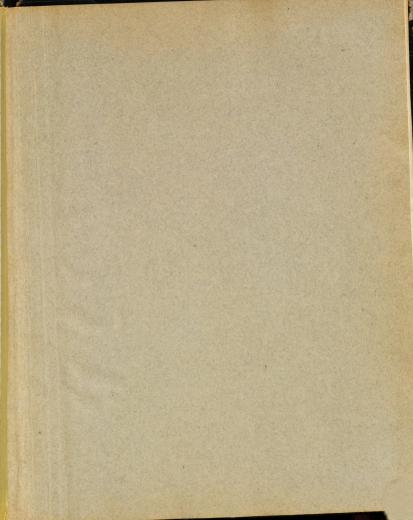
VERMICIDAL VALUE OF COLLOIDAL IODINE CHANDLER

Thesis for the Degree of M. S. Elbert Martin Alderman 1928



THESIS



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Submitted to the Faculty of the Michigan State College
in partial fulfillment of the requirements for the
degree of Master of Science

by

Elbert Martin Alderman

June 1928

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VERMICIDAL VALUE OF COLLOIDAL IODINE (CHANDLER)

Introduction

Since the experimental work relative to date for thesis has been limited very largely to poultry the value of Colloidal Iodine in the destruction of intestinal parasites of poultry will be the phase of the subject dealt with herein.

The problem of controlling intestinal parasites of poultry is becoming more and more acute as the poultry industry is becoming more extensive. Raising large numbers of fowls continuously on relatively small areas or in crowded quarters increases to some considerable degree the likelihood of rarasitic infestation. To prevent, in a measure, heavy parasitic infestation of birds handled under such conditions it is necessary to thoroughly cleanse the quarters quite frequently and iodize (1) the floors, dropping boards, perches, etc. to destroy the worm eggs and larvae. Where the quarters are properly cleansed and iodized (2) and the birds individually dosed with colloidal iodine (Chandler), at the time of going into winter quarters and again in the spring before turning to range, the degree of parasitic infestation can be reduced to the minimum.

In heavily parasitized fowls it is barely possible that the parasites deprive the fowl of a very limited

 $A_{ij} = A_{ij} + A$

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percentage of nourishment. The damage done to fowl in this way is infinitesimally small as compared with that of other complications resulting directly or indirectly from such heavy worm infestations. The parasites that attach themselves to the intestinal wall cause considerable injury to the mucosa thereof, and, as a result of the constant irritation, a pathological condition develops which terminates in a muchly thickened intestinal wall and this tends to prevent the proper assimilation of food. And, too, it is possible that intestinal parasites secrete or are directly responsible for the production of certain toxins or poisons which exert their influence on the red blood cells and the nerves. The action of the hemolysin is manifested by the pale condition of the skin, the comb, and the wattles - a characteristic picture of a heavily parasitized fowl. The action of the neurotoxin is evidenced by some form of paralysis; as wry neck, etc. Perhaps the most important damage done by intestinal parasites is that of lowering the normal resistive power or predisposing fowls to other types of infection. The injury to the intestinal mucosa serves as portal of entry for various bacteria and protozoa (3). It is reasonable to suppose then that this would not only interfere with the health and growth of the young birds, and with egg production, but is possible that it would also effect the fertility of

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the eggs produced by these parasitized fowls and also the strength and normal resistive power of chicks hatched from such eggs (4). It is obvious, therefore, that some efficient method of controlling intestinal parasites of poultry is imperative. As a means to this end the vermicidal efficiency of colloidal iodine (Chandler) has been, to some considerable extent, perfected.

Colloidal Iodine (Chandler) is a hydrosol or colloidal dispersion of the emulsoid type. This iodine product contains a small percentage of the iodine in aqueous solution and an excess of the elemental iodine in the form of very small particles in suspension - thus constituting a store-house, as it were, of an abundance of iodine ready to be given up in aqueous solution as necessity demands. Not only does the suspensoid carry a supply of readily available and highly soluble iodine but this product, in dilute aqueous solution, is comparatively non-irritating, non-toxic, and does not blister the skin nor injuriously irritate the mucous lining of the intestinal tract of birds subjected to treatment (5).

Review of work on the vermicidal value of iodine
In a series of experiments (5) on several hundred
birds it was proved that iodine in oleaginous suspension
or other form, when delivered into the crop of fowls was
not efficient in the destruction of intestinal parasites.
This, in all probability, was due to the fact that the

festation, but instead had exerted its energy in the reaction with organic material at the seat of delivery. This experimental data shows too that Iodine Vermicide Merck (Liquid for poultry) in one ounce doses delivered into the gizzard of birds is one hundred percent efficient against Ascaridia and Cestoda. Experimental data also shows that Colloidal Iodine (Chandler) containing 2.05% I₂, prepared from powdered colloidal iodine (Chandler), in one ounce doses delivered into the gizzard of birds is apparently one hundred percent efficient against roundworms and tapeworms.

From the above data it is evident that free or elemental iodine must come in direct contact with the parasites in order to be effective; that the optimum dose is one ounce; that the dose must be delivered directly into the gizzard in order to pass the entire length of intestinal canal and thus convey the elemental iodine to all possible areas of infestation; and that the iodine kills or destroys intestinal parasites of fowls by the action of the uncombined iodine upon them.

Having this data at hand it was thought advisable to conduct further experiments for the purpose of determining the vermicidal value of Colloidal Iodine (Chandler). The efficiency of Iodine Vermicide Merck having been established in a series of critical experiments (5) this product was

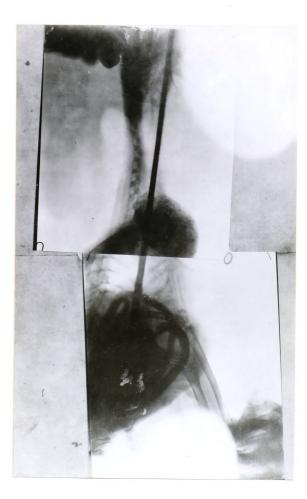
used as a check on the iodine suspensoid. In the following experiments the birds, two hundred seventyeight in number, were dosed individually by means of a metal dosing appliance consisting of a metal tube about sixteen inches in length with a one ounce rubber bulb attached to the upper end. With assistant holding bird with body in a vertical position the head was grasped with left hand, extending the neck and at same time pressing beak open with thumb and index finger and with right hand introducing the tube -after dose had been drawn into rubber bulb -- into the eosophagus and beyond the crop into gizzard and then slowly delivering the dose into the gizzard by gently pressing rubber bulb with right hand. These birds were then placed in individual cages or coops which were provided with wire mesh bottom and trays underneath for collecting the excreta. Careful observations were made every few hours and the worms, if any present, counted and removed from the trays. The birds were fed and watered as they had been previous to the experiment. After fortyeight hours from time of first dosing the birds were check dosed with Iodine Vermicide Merck and further observations made at regular intervals and results noted.

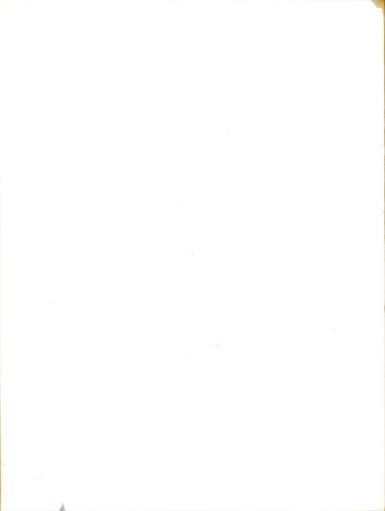
In the first few of the series of experiments sodium bicarbonate was used to dissolve the mucous in the intestinal canal, hoping, thereby, to increase the efficiency of vermicide thus making possible a reduction of iodine

content. The results obtained were not satisfactory,
so gum arabic was substituted for the sodium bicarbonate.
By using gum arabic to increase the protective colloidal
efficiency made it possible to reduce the iodine content
of dose, which in turn means a reduction in price of dose.

Plate I. X-Ray picture of bird showing dosing appliance in position and giving outline and relation of the oesophagus, crop, gizzard, and the small intestine as it leaves the gizzard.

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Following is presentation of protocols of a series of checked experiments:

Experiment 101

Initial dose: Iodine Suspensoid (S) containing 1.5% I2 with

1% sodium bicarbonate (1). 30 cc

Size of dose:

Iodine Vermicide Merck (liquid for poultry) (V) carrying 2% adsorbed iodine. Check dose:

Size of dose: 32 cc

January 10 Date dosed: Check dose: January 12

Bird	Worms v	oided as	Worms v	oided as'		
No.'		initial '	result		Percent	efficiency
1	dose	1	dose	1		
1	R.	т. т. т	R.	T. 1	R.	T.
101	5	1 0 1	0	1 0 1	100	••
102	0	1 0 1	0	1 0 1	• •	• •
103	3	1 0 1	0	1 0 1	100	••
104	0	1 0 1	0	1 0 1	• •	••
105	0	1 11 1	0	1 0 1	• •	100
106	0	1 0 1	0	1 0 1	• •	• •
107	2	1 0 1	0	1 0 1	100	•••
108	1	1 0 1	0	1 0 1	100	• •
109	0	1 0 1	3	1. 0	0	• •
110	0	1 0 1	0	0 1	• •	
111	0	0 1	0	1 0 1	• •	• •
112	2	1 0 1	0	1 0 1	100	• •
113	0	7 0 1	0	0 1	• •	• •
114	6	1 0 1	0	0 1	100	• •
115	0	0 1	0	7 0 1	• •	• •
116	4	1 0 1	0	0 1	100	• •
117	0	0 1	0	0	• •	• •
118	0	0 1	0	1 0 1	• •	
119	2	1 0 1	0	0 1	100	• •
120 '	0	1 0 1	0	0 1	••	• •
121 '	0	0 1	0	1 0 1	• • •	• •
122 '	0	1 0 1	0	1 0 1	• •	• •
123	0	0 1	. 0	0 1	• •	• •
124	0	6 1	0	0 1	• •	100
125	0	0 1	0	0 '	• • •	• •
126	0	0	0	0 1		• •
127	0	68 '	0	1 0 1	• •	100
128 '	0	0 '	0	0 1		
129	7	1 0 1	0	0 1	100	
130	0	0	0	0 1	• •	• •
131	0	0	0	0		• •
132	0	0 1	0	0	'	••

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- S: Iodine preparation (according to formula of Dr. W. L. Chandler) in which all of the iodine is present in available form.
- V: Protein iodine compound (according to Dr. W. L. Chandler) carrying 2% adsorbed iodine.
- R: Roundworms (Ascaridia).
- T: Tapeworms.
- ..: No worms were voided.
- Note: In the above experiment the vermicidal efficiency of Iodine Suspensoid is very high, though not 100% as there were three worms voided by one bird on check dose.

Iodine suspensoid containing 1.5% Iz with 1% sodium bicarbonate. Initial dose:

-30 cc Size of dose:

Todine vermicide Merck (liquid for poultry) carrying 2% adsorbed iodine. Check dose:

37 cc Size of dose:

January 14 Date dosed: January 16 Check dose:

Bird' result initial ' result check '		Worms v	oided as'	Worms vo	oided as'	Percent	efficiency
R. T. T	Bird'	result	initial '	result o	check '		_
201	No.				T		
202 0 0 0 0 203 0 0 0 0 204 0 0 0 0 205 0 0 0 0 206 0 0 0 0 207 3 0 0 0 100 208 0 0 0 0 100 209 1 0 1 0 0 210 3 0 0 0 100 211 3 0 0 0 100 213 0 0 0 0 100 213 0 0 0 0 100 214 4 0 0 0 100 216 0	1	R.					T.
203 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 '						100	•
204 0 0 0 205 0 0 0 0 206 0 0 0 0 207 2 0 0 0 100 208 0 0 0 0 209 1 0 1 0 0 210 3 0 0 0 100 211 3 0 0 0 100 212 9 0 0 0 100 213 0 0 0 0 100 214 4 0 0 0 215 0 0 0 0 216 0 0 0 0 217						• •	1
205 0 0 0 0 206 0 0 0 0 207 2 0 0 0 100 208 0 0 0 0 0 209 1 0 1 0 0 0						• •	• •
206						• •	
207 2 0 0 0 100 208 0 0 0 0 209 1 0 1 1 0 0 210 3 0 0 0 100 211 3 0 0 0 100 212 9 0 0 0 100 213 0 0 0 100 214 4 0 0 0 100 215 0 0 0 0 100 216 0 0 0 0 216 0 0 0 0 218 1 0 0 0 219 0 0 0 0 221 0 0 0 0						• •	•••
208 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 ' 0 '						• •	••
209 ' 1 0 1 0 0 210 ' 3 0 0 0 100 211 ' 3 0 0 0 100 212 ' 9 0 0 0 100 213 ' 0 0 0 0 100 214 ' 4 0 0 0 100 215 ' 0 0 0 0 100 216 ' 0 0 0 0 217 ' 0 0 0 0 218 ' 1 0 0 0 100 220 ' 1 0 0 0 100 221 ' 0 0 0 0 222 ' 0 0 0 0 223 ' 0 0 0 0		2				100	•
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213 0 0 0 0 214 4 0 0 0 100 215 0 0 0 0 216 0 0 0 0 217 0 0 0 0 218 1 0 0 0 100 219 0 0 1 0 0 220 1 0 0 0 100 221 0 0 0 0 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 2	211						••
214 4 0 0 0 100 215 0 0 0 0 216 0 0 0 0 217 0 0 0 0 218 1 0 0 0 100 219 0 0 1 0 0 220 1 0 0 0 100 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 226 2 0 0 0 228 0 0 0 229 <td< td=""><td>212</td><td></td><td></td><td></td><td></td><td>100</td><td></td></td<>	212					100	
215 0 0 0 0 216 0 0 0 0 217 0 0 0 0 218 1 0 0 0 100 219 0 0 1 0 0 220 1 0 0 0 100 221 0 0 0 0 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 226 2 0 0 0 228 0 0 0 229 <td< td=""><td>213</td><td></td><td></td><td></td><td></td><td></td><td>• •</td></td<>	213						• •
216 0 0 0 217 0 0 0 0 218 1 0 0 0 100 219 0 0 1 0 0 220 1 0 0 0 100 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 226 2 0 0 0 227 0 0 0 228 0 0 0 229 0 0 0	214					100	••
217 0 0 0 0 218 1 0 0 0 100 219 0 0 1 0 0 0 220 1 0 0 0 100 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 226 2 0 0 0 228 0 0 0 0 229 0 0 0	215					• •	
218 1 0 0 100 219 0 0 1 0 0 220 1 0 0 0 100 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 226 2 0 0 0 227 0 0 0 0 228 0 0 0 229 0 0 0						• •	••
219 0 0 1 0 0 220 1 0 0 0 100 221 0 0 0 0 222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 0 0 226 2 0 0 0 227 0 0 0 0 228 0 0 0 0 229 0 0 0		0					• •
220 1 0 0 0 100		1		0			••
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222 0 0 0 0 223 0 0 0 0 224 0 0 0 0 225 0 0 1 0 0 226 2 0 0 0 100 227 0 0 0 0 228 0 0 0 0 229 0 0 0	221					• •	•••
224 0 0 0 0 225 0 0 1 0 0 226 2 0 0 0 100 227 0 0 0 0 228 0 0 0 0 229 0 0 0	222					• •	
225 0 0 1 0 0 226 2 0 0 0 100 227 0 0 0 0 228 0 0 0 0 229 0 0 0	223						• •
226				0			1
227 0 0 0 0 228 0 0 0 0 0				1			1
228 0 0 0 0 0 0		2				100	1
229 0 0 0 0 0						• •	1
						• •	1
230 1 0 0 100		0					1
	230	1	0 '	0	0	100	1

In the above experiment the infestation was not Note: heavy. The dosage was not effective, due possibly to there not being enough free iodine in the low percentage dose.

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Iodine suspensoid, containing 1.2% $\rm I_{2}$ with 1% sodium bicarbonate. Initial dose:

Size of dose: 40 cc

Check dose: Iodine vermicide Merck (liquid for poultry) containing 2% adsorbed iodine.

Size of dose: 32 cc Date dosed: January 18 Check dose: Jamuary 20

	Worms	roided as'	Worms v	oided as		
Bird'	result	initial '	result	check '	Percent	efficiency
No.'	dose		dose	,		•
١.	R.	T. 1	R.	T. '	R.	T.
301	0	0 1	0	0	••	•••
302 '	1	0 1	0	0 1	100	• • • • • • • • • • • • • • • • • • • •
303	0	0 1	0	0	• •	·
304	0	0 1	0	0 1		·
305	0	1 0 1	0	0 1	• • •	٠
306 T	0	1 0 1	0	0 1		· · · · ·
307	0	0 1	0	0 1		·
308 '	0	1 0 1	0	0 1		٠
309 '	1	0 '	0	0 1	100	
310	0	0 1	0	0 1		'
311	0	1 0 1	0	0 1		٠
312 '	0	0 1	0	0 1		
313 '	0	0 1	0	0 1	•••	• • •
314 '	0	0 1	0	0 1	•••	'
315 '	0	1 0 1	0	0 1	•••	'
316	0	7 0 7	0	0 1	• • •	·
317	0	7 0 1	0	0 1		·
318 '	0	, 0,	0	0 ,	• •	· · · ·
319 '	5	0	0	0 1	100	· · ·
320	0	1 0 1	0	0 1	• •	· · · ·
321	0	1 0 1	0	, 0 ,	•••	· · · · · ·
322 '	0	0 1	0	1 0 1	•••	· · · · · ·
323	0	0 1	0	0 1		· · ·
324	0	0 1	0	0	••	·
325	0	0	0	0	•••	•••
326 '	0	0 1	0	0		· · · · · ·
327 '	0	1 0 1	0	, 0	•••	·
328 '	0	1 0 1	0	, 0		••
329	0	0 1	0	, 0		· · · ·
330	0	0	0	1 0 1		· · · ·

Note: In above experiment the infestation very light - not a fair test of low percentage dose. This experiment was, therefore, repeated.

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Iodine suspensoid containing 1.2% I2 with Initial dose:

1% sodium bicarbonate.

Size of dose: 40 cc

Iodine vermicide Merck (liquid for poultry) containing 2% adsorbed iodine. Check dose:

32 cc Size of dose:

January 25 Date dosed: January 28 Check dose:

Bird'		oided as		voided as		
	Lagarr	initial '		check		efficiency
No.'	dose	1	dose	1		-
1-	R.	T. 1	R.	7. T.	R.	T.
401	0	1 0 1	0	1 0 1	• •	•••
402	0	1 0 1	0	0 1	• •	· ·
403	0	1 0 1	0	0 1	• •	1
404	0	1 0 1	0	0	• •	• • •
405	0	0 1	0	0	• •	7
406	0	1 0 1	0	0 1	• •	••
407	0	0	0	0	• •	•
408	0	0	0	0	• •	•••
409	1	0 1	0	0 1	100	• • •
410	0	0 1	0	1 0 1	• •	T
411	0	0 1	0	0 '	• •	• •
412	0	0 1	0	1 0 1	• •	• •
413	0	0 1	0	0 1	_•_•	• •
414	2	0 1	0	0 1	100	1
415	6	1 0 1	1	1 0 1	85	1
416	0	0 1	0	0	• •	
417	0	0 1	0	0 1	• •	• • •
418	13	1 0 1	0	0	100	• • •
419	3	0 1	1	0 1	75	• • •
420	1	1 0 1	13	0 1	0	
421	4	0 1	0	1 0 1	100	1
422	1	1 0 1	1	1 0 1	0	1
423	0	1 0 1	0	0 1	• •	• •
424	4	1 0 1	0	0	100	• •
425	1	1 0 1	0	0 1	• •	•
426	0	0 1	0	1 0 1	• •	1
427	0	1 0 1	0	1 0 1	• •	1
428	0	0 1	0	0 1	• •	Y
429	17	0 1	4	1 0 1	80	
430	0	0 1	0	0	• •	• •

In above experiment infestation moderate - the low Note: percentage dose not efficient.

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Initial dose: Iodine suspensoid containing 2% I2.

Size of dose: 30 cc

Check dose: Iodine vermicide Merck (liquid for poultry)

carrying 2% adsorbed iodine.

Size of dose: 30 cc

Date dosed: January 30 Check dose: February 1

Bird'r No.'d 501' 502' 503' 504' 505' 506'	result lose R. 10 7 1	oided as initial 'T. 'T. 'O'		T.	R. '	fficiency T.
No. d 501 502 503 504 505 506	7 10 7 1	T. 1	dose R.	T. T	R. '	
501 ' 502 ' 503 ' 504 ' 505 ' 506 '	R. 10 7 1 3	0 1	0 '			T.
502 ' 503 ' 504 ' 505 ' 506 '	7 1 3	7 0 1		0		
503 ' 504 ' 505 ' 506 '	3				100	• •
504 ' 505 ' 506 '	3			0 '	100	• •
505 ' 506 '	3		0 '	0 '	100	1
506		0	0	0 .	100	• •
	12	0	0 '	U ·	100	• •
PANT	0	0	0	0 1	• •	• •
507	0	1 0	0	· ·	• •	• •
508	1	0 1	0	0	100	• •
509	0	0	0 1	U	• •	• •
510	0	0	0		• •	• •
511 '	1	0		U	100	• •
512 '	6	•	0 '	O	100	• •
513	22	0	U	U ·	100	• •
514	0	0	0	<u>_</u>	• •	• •
515 '	11	0 1	U		100	* •
516 '	19	0	0 '	U	100	• •
517 '	17	0	U	<u> </u>	100	• •
518	0	0	0	U .	• •	• •
519 '	1	•	0 '	O	100	• •
520	12	0	0 '	U	100 '	• •
521	0	0	0 '	0 '	• •	• •
522	0	0	0	0 '	• •	• •
523	3	0	1 '	0	75	• •
524 '	7	0	0 '	O .	100	• •
525	0	C	0	0 '	• •	• •
526	18	. 0	0 '	0 '	100	• •
527	0	0	<u>.</u> T	U ·		• •
528 '	0	0 1	0 '		• •	• •
529	1	0	0 '	0 .	100	• •
530	16	0 1	0	0 '	100	• •

Note: In above experiment infestation rather heavy - the increased percentage dose more efficient, though not 100%. In a total of 170 worms only two voided on check dose. This experiment was, therefore, repeated adding 4% gum arabic.

Iodine suspensoid containing 2% I2 with Initial dose:

4% gum arabic.

Size of dose:

Iodine vermicide Merck (liquid for poultry) containing 2% adsorbed iodine. Check dose:

Size of dose: 30 cc

February 2 Date dosed: Check dose: February 4

	Worms v	roided as'	Worms v	oided as	1	
Bird'	result	initial '	result	check	' Percent	efficiency
No. '	dose	•	dose		•	·
1	R.	1 T. 1	R.	T.	· R.	T.
601	6	1 0 1	0	1 0	100	
602 1	12	1 0 1	0	1 0	100	1
603	0	1 0 1	0	1 0	1	· · · · · · · · · · · · · · · · · · ·
604	20	0 1	0	0	100	1
605	31	1 5 1	0	0	100	100
606	13	1 0 1	0	0	100	
607	1	1 0 1	0	' 0	100	
608	20	1 0 1	0	• 0	100	1
609	0	0 1	0	• 0	1	
610	4	1 0 1	0	0	100	'
611	0	0	0	• 0	1	1
612 '	5	0 1	0	' 0	100	1
613	0	0 1	0	0	1	
614 '	1	0 1	0	' 0	100	1
615 '	0	0 1	Ċ	. 0	•	• • • • • • • • • • • • • • • • • • • •
616 ·	33	1 1	0	0	' 100	100
617	0	1 0 1	0	' 0	1	1
618 '	6 .	1 0 1	0	0	100	1
619 '	0	1 0 1	0	• 0	1	•
620 '	0	1 0 1	0	0	1	<u> </u>
621 '	14	0 1	0	' 0	' 100	1
622 '	0	0 1	C	1 0	1	• • • • • • • • • • • • • • • • • • • •
623 '	22	0 1	0	0	100	
624	13	0 1	0	0	100	
625 '	6	1 0 1	0	0	' 100	1
626 '	7	1 0 1	0	0	100	1
627 '	35	1 0 1	0	1 0	100	1
628 '	0	1 0 1	0	0	1	1
629 '	0	1 0 1	0	• 0	1	1
630 '	2	1 0 1	0	0	100	1

In above experiment infestation heavy - there being 257 worms voided on first dose - the iodine suspensoid containing 2% I2 with 4% gum arabic being 100% efficient against roundworms and tapeworms. Initial dose: Iodine suspensoid containing 2% I2 with 4%

gum arabic.

Size of dose: 30 cc

Check dose: Iodine vermicide Merck (liquid for poultry)

carrying 2% adsorbed iodine.

Size of dose: 30 cc

Date dosed: February 6 Check dose: February 8

	Worms v	roided as'	Worms v	oided as		
Bird'	result	initial '	result	check '	Percent	efficiency
No. '	dose	1	dose	1		
1	R.	T.	R.	T.	R.	T.
701	8	1 0 1	0	0	100	• •
702	2	1 0 1	0	0	100	• •
703	26	0 1	0	0	100	• •
704	16	1 0 1	0	0	100	• •
705	0	1 0 1	0	0	• •	• •
706	5	1 0 1	0	0	100	• •
707	3	1 0 1	0	0	100	• • •
708	6	1 0 1	0	0	100	• •
709	26	0	0	0	100	1
710	17	1 0 1	0	0	100	1
711	7	0 1	0	0	100	• •
712	13	1 0 1	0	0	100	• • •
713	4	1 0 1	0	0	100	1
714	1	1 0 1	0	0	700	• •
715	0	1 0 1	0	0 1	• •	•
716	2	1 0 1	0	1 0	100	• •
717	17	1 0 1	0	0	100	1
718	0	1 0 1	0	0	• •	1
719	6	1 0 1	0	0	100	• •
720	0	1 0 1	0	0	• •	1
721	0	1 0 1	0	0	• •	• •
722	5	0 1	0	0	100	1
723	0	1 0 1	0	0	• •	1
724	8	1 0 1	0	0 '	100	1
725	0	1 0 1	0	0	• •	1
726	9	0 1	0	0	100	• •
727	7	0 1	0	0 1	100	• •
728 1	9	1 0 1	0	0	100	•
729	10	0 1	0	0	100	
730	4	1 0 1	0	0	100	• •
731	29	1 0 1	0	0	100	• •
732	5	7 0 1	0	0	100	•••

Note: In above experiment infestation heavy - there being 245 worms voided on first dose - the iodine suspensoid containing 2% I₂ with 4%, gum arabic being 100% efficient. Having obtained this degree of efficiency it was decided to reduce the iodine content.

* . . . ···

Iodine suspensoid containing 1.8% Ig with Initial dose:

2% gum arabic.

Size of dose: 30 cc

Iodine vermicide Merck (liquid for poultry) carrying 2% adsorbed iodine. Check dose:

Size of dose: 30 cc

Date dosed:

February 15

Check dose: February 17

		oided as'		oided as		
Bird'	result	initial '	result	check '	Percent	efficiency
No.	dose		dose	•		
1-	R.	T.	R.	T.	R.	Т.
801	23	7 0 7	0	0 1	100	• •
802	0	0 1	0	0 1	••	
803	1	0 1	0	, 0 ,	100	1
804	0	0 1	0	0 1	• •	1
805	2	0 1	0	7 0 1	100	• • •
806	0	1 0 1	0	1 0 1	• •	T
807	0	0	0	1 0 1	• •	••
808	0	0 1	0	1 0 1	• •	•••
809	1	7 0 7	0	1 0 1	100	•••
810	9	7 0 1	0	0 1	100	•
811	5	0 1	0	1 0 1	100	•••
812	21	1 0 1	0	1 0 1	100	· · ·
813	9	0 1	0	1 0 1	100	· · ·
814	1	1 0 1	2	1 0 1	33	•••
815	0	0 1	0	1 0 1	• •	• •
816	15	0 1	0	1 0 1	100	7

In above experiment infestation moderate - the dosage Note: not 100% efficient. It was decided to decrease volume of dose and increase gum arabic content.

Initial dose: Iodine suspensoid containing 3.6% I2 with

4% gum arabic.

Size of dose: 15 co

Check dose: Iodine vermicide Merck (liquid for poultry)

carrying 2% adsorbed iodine.

Size of dose: 30

30 cc

Date dosed: Check dose: February 18 February 21

		oided as		oided as		
Bird'		initial '	result	check '	Percent	efficiency
No. '	dose	1	dose	T		
	R.	T	R.	T.	R.	T.
901	0	1 0 1	0	0	• •	• •
902	0	0 1	0	0 1	• •	• •
903	0	0 1	0	0 1	• •	
904	4	0 1	0	0	100	• •
905	0	1 0 1	0	0 1	• •	• •
906	I	1 2 1	0	1 0 1	100	100
907	0	1 0 1	0	0 1	• •	• •
908	9	1 2 1	1	0 1	90	100
909 1	1	7 0 7	0	1 0 1	100	• •
910 '	1	1 0 1	0	0	100	• • •
911 '	3	1 0 1	0	, 0 ,	100	• •
912 1	3	10 '	0	, 0,	100	100
913	0	1 0 1	0	0 1	• •	• •
914	3	1 0 1	0	0 1	100	• •
915	1	1 0 1	0	1 0 1	100	••
916	1	1 0 1	0	1 0 1	100	

Note: In above experiment the small volume of high percentage dose not 100% efficient. The experiment was, therefore, repeated, with an increase in gum arabic content.

Experiment 110

Iodine suspensoid containing 3.47% Iz with Initial dose:

8% gum arabic.

Size of dose:

Iodine vermicide Merck (liquid for poultry) carrying 2% adsorbed iodine. Check dose:

Size of dose: 30 cc

February 22 Date dosed: February 25 Check dose:

1	Worms v	oided as	Worms v	oided as'		
Bird'	result	initial '	result	check '	Percent	efficiency
No.	dose	1	dose			
1 1	R.	T.	R.	T.	R.	T.
1001'	0	0 1	0	1 0 1	• •	1
1002	3	1 0 1	0	0	100	• •
1003	0	0 1	0	0	• •	
1004	0	0 1	0	0	• •	•
1005	0	0 1	0	0	• •	• • _
1006	0	0 1	0	0 '	• •	• •
1007	9	0 1	0	0	100	• •
1008	0	0 1	0	0 1	• •	• • •
1009'	4	1 0 1	0	0 '	100	• •
1010'	0	0 1	0	0 1	• •	
1011'	5	0 1	0	0 1	100	• •
1012'	4	0 1	0	0 1	100	• •
1013'	1	Q	0	0 1	100	• •
1014	0	0 1	0	0	• •	••
1015	0	0 1	0	0	• •	• •
1016'	0	1 0 1	0	0	• •	• •

In above experiment infestation light. Small volume Note: of high percentage dose 100% efficient.

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Experiment 111

Initial dose: Iodine suspensoid containing 1.8% Is with

4% gum arabic.

Size of dose: 30 cc

Check dose: Iodine vermicide Merck (liquid for poultry)

carrying 2% adsorbed iodine.

Size of dose: 30 cc

Date dosed: February 27

Check dose: March 1

	Worms v	oided as'	Worms v	oided as'			
Bird	result	initial '	result	check '	Percent efficiency		
No.	dose	•	dose	1			
	R.	T.	R.	T.	R.	T.	
1101	19	1 0 1	0	1 0 1	100	1	
1102	7	7 0 1	0	0 1	100	• • •	
1103	0	0 1	0	0 1	• •	• •	
1104	2	101	0	0 1	100	•	
1105	33	101	0	0 1	100	• • •	
1106	1 0	1 0 1	0	0	• •	• • • • • • • • • • • • • • • • • • • •	
1107	2	101	0	1 0 1	100	• • •	
1108	13	101	0	0 1	100	• • • • • • • • • • • • • • • • • • • •	
1109	2	. 0	0	0 1	100	• •	
1110	2	1 0 1	0	0 1	100	• • •	
IIII	0	101	0	1 0 1	• •	•	
1112	1 3	0 1	0	1 0 1	100	•••	
1113	7 5	1 0 1	0	0 1	100	•••	
1114	6	101	0	1 0 1	100	• •	
1115	5	7 3 7	0	1 0 1	100	••	
1116	14	0 1	0	0 1	100	• •	

Note: In above experiment infestation heavy - there being 116 worms voided on first dose - the iodine suspensoid containing 1.8% I₂ with 4% gum arabic being 100% efficient. It, therefore, appears that the suspensoid, in one ounce dose, containing 1.8% I₂ and about twice as much gum arabic is sufficient.

Summary of experiments

- 20 -

No.	Suspensoid '	Worms	voided	' Vermicide'	Worms	voided
		R.	T.		R.	T.
101	' 30 ce 1.5% with' ' 1% NaHCOs	32	† 85 †	' 32 cc 2% '	3 1	00
102	30 cc 1.5% with	31	00	' 32 cc 2% '	3 ·	00
103	' 40 cc 1.2% with'	7	' 00 '	' 32 cc 2% '	00 '	00
104	40 cc 1.2% with'	53	' 00 '	' 32 cc 2% '	20	00
105	30 cc 2%	168	00	' 30 cc 2% '	2 '	00
106	30 cc 2% with '4% gum arabic	251	6	' 30 cc 2% '	00 !	00
107	' 30 cc 2% with ' 4% gum arabic '	245	' 00 '	' 30 cc 2% '	00	00
108	'30 cc l.8% with' '2% gum arabic	87	' 00 '	' 30 cc 2% '	2 '	00
109	' 15 cc 3.6% with' ' 4% gum arabic '		14	' 30 cc 2% '	1	00
110	l 15 cc 3.47% 'with 8% gum 'arabic	26	1 00 1 1	30 cc 2%	00	00
111	30 cc 1.8% with'	113	3	30 cc 2%	00	00

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Plate II. (a) Davainea cesticillus

- (b) Hymenolepis carioca
- (c) Scars where worms have been attached
- (d) Thickened intestinal wall

Approximately fifty percent of the Cestoda were lost in fixation process. Note scars where worms have been attached. The scarred and thickened condition of the intestinal wall is pronounced. Impossible for proper assimilation of food under such conditions.





Plate III. Showing Davainea cesticillus, the same genus and species as shown at (a) Plate II. Note the difference in size. The degree of infestation not nearly so great as in Plate II.



Conclusion

Several previous experiments having shown that there was no apparent ill effects from use of the colloidal iodine, the Sixth International Egg Laying Contest at Michigan State College had their birds dosed, just previous to beginning the contest, with iodine suspensoid. These birds broke all previous records by having reached the maximum production for second week within the early part of the second week of the contest. This is sufficient evidence of the fact that there is no appreciable reduction in egg production nor any physical injury to the birds due to the treatment.

With the improved dosing appliance used in these experiments birds may be individually treated with a reasonable degree of rapidity, accuracy, and safety. With a little practice one man can dose one hundred fifty birds per hour.

It is obvious that a quantity less than thirty cubic centimeters of any economical strength of the iodine suspensoid is not one hundred percent efficient - due to the fact, no doubt, that there is not enough of the vehicle, in the smaller volumes, to spread throughout the length of the intestinal canal and thus transport the free uncombined iodine to all possible areas of infestation.

Experimental data shows that thirty cubic centimeters of 1.8% iodine suspensoid is one hundred percent efficient against both roundworms and tapeworms.

Treating the birds with iodine suspensoid in the fall before going into winter quarters - the quarters having been thoroughly cleansed and iodized - and again in the spring before turning to range should keep them fairly free of intestinal parasites and most certainly enable them to give better returns for the food consumed. The high degree of efficiency of the colloidal iodine (Chandler) in the destruction of intestinal parasites of poultry, the ease of administration, and the comparatively reasonable cost of the product secures for it a place of much importance on the commercial poultry farm and in the back yard flock as well.

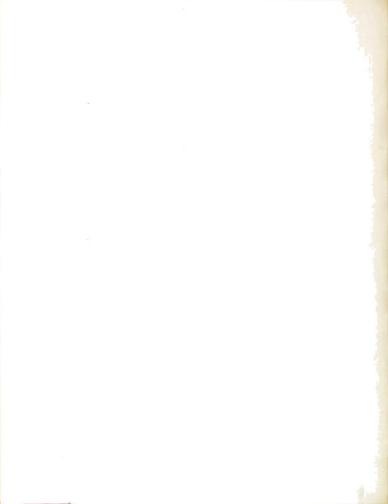
Acknowledgment

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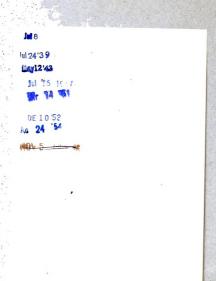
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