

face Technique,⁶ have also been shown to be in accord with the theory that the chylomicrons are surrounded by protein films and thus confirm the conclusion from the isoelectric point determinations.

These protein films around the chylomicrons determine the stability of the chylomicron emulsion and thus the very act of the transport of free fat by the blood.

If, as seems probable, cells take up chylomicrons as such in the assimilation of fat from the blood,² the surface properties are presumably of the greatest importance. It has been shown⁷ that particles with lipid surfaces (acid-fast bacteria) are not readily taken up by cells (phagocytized), whereas those with serum-protein surfaces (acid-fast bacteria treated with the proper serum) are readily taken up. The protein films on chylomicrons give them a protein surface which may well be the all-important factor in determining their direct assimilation from the blood by cells.

After assimilation chylomicron fat may be stored in the form of larger fat drops² or may be acted upon chemically in its final utilization by the body. Both must involve the destruction of the protein films, which must therefore be considered in the study of these problems. This destruction could readily be brought about by proteolytic enzymes.

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Hexylresorcinol in the Treatment of Hookworm Disease.*

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Hexylresorcinol was recently found by us to be an effective ascaricide, killing *Ascaris suum* quickly *in vitro*, removing in single therapeutic doses practically 100% of the ascarids from dogs and 90% or more from man.^{1, 2, 3} Leonard has found this substance

⁶ Mudd, S., and Mudd, E. B. H., *J. Exp. Med.*, 1924, **40**, 633, 647; Seifriz, W., in Alexander, J., "Colloid Chemistry," The Chemical Catalog Co., Inc., New York, 1928, **2**, 437.

⁷ Mudd, S., Lucké, B., McCutcheon, M., and Strumia, M., Colloid Symposium Monograph, 1928, **6**, 131; *J. Exp. Med.*, 1930, **52**, 313; Strumia, M., Mudd, S., Mudd, E. B. H., Lucké, B., and McCutcheon, M., *J. Exp. Med.*, 1930, **52**, 299.

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very non-toxic in his clinical work on urinary antisepsis,⁴ and we have treated 1500 human cases for ascariasis without symptoms of any consequence.⁵ Our laboratory experiments showed hexylresorcinol to be also effective against hookworm in dogs.²

Through the kindness of Dr. W. W. Cort of the Johns Hopkins School of Hygiene, and Dr. A. T. MacCormack, Commissioner of Health for the State of Kentucky, arrangements were made by which we could treat and re-examine cases of ascariasis studied in the survey being carried out by Dr. Cort on the distribution and incidence of ascariasis in the United States. A field laboratory was set up under the directorship of Dr. G. F. Otto of Dr. Cort's department, in Jackson, Kentucky, with a technical staff for making egg counts by the Stoll Method.⁶ Dr. H. W. Brown of this department was in charge of all treatments, recollections, and recounts. Of the 6,000 cases examined by Dr. Cort's staff, 1,350 cases of ascariasis were treated by Dr. Brown and Dr. B. H. Robbins; 1,000 recollections were made 2 weeks after treatment, and egg counted. Among these, 530 cases harboring hookworms were found and treated. These hookworm treatments were incidental to the more complete studies of hexylresorcinol in ascariasis and are necessarily incomplete. The cases were treated with various amounts of the drug at different times in widely separated communities and under all manner of conditions. Those here reported are a summary of the effects of therapeutic doses of hexylresorcinol given as crystals in hard gelatin capsules and followed by water in some instances and mineral oil in others. In our laboratory experiments hexylresorcinol was found to be very effective when given with oil, but this is disagreeable to take, and in the field our ascaris studies showed that about as good results were obtained with water alone, which is a much simpler form of treatment.

The results are sufficient to show that hexylresorcinol given in crystalline form in hard gelatin capsules will remove 90% of the hookworms in a group of cases if precautions are taken to see that no food is allowed for some time before as well as after treatment.

¹ Lamson, P. D., Ward, C. B., and Brown, H. W., *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **27**, 1017.

² Lamson, P. D., Brown, H. W., and Ward, C. B., "Hexylresorcinol in Canine Ascariasis," in press.

³ Lamson, P. D., Caldwell, E. L., Brown, H. W., and Ward, C. B., *Am. J. Hyg.*, 1931, March issue.

⁴ Leonard, Veader, *J. Am. Med. Assn.*, 1924, **83**, 2005.

⁵ Full report of 1500 cases to appear later.

⁶ Stoll, Norman R., and Hausheer, Walter C., *Am. J. Hyg.*, 1926, **6**, 134.

TABLE I.
Hookworm treatment using hexylresorcinol.
Total egg counts (0.01 gm. formed basis) of all cases.

Amount of Hexylresorcinol	Followed by	Before Treatment	After Treatment	% Reduction	Total Cases	% Cases Negative after Treatment
1 gm.	Water	1003	198	80	24	41
1 "	30 cc. mineral oil	924	104	89	26	46
0.8 "	Water	3914	816	79	94	57
0.8 "	30 cc. mineral oil	264	61	77	20	60
0.6 "	Water	1681	237	86	21	43
<i>Repeated Doses</i>						
Two doses of 0.6 gm. given at intervals of 1 to 7 days. Total amount of hexylresorcinol taken, 1.2 gm.						
1.2 gm.	Water	774	118	85	52	63
1.2 "	30 cc. mineral oil	473	18	96	19	88

It has been found in all our work that the presence of food, especially of protein nature, greatly reduces the efficacy of hexylresorcinol as a vermicide. No symptoms of any consequence were observed when treatment was properly carried out. A few cases of nausea and vomiting occurred if food was taken shortly after treatment but the fact that whole schools were treated at a time, and no children ever refused or complained of re-treatment even on the day after the first dose shows, we believe, that the drug caused no serious disturbance. Whole communities refused treatment of any sort at first, believing that a vermifuge given several years previously was to be repeated.

We wish to express our thanks to those mentioned above, as well as to Dr. P. E. Blackerby and the many county health officers who made this work possible, and to Dr. Veader Leonard, of Baltimore, for his kindness in supplying us with the hexylresorcinol used in these treatments.

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The Use of Wires in Blood-Vessel Surgery.

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Experiments have been conducted to ascertain (1) what metal causes the greatest amount of blood clotting *in vivo*, and (2) to note

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