

extensively involved than the latter ganglia, however. Attention has been called to degenerative changes in this ganglion in cases of Addison's disease.⁴ Although Hollinshead⁵ has shown that the nerve fibers to the adrenal medulla are preganglionic it seems likely that the cortex would receive some post-ganglionic fibers from the coeliac ganglion. Hence some of the changes in that ganglion may represent axonal reaction.

Summary. The cells of the autonomic ganglia of cats deprived of their adrenal glands for a sufficient time to bring about classical signs of adrenal insufficiency present definite degenerative changes. These changes vary in degree directly with the severity of the insufficiency as indicated by the physical signs. No definite statement can be made as to the significance of these findings in so far as our studies are concerned but the suggestion is offered that autonomic ganglion cell degeneration may explain some of the vasomotor disturbances in adrenal insufficiency. Neither is it possible to offer an explanation as to how the adrenal insufficiency affects the ganglion cells—whether as a part of a general metabolic disturbance or in some more direct, or even more complex, manner.

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Do Cysts of *Endamoeba histolytica* Formed in the Intestine Excyst Before Evacuation and Cause Internal Autoinfection?*

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The following study was designed to determine whether internal autoinfection from cysts of *Endamoeba histolytica* occurs. By internal autoinfection is meant the excystation of cysts formed in the intestine and their invasion of the tissues of the host without leaving the body. The term does not refer to "anus to mouth" transmission of cysts nor to reinvasion of the gut by the trophozoites.

Sellards and Theiler¹ claim to have infected 6 of 8 kittens by injecting material containing cysts only into the colon following

⁴ McCrae, Thomas, *Osler's Principles and Practice of Medicine*, tenth edition, 1927, p. 882.

⁵ Hollinshead, W. H., *J. Comp. Neurol.*, 1936, **64**, 464.

* Conducted in part as a project of the Amebiasis Unit of the National Institute of Health at Tulane University.

¹ Sellards, A. W., and Theiler, M., *Am. J. Trop. Med.*, 1924, **4**, 309.

laparotomy. In each case a silk ligature was tied around the large bowel and the inoculum injected above the point of ligation. Hoare² exhibited sections of the intestine of a kitten, presumably infected with *Endamoeba histolytica* by the rectal injection of cysts alone. According to Wenyon,³ Drbohlav has stated that he was able to confirm these observations. However, these results are open to question, since the information for the most part is incomplete, there was a possibility of trophozoites being in the inoculum or the results were obtained under abnormal conditions.

Negative results were obtained by Izar,⁴ who, in a single instance, inoculated one adult cat *per rectum* with a patient's stool containing cysts and presumably no trophozoites. No symptoms developed. Hegner, Johnson and Stabler⁵ failed to produce infection in a brown howler monkey after injection of a human strain of cysts *per anum* into the colon.

In the present study 24 healthy young dogs, in addition to controls, were used. All animals were carefully examined before use to insure that none were naturally infected with amebæ. Precautions were taken to eliminate the possibility of the inoculum's reaching the mouth and thus causing infection by the normal route. Seven human strains of *Endamoeba histolytica*, known to be infective for dogs, were used to rule out individual differences of the strains. Both ripe and unripe cysts were present in the material used for inoculation and similar forms readily excysted when ingested by control animals. The inoculum in each case was exposed to low temperatures for a period sufficient to insure its freedom from viable trophozoites. The writer is indebted to Col. Charles F. Craig for complement fixation tests done on the animals before their use. All dogs gave negative reactions.

A number of attempts was made to determine, first, whether excystation occurred within reasonable time limits, and second, whether tissue invasion was produced. In the first series of 5 dogs, cysts were injected into the ileum following laparotomy, to determine whether excystation occurred in the ileum or large bowel without passage of the cysts through the stomach and small intestine. In all 5 animals no excystation occurred during periods ranging from 2 to 8 hours, which greatly exceed the normal time required for excystation when cysts are ingested. Dehydration was evident in some instances, but in others where such a condition did not exist, ex-

² Hoare, C. A., *Trans. Roy. Soc. Trop. Med. and Hyg.*, 1925, **19**, 277.

³ Wenyon, C. M., *Protozoology*, 2 vols., 1926, 1563 pp.

⁴ Izar, G., *Beiheft z. Arch. f. Schiffs und Tropenhyg.*, 1914, **18**, 31.

⁵ Hegner, R., Johnson, C. M., and Stabler, R. M., *Am. J. Hyg.*, 1932, **15**, 394.

cystation likewise failed to occur. The same procedure, except that the inoculum was injected into the large bowel instead of the ileum, was repeated in 2 additional dogs. No excystation occurred.

To eliminate the unnatural conditions produced by laparotomy, cysts were injected into the cecum and colon *per anum*, with the use of the technic devised by Faust⁶ for the transfer of the dysentery ameba from dog to dog. In these animals apparently viable cysts were found at autopsy from 3 to 12 hours after inoculation. It was evident that under these conditions neither excystation nor further development had taken place.

Since the dehydration was marked in some animals, even though large volumes of fluid had been given by mouth, it was found that agar aided in keeping the inoculum moist for several hours. Three dogs were given agar either by mouth or in the inoculum which was instilled into the colon *per anum*. The cysts likewise failed to excyst even when dehydration was slight and the medium of the inoculum in the intestine was moist or liquid.

Attempts to induce infection were made by producing stasis by various methods. Collodion plugs were inserted into the rectums of 4 dogs following inoculation with cysts by the anal route. These animals were autopsied from 2½ to 4 days later and only cysts were found, except that in one dog, which had freed itself and probably had ingested a portion of the voided inoculum, a single trophozoite was seen. Similarly, there was no evidence of excystation or tissue invasion in 3 dogs in which the anus was sutured to provide better retention of the inoculum.

The technic employed by Sellards and Theiler, who reported producing infection in cats by means of ligating the rectum following laparotomy and injecting cysts by needle into the lumen above the point of ligation, was repeated. One of 3 dogs inoculated in this manner became infected. In this animal, however, the large intestine was extremely dilated with fluid and gas, due to the stasis, and the mucosa was extremely inflamed. This condition was not quite so marked in the 2 negative animals in this series. It should be noted that this was the only infection produced in dogs by cysts which had not passed through the stomach and small intestine, and that this occurred under extremely abnormal conditions.

It is believed that these studies in the dog, which has been shown by Faust⁷ to be a far more suitable experimental host for *Endamoeba histolytica* than the cat, indicate that internal autoinfection

⁶ Faust, E. C., *Porto Rico J. Pub. Health and Trop. Med.*, 1931, **6**, 391.

⁷ Faust, E. C., *Am. J. Trop. Med.*, 1932, **12**, 37.

by cysts does not normally occur, although it may be produced under extremely artificial conditions.

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**Value of Mouse Brain Antigen for Diagnosis of Lympho-
granuloma Inguinale.**

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D'Aunoy and von Haam¹ reported the results of a series of Frei tests performed in 547 cases of lymphogranuloma inguinale and 1,132 negro hospital patients suffering from various other diseases. The diagnoses based upon the test proved correct in 90.9% of the cases, in 7.2% the patients gave doubtful reactions and in 1.9% apparently faulty reactions were obtained. A comparison of the various antigens used for the Frei test showed that antigen prepared from human glands and the brains of experimentally infected marmosets gave less doubtful reactions than the antigen prepared from diluted human pus or brain emulsions of infected mice.

Strauss and Howard² published the results of Frei tests on 14 persons which included 8 healthy controls, 5 definite cases of lymphogranuloma inguinale and one questionable case. They claimed that nearly half of the reactions to mouse brain antigen injected intradermally into normal subjects were indistinguishable from typical positive Frei reactions. These false reactions were ascribed by the authors to unknown changes which occur in infected mouse brain antigens within a few weeks after preparation. For this reason, the authors believe that Frei antigen made from mouse brain is unsuitable for the routine diagnosis of lymphogranuloma inguinale.

Grace and Suskind,³ testing 95 specimens of their own lymphogranulomatous mouse brain antigens and 41 specimens of commercial mouse brain antigen in 50 cases of lymphogranuloma inguinale and 128 persons who served as control, denied the occurrence of any changes which would make the antigen unreliable for the performance of the Frei test, within a period of 2 years after preparation.

¹ D'Aunoy, R., and von Haam, E., *Am. J. Clin. Path.*, 1936, **6**, 529.

² Strauss, M. J., and Howard, M. E., *J. A. M. A.*, 1936, **106**, 517.

³ Grace, A. W., and Suskind, F. H., *J. A. M. A.*, 1936, **107**, 1359.