He was persuaded to record carefully the intensity of the response in relation to the situation which elicited it. He has made 508 observations during 94 days, the salient facts of which are detailed below.

A "drop" is defined as the amount of fluid necessary to fill the eye and run over onto the cheek. If enough fluid was produced to cause one drop to fall off of the cheek, this was considered 2 drops, or if more than one drop ran off, each was added.

It appears that defecation is a much more effective stimulus (2.2 drops, average of 86 observations) than urination alone (0.01 drops, average of 255 observations) or urination during a desire to defecate (0.4 drops, average of 114 observations), that performing the 2 acts at the same time (2.3 drops, average of 57 observations) does not enhance the response to as great a degree as does defecation with effort to retain urine (3.7 drops, average of 7 observations). The passage of watery feces is much less effective as a stimulus to lacrimation (0.6 drops, average of 5 observations) than is the passage of normal feces. In addition it may be remarked that straining alone has no effect. Warm soap suds enemata and mechanical stretching of the anal sphincter are also without effect.

That the response involves the normal nervous outflow (parasympathetic) is indicated by the fact that the lacrimatory response is eliminated as a result of a moderate dose of atropine.

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Treatment of Pin Worm (Enterobius vermicularis) Infestation with Hexylresorcinol.*

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The removal of *Enterobius vermicularis* is especially difficult because its life span of 3-4 weeks is spent in migrating down the small and large intestines. Because of this migration, treatment must be directed against the young worms in the small intestine as well as the gravid females in the large intestine. That the eggs are infective when passed in the anal region by the female worms adds to the difficulty, and the possibility of reinfestation during treatment can-

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not be ruled out. Thus in the present study, enemas from one case were negative over a period of 2 weeks and then 7 female worms, all just mature and of the same size, were recovered. From another case negative for 7 weeks, 3 worms were later removed. These worms undoubtedly represented reinfestation during the treatment.

Crystalline hexylresorcinol has been shown by Lamson *et al.*[1] to be very effective against ascaris and hookworm. Further it has been found that a 1-1000 saline solution suspension of this drug kills enterobius in 2 minutes and hence it was tried on a number of cases harboring this worm.

Treatments by Oral Administration and Enemas. Six persons from 3 to 30 years of age were given the combined treatment of crystalline hexylresorcinol in pills by mouth and enemas composed of 1 gm. hexylresorcinol in 1000 cc. of water. The oral dose was 0.1 gm. per year of age up to 10 years, with the maximum dose of 1.0 gm. It was given 8 hours after a light breakfast‡ and no food was then taken for 4 hours after treatment, as it has been shown (Lamson[1]) that this drug combines with proteins and greatly decreases its activity. A preliminary cleansing soap suds enema preceded that of the hexylresorcinol suspension; the latter was given high and retained 5 minutes. The number of treatments varied from 3 to 13 and were at first given twice weekly and the last 3 were given at intervals of 1, 2, and 4 weeks. The patients were advised to boil their bed sheets twice weekly to kill any eggs or worms deposited upon them. The results from the enemas were collected separately, washed through a 40 mesh screen and the worms counted. Since enterobius does not usually pass eggs until it migrates to the anal region, stool examinations for eggs in determining the presence of this worm are not satisfactory. Because of this, one has to rely on the patient examining each stool for the adult worms and on the results of enemas to ascertain whether or not worms are still present.

Table I gives the results of the treatments. Ninety percent of the worms recovered were removed by the first treatment and 99% by three treatments. The greatest number of worms recovered from one person was 1770. Two cases became negative after a single treatment. Five of the cases remained negative for a period of 7

[1] Lamson, P. D., Brown, H. W., Robbins, B. H., and Ward, C. B., *Am. J. Hyg.*, 1931, **13**, 803.

‡ The clinic patients were not available until afternoon. It would probably be more satisfactory to do the treatment at breakfast time, omitting this meal entirely.

TABLE I. *Enterobius (Oxyuris) vermicularis*
Treatment with soap suds enema followed by enema of 1 gm. hexylresorcinol to 1000 cc. of water. Pills of hexylresorcinol by mouth. Number of worms recovered in enemas.

Age	Treatment	1	2	3	4	5	6	7	8	9	10	11	12	13	Total	Soap suds enemas	Hexylresorcinol enemas
	Day of treatment	0	2	7	9	14	16	21	23	28	35	42	56	86			
30		19	0 HR*		0										19	8	11
29		9 HR	5 HR	30 HR	1 HR	1	1 HR	2	7	2	0	0	0	0	58	13	45
27		5	1 HR	7 HR	1 HR	1 HR	1			1		0	0	0	17	8	9
9		973	9 HR	2 HR	0 HR	6 HR	1	0 HR	0	0	1	0	0	3	995	8	987
5		1602	40 HR	121 HR	0 HR	0 HR	0	7 HR	0	0	0	0	0	0	1770	280	1490
3		6	0 HR	0 HR	0 HR			0			0	0	0	0	6	1	5
	Worms recovered	2614	55	160	2	8	3	9	7	3	1	0	0	3		318	2547
	% of all worms recovered	90%		99%													

TABLE II.
Treatment with soap suds enema followed by enema of 1 gm. hexylresorcinol to 1000 cc. of water.

7	No pills	87	3	21	3	4	1	3	0	1	8	3	1	1	136	16	120
6	" "				16	1	1	0	1	1	0	0	0	0	20	7	13
4	" "				1	3	0	2	0	0	0	0	0	0	6	3	3

*HR indicates oral administration of hexylresorcinol on this day.

weeks. The one case in which 3 worms were removed after being free of worms for 7 weeks had evidently become reinfested. In these 6 cases, the total worms recovered in the soap suds enemas was 318 and they were all alive, while the 2547 recovered in the hexylresorcinol enemas were all dead. These figures represent only the worms recovered in the enemas and, of course, do not include worms killed but not expelled in the enemas as well as those killed by the oral administration of the drug and expelled sometime later.

Treatment by Enemas. Three cases were treated by enemas only, omitting the pills by mouth. Table II shows that 2 of the cases became free of worms after 3 and 5 treatments respectively, while the third case was still positive after a series of 13 enemas over a period of 3 months. Since the life span of the worm in man, at the most, is probably not over 3 to 5 weeks, it is quite obvious that in this case we were dealing with a series of reinfestations.

Treatment by Oral Administration. Six adults harboring enterobius were each given 1.0 gm. of hexylresorcinol pills. The drug was given early in the morning and breakfast omitted and no food was taken until 6 hours later. Three weeks after treatment, stool examinations were made and all 6 contained enterobius or its eggs.

Conclusion. 1. Hexylresorcinol is very active on *Enterobius* vermicularis, a 1-1000 suspension killing them in 2 minutes. 2. Five out of 6 people treated with hexylresorcinol pills by mouth and enemas became free of their enterobius. Two out of 3 people treated by enema only became free of enterobius. Although this is not sufficient data to judge which method is the best, the life history of the worm indicates need of both oral and enema treatment. 3. Suggested outline of treatment. Treat twice a week in the morning as follows: (a) Omit breakfast; no food until noon. (b) Hexylresorcinol pills orally, 0.1 gm. per year of age up to 10 years of age, maximum dose after this age 1.0 gm. Drink plenty of water. (c) Soapsuds enema and after its evacuation an enema of 1 part crystalline hexylresorcinol in 1000 cc. of water; this enema to be given high and retained 5 minutes. (d) Bed sheets to be boiled at least twice weekly to destroy eggs or worms passed on them.

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On the Motion of Growth. I. Introduction to the Energetics of Growth and Metabolism.

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It is proposed in this and in a few succeeding papers briefly to present the major results of an extensive investigation into the general nature and mechanism of growth, a problem which has now occupied our attention for the past eight years. It is clearly impossible, accordingly, to do more here than to sketch in the barest fashion such features as are of primary interest to those working in this field. A detailed description whereby all steps in the argument are properly and fully justified has already been prepared for early publication elsewhere.

Previous workers as described by Scammon[1] have contributed

[1] Scammon, R. E., Report of National Research Council Committee on Child Development, Washington, 1929, Part I, pg. 1.