas	:1 week no live fleas. 3 weeks few fleas. Hair in fine shape.	
21	:9-17-27	:Manhattan, Kansas	:Fleas on Collie	:1 per 4 square inches	: 10%	:3 pts.	:Sprayed once	:Hot, Clear	:About house	:4 days later no live fleas	:Diluted with warm water. Dog slept in cement cellar which was sprayed. Hair abundant and in good condition.	
22	:9-17-27	:Manhattan, Kansas	:Fleas on dog, short hair	:1 per square inch	: 10%	:1 qt.	:Bathed once	:Hot, Clear	:In house, in garage 1 day	:4 days later 1 flea	:Bed blanket washed. Kept in garage 1 day till bedding cleaned. Hair in good condition.	
23	:9-17-27	:Manhattan, Kansas	:Fleas on dog, long hair	:3 per square inch	: 10%	:1 pt.	:Bathed once	:Hot, Clear	:Tied up	:1 week later few fleas	:Failed to keep tied up. Light infestation. Dog improved. Looked better.	
24	:9-17-27	:Manhattan, Kansas	:Fleas on cat	:1 per square inch	: 10%	:1 pt.	:Bathed once	:Hot, clear	:Tied up 1 day	:1 week later few fleas	:Much improved. Few fleas. Hair much better.	
25	:9-23-27	:Manhattan, Kansas	:Fleas on dog, long hair	:1 per square inch	: 10%	:1 qt.	:Bathed once	:Cool, damp, cloudy	:Tied to dog house	:2 days no fleas	:Kennel sprayed, week later lice on dog, from garage near dog house.	

Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
26	10-15-27	Riley, Kansas	Bots on horse, eggs of G. intestinalis	Heavy on legs	100%	1/2 pt.	With rag	Warm	Corral		6 days later 90% kill	Treated: dead-117, live 13; Not treated: dead-4, alive 101.
27	10-28-27	Kansas State College	Lice on 3 hogs	1 per square inch on neck & shoulders	8%	1 qt.	Sprayed once	Mild	In pen		95% kill	About 95% kill.
28	10-28-27	Kansas State College	Bot fly eggs on horse	Abundant	100%	1/2 pt.	With rag	Mild	Corral		7 days later, see re-marks	Treated - 93% dead; Not treated - 17.5% dead.
29	11-7-27	Manhattan, Kansas	Fleas on 2 dogs	3 per square inch	10%	1 qt.	Bathed once	Cold, damp	House	1 flea	1 flea	Only one flea found on one dog.
30	1-29-28	Riley, Kansas	Ox Warbles on cow	6 warbles	50%	1 cc.	oil can	Cool, damp	On pasture		5 alive; 1 dead	Condition of cyst soft, pliable and not inflamed.
31	2-1-28	Kansas State College	Ox Warbles on cow	9 warbles	50%	1 cc.	oil can	Clear, cool	With dairy herd		All alive	Examined five days after treatment, all alive.
32	2-8-28	Kansas State College	Ox Warbles on cow	12 warbles	50%	1 cc.	oil can	Cold, windy	With dairy herd		One dead	Examined 5 days after treatment, one dead.

Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
33	2-28-28	Manhattan grade school	Head lice on children	10 per head	10%	1 qt.	Hair washed	Mild		See remarks		2 boys washed head after treatment. No live lice found on one who did not wash head.
34	3-2-28	Kansas State College	Haematopus asinus and Trichodectes parumpilosus on Jack	20 per square inch	10%	3 qts.	Sprayed once	Mild	In barn	No live lice	No live lice	Examined daily for 3 days. No live lice found.
35	3-2-28	Kansas State College	Demodex on 3 dogs	Heavy	20%	1 qt.	Sprayed twice	Mild	In barn		See remarks	Second spray 3-6-28. Final results not checked. Hair and skin in fine condition.
36	3-10-28	Farm near Manhattan	Ox warbles on 3 cows	42 warbles	50%	1 cc.	Oil can	Warm	In corral		After 6 days, 5 dead, 37 alive	Cysts soft, pliable, and not inflamed.
37	3-21-28	Kansas State College	Linognathus vitulae on 4 calves	Heavy on withers	8%	1 qt.	Sprayed once	Warm	In corral	Approximately 75% kill	Approximately 75% kill	Continued to increase in number after first examination.
38	3-21-28	Kansas State College	Linognathus vitulae on 4 calves	Heavy on withers	9%	1 qt.	Sprayed once	Warm	In corral	Approximately 90% kill	Approximately 90% kill	Same as above
39	3-21-28	Kansas State College	Linognathus vitulae on 4 calves	Heavy on withers	10%	1 qt.	Sprayed once	Warm	In corral	No live lice	No live lice	No live lice found for one week after treatment.



Exp. No.	Date	Location	Parasites and Host	Degree of infestation	Dilution	Amount used	How applied	Weather conditions	Care of Animals	Result 24 hrs.	Result later	Remarks
40	3-21-28	Kansas State College	Trichodectes scalaris on two heifers*	Heavy	8%	1 qt.	Sprayed once	Warm	In corral	No live lice	No live lice	Checked daily for 10 days and no live lice found. Hair in fine condition.
41	3-21-28	Kansas State College	Trichodectes scalaris on 1 cow	Heavy 10 per square inch	7%	1 qt.	Sprayed once	Warm	With herd	No live lice		Only front half of animal sprayed. Sprayed area free from lice for 3 days, then appeared.
42	3-26-28	Kansas State College	Haematopinus asini and Trichodectes parumpilosis on Jenny and colt	20 per square inch	8%	3 qts.	Sprayed once	Mild	In barn	No live lice	No live lice	Checked for 5 days and no live lice found. Animals were then butchered.