The incidence of Trichinella spiralis in the area of Louisville-Jefferson County, Ky., as determined by examining the diaphragms of humans autopsied at the Louisville General Hospital and of swine slaughtered in the Louisville abattoirs.

Trichinella spiralis in the Diaphragms of Humans and Swine

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INTEREST in the control of trichinosis as a public health measure was awakened by the First National Conference on Trichinosis in 1952, and an amended recommendation of the 1954 Conference on Trichinosis (*1*) emphasized the continuing importance of data on the prevalence of this disease. The amended recommendation stated:

"Because of the advantages of having up-to-date information concerning the incidence of trichinosis in man, and in view of a decreased incidence of trichinous infection encountered in swine, the United States Public Health Service is requested to repeat the random survey of human trichinosis carried out by that agency between 1936 and 1941."

Even though the study here reported was conducted a decade ago, the data should be useful statistically since there are no published data on the incidence of trichinosis in either the human or porcine population of Kentucky.

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Individual reports of the investigation described have been submitted to the Graduate School of the University of Louisville in partial fulfillment of requirements for the degree of master of science. Dr. Kimsey's report, "The incidence of infestation with Trichinella spiralis as revealed by the examination of 570 diaphragms at the Louisville General Hospital, Louisville, Ky.," was submitted in 1943; Dr. Adams' report, "The incidence of Trichinella spiralis in the diaphragms of swine from the Louisville abattoirs," in 1942.

Materials and Methods

Using essentially the same methods, one author investigated the incidence of *Trichinella spiralis* in the diaphragms of humans and the other studied the incidence of the parasite in the diaphragms of swine.

Study of Human Diaphragms

The material used in the study of infestation of humans consisted of a series of diaphragms removed at routine autopsy at the Louisville General Hospital, Louisville, Ky. Except for the exclusion of diaphragms of children under

1 year of age, there was no conscious selection of subjects. The investigation was divided into two series and the results were interpreted and reported separately.

Series 1 consisted of 311 diaphragms placed directly in 10 percent formalin when removed from the body and later examined by a modification of the direct microscopic method employed by Nolan and Bozicevich (*2*). A gram of muscle from which tendinous material had been removed, taken at random from various parts of the diaphragm, was teased into pieces and firmly pressed between two glass plates. The positive findings were recorded in terms of trichinae per gram of diaphragm as revealed by the examination of the pressed preparation, using a wide-field microscope with a 12.5 ocular and a 1.7 objective.

Series 2 consisted of 259 diaphragms which were examined by both the direct microscopic and the digestion techniques. The diaphragms were removed at routine autopsy and kept in jars of fresh water at icebox temperature until time of examination. The specimens were then carefully dissected, and four 1-cm.-wide strips taken from different locations on the circumference of the diaphragm were cut parallel to the direction of the muscle fibers, care being taken to include the tendinous insertions. The strips were placed in 10 percent formalin, and all four were examined later by the direct microscopic method employed in series 1.

The digestion method used was a modification of the digestion-Baermann technique described by Queen (*3*) in 1931. The portion of the diaphragm that remained after the material for the direct microscopic examination had been removed was finely ground and digested by artificial gastric juice, which consisted of 0.5 percent hydrochloric acid and 0.7 percent commercial pepsin in an aqueous solution. A liter of this digestion material was added to approximately 50 gm. of the ground muscle, and the mixture was simultaneously agitated mechanically and incubated at 37° C. for a period of 12 hours. The mixture was allowed to settle for an equal period of time, and the sediment then was filtered through cheesecloth and later through a No. 3 Coors porcelain desiccator plate placed in a funnel. The sediment from this filtration was centrifuged and the deposit was poured into a Petri dish for microscopic study with a dissecting microscope with a 20-diameter magnification. There was no quantitative report as to the larvae per gram of digested diaphragm. The detection of larvae in any fraction of the centrifuged sediment constituted a positive finding.

Study of Swine Diaphragms

One thousand swine diaphragms were taken by random selection immediately prior to Government inspection of the viscera of the animals. These diaphragms were collected from 4 abattoirs over a period of 9 months in order to insure representative sampling of the swine slaughtered in the Louisville market.

Table 1. Human diaphragms positive for Trichinella spiralis by direct microscopic method only (series 1)

Serial No.	Age (years)	Sex	Race	Eosinophils in blood (percent)	Cysts per gram of diaphragm
1	16	M	W	0	1
2	59	M	N	2	1
3	29	F	N	N.D.	4
4	40	F	N	0	13
5	74	M	W	0	1
6	46	F	W	0	4
7	64	F	N	0	51
8	34	F	N	0	1
9	39	M	N	N.D.	2
10	67	M	W	0	1
11	57	M	N	0	2
12	55	M	N	N. D.	3
13	61	M	W	0	2
14	58	F	N	1	75
15	68	M	N	0	6
16	60	F	N	N. D.	4
17	39	F	N	0	4, 500
18	72	F	W	0	3
19	34	M	W	N. D.	1
20	40	M	W	N. D.	2
21	59	M	N	N. D.	2
22	71	M	W	N. D.	4
23	37	M	N	1	3
24	79	M	N	2	3
25	61	M	W	N. D.	1
26	30	M	N	0	2
27	60	M	N	N. D.	408
28	79	M	N	0	5
29	49	F	N	0	1
30	54	M	W	0	3
31	74	F	W	0	8
32	36	M	W	0	1
33	62	F	W	1	1
34	71	M	W	1	3
35 [1]					3

N. D. No blood count made.

[1] Tag lost, diaphragm saved.

The method of preservation of the swine diaphragms was the same as that employed for human diaphragms. The diaphragms were examined by both the direct microscopic and the digestion techniques. In the direct microscopic examination, the fascia was removed from the diaphragm, and one-half gram of muscle taken from various parts of the organ was cut into small thin strips and examined in the manner described for the human diaphragms.

The digestion method employed early in the study of the swine diaphragms was the previously described modification of the Baermann technique. All of the diaphragm that remained after the sample for the direct microscopic study had been removed was ground and digested in 3 liters of the artificial gastric juice for 24 hours at 37° C., with constant mechanical agitation. There was no other modification of the technique. However, after 107 diaphragms had been examined, the mass digestion procedure of Hood and Olsen (*4*) was adopted. The diaphragms were stripped of the tendon and fat and 10-gram portions from each of 10 or 20 diaphragms were digested together. The remainder of each diaphragm was retained so that the specimens might be examined individually if larvae were found in the mass digestion. One liter of artificial gastric juice was used to digest 50 gm. of diaphragm.

Results

Human Diaphragms

Series 1. Of the 311 human diaphragms examined by the direct microscopic method alone, 35 (11.2 percent) were found to contain *Trichinella spiralis*. The more important data concerning the group are shown in table 1.

The density of infestation varied from 1 cyst per gram to 4,500 cysts per gram of diaphragm.

The ages of the patients varied from 1 to 88 years. Of the 311 diaphragms examined, 99 (31.8 percent) were from persons less than 40 years of age at death; 188 (60.5 percent) were from persons dying at between 40 and 80 years of age; and 3 (0.9 percent) were from persons over 80 years of age. The ages of 21 individuals (6.8 percent) were unknown. These persons were dead upon arrival at the hospital—in most instances, coroner's cases—or they died before a history could be obtained.

The age distribution of the patients with *T. spiralis* infestation is shown in table 2. Of the 23 diaphragms of patients in the first two decades of life, only 1, that of a boy 16 years of age, showed presence of trichinae. Four percent of the group aged 20–29 years and 8.1 percent of the group aged 40–49 years revealed infestation with *T. spiralis*. In each of the other decades (through the seventh), the incidence of infestation was over 13 percent. The highest incidence (18.4 percent) fell in the group aged 70–79 years. The highest percentage (22.8) of the 35 positive cases fell in the group aged 60–69 years.

The incidence of trichinosis by race and sex of the patients is recorded in table 3. Of the 311 diaphragms examined, 184 were from males and 108, from females. The race and sex of 19 patients were not recorded. Twenty-two (11.9 percent) of the 184 males and 12 (11.1 percent) of the 108 females were infested with trichinae. One positive diaphragm was found among the 19 patients of unknown race and sex. Of the 292 persons whose race and sex were recorded, 171 were white, 14 (8.2 percent) being infested with trichinae. Twenty (16.5 percent) of the 121 Negro patients harbored encysted larvae. The highest incidence of in-

Table 2. Results of examination of human diaphragms for Trichinella spiralis by direct microscopic method only (series 1), by age distribution of patients

Age (years)	Number diaphragms examined	Positive		
		Number	Percent	Percent of total positives
1–9	11	0	0	0
10–19	12	1	8.3	2.9
20–29	25	1	4.0	2.9
30–39	51	7	13.7	20.0
40–49	49	4	8.1	11.4
50–59	45	6	13.3	17.1
60–69	56	8	14.2	22.8
70–79	38	7	18.4	20.0
80 and over	3	0	0	0
Unknown [1]	21	1	4.7	2.9
Total	311	35	11.2	100.0

[1] Tags lost, diaphragms saved.

festation (18.1 percent) occurred in Negro males; the lowest (7.5 percent), in white females. The white males showed an incidence of 8.4 percent; the Negro females, 14.5 percent.

Series 2. Of the 259 diaphragms examined by both the direct microscopic and digestion methods, 54 (20.8 percent) showed the presence of *T. spiralis*. Of these 54 positive cases, 13 (24.1 percent) were not detected by the digestion method and 7 (12.9 percent) were not revealed by the direct microscopic method. Thirty-four (63.0 percent) were positive by both methods. By the digestion method, 41 (15.8 percent) of the total diaphragms were positive; by the direct microscopic method, 47 (18.1 percent). Of the total positives, 75.9 percent were detected by the digestion method and 87.0 percent by the direct method.

The more important data concerning these positive cases are shown in table 4.

The density of infestation as determined by the direct microscopic method varied from 2 cysts per gram to 73 cysts per gram of diaphragm. Since the modified digestion-Baermann technique was not carried out quantitatively, it was assumed that if the direct microscopic test on a diaphragm failed to reveal any organisms and trichinae were found by the digestion technique, the diaphragm contained less than two cysts per gram.

The ages of the patients in this series varied from 1 to 86 years. Of the diaphragms examined, 70 (27.0 percent) were from persons less than 40 years of age; 174 (67.2 percent) were from persons dying between 40 and 80

Table 3. Incidence of Trichinella spiralis in human diaphragms examined by direct microscopic method only (series 1), by sex and race of patient

Sex and race	Number diaphragms examined	Infested	
		Number	Percent
Total	311	35	11.2
Male	184	22	11.9
White	118	10	8.4
Negro	66	12	18.1
Female	108	12	11.1
White	53	4	7.5
Negro	55	8	14.5
Unknown	19	1	5.2

Table 4. Human diaphragms positive for Trichinella spiralis by both the direct microscopic and modified digestion-Baermann methods (series 2)

Serial No.	Age	Sex	Race	Eosinophils in blood (percent)	Direct microscopic method (cysts per gram of diaphragm)	Modified digestion-Baermann method
1	60	F	N	0	15	Positive
2	68	F	N	N. D.	20	Do.
3	86	M	N	N. D.	8	Negative
4	59	M	N	2	4	Positive
5	68	F	N	0	70	Do.
6	66	M	N	0	5	Do.
7	44	F	N	0	10	Negative
8	53	M	W	0	2	Do.
9	37	M	W	0	2	Do.
10	57	F	W	0	4	Do.
11	55	F	W	0	2	Positive
12	49	F	W	0	2	Negative
13	66	M	W	1	4	Do.
14	54	M	W	2	0	Positive [1]
15	57	F	W	1	0	Do. [1]
16	64	M	N	0	4	Positive
17	67	M	W	1	34	Do.
18	44	F	W	3	4	Negative
19	45	F	N	2	10	Positive
20	40	M	W	0	38	Negative
21	45	F	N	0	0	Positive [1]
22	52	M	W	1	4	Positive
23	60	F	N	N. D.	4	Do.
24	70	M	N	N. D.	40	Do.
25	83	M	W	N. D.	4	Do.
26	82	F	W	0	6	Do.
27	65	M	N	0	2	Do.
28	29	F	W	0	10	Do.
29	51	M	W	4	0	Positive [1]
30	65	M	W	N. D.	4	Positive
31	73	F	W	0	73	Do.
32	71	M	W	0	3	Do.
33	67	F	W	0	2	Negative
34	72	F	N	0	4	Do.
35	56	M	W	N. D.	4	Positive
36	----	M	N	N. D.	0	Positive [1]
37	68	F	W	1	0	Do. [1]
38	73	M	W	0	8	Positive
39	67	M	W	1	3	Do.
40	57	F	W	0	6	Do.
41	34	M	W	3	2	Do.
42	67	M	W	N. D.	3	Do.
43	34	M	N	0	6	Do.
44	50	M	N	N. D.	7	Do.
45	47	M	N	1	0	Positive [1]
46	54	M	N	N. D.	14	Positive
47	32	M	W	0	14	Negative
48	37	F	N	0	2	Do.
49	17	M	W	0	5	Positive
50	30	M	N	0	3	Do.
51	26	F	W	0	10	Do.
52	76	F	W	0	21	Do.
53	75	M	N	N. D.	32	Do.
54 [2]	----	----	----	----	11	Do.

N. D. = No blood count made.

[1] Less than 2 cysts per gram. [2] Tag lost, diaphragm saved.

years of age; and 6 (2.3 percent) were from persons over 80 years of age. The ages of 9 individuals (3.5 percent of the 259) are unknown. They were dead upon arrival at the hospital or died before a history could be obtained.

The ages of patients in this series are shown by decades in table 5. Only 1 diaphragm of the 25 examined from persons in the first two decades of life contained trichinae. This was a diaphragm of a white male 17 years of age. In the other seven decades of life the lowest percentage of positives was 13.3 percent, in the 20–29-year age group. Fifty percent, 3 of the 6 cases in the 80–89-year age group were positive. Of the 54 positive cases, the highest incidence (25.9 percent) was in the 60–69-year age group.

Table 5. Results of examination of human diaphragms for Trichinella spiralis by both direct microscopic and modified digestion-Baermann methods (series 2), by age distribution of patients

Age (years)	Number diaphragms examined	Positive		
		Number	Percent	Percent of total positives
1–9	13	0	0	0
10–19	12	1	8.3	1.8
20–29	15	2	13.3	3.7
30–39	30	6	20.0	11.1
40–49	40	7	17.5	13.0
50–59	53	12	22.6	22.2
60–69	51	14	27.4	25.9
70–79	30	7	23.3	13.0
80 and over	6	3	50.0	5.6
Unknown [1]	9	2	22.2	3.7
Total	259	54	20.8	100.0

[1] Tags lost, diaphragms saved.

The incidence of trichinae by sex and race of the patient is recorded in table 6. Of the 259 cases examined, 182 were males and 72, females. The sex and race of 5 patients were not recorded. Of the 182 males examined, 31 (17.0 percent) were infested with trichinae. Twenty-two (30.5 percent) of the 72 females were found to be parasitized. One positive diaphragm occurred among the five patients of unknown sex and race. Of the 254 persons whose sex and race were recorded, 154 were white, and 31 (20.1 percent) of these were infested with *T. spiralis*.

Twenty-two percent of the 100 Negro patients harbored encysted trichinae. The highest incidence (33.3 percent) occurred in white females; the lowest incidence (15.6 percent), in white males. The Negro males showed an incidence of 19.4 percent and the Negro females, 27.2 percent.

A differential blood count was performed in 24 of the 35 patients whose diaphragms were examined in series 1 (table 1). Of these 24 patients, only 6 showed eosinophils, the greatest number in any patient being 2.0 percent of the total count. Of the 41 patients in series 2 whose diaphragms contained trichinae and upon whom a differential blood count was made, only 13 were found to have eosinophils. The highest incidence was 4.0 percent. There were no eosinophils in 28 of the 41 patients.

Swine Diaphragms

Of the 1,000 swine diaphragms examined, only 2 were found to contain trichinae by the digestion method and 1, by the direct microscopic method. The one specimen found positive by direct examination was also positive by digestion. Thus, the incidence of infestation in the group studied was 0.2 percent.

Discussion

The human diaphragms used in this study were removed at routine autopsy at the Louis-

Table 6. Incidence of Trichinella spiralis in human diaphragms examined by both direct microscopic and modified digestion-Baermann methods (series 2), by sex and race of patient

Sex and race	Number diaphragms examined	Infested	
		Number	Percent
Total	259	54	20.8
Male	182	31	17.0
White	115	18	15.6
Negro	67	13	19.4
Female	72	22	30.5
White	39	13	33.3
Negro	33	9	27.2
Unknown	5	1	20.0

ville General Hospital, Louisville, Ky. Aside from the exclusion of children under 1 year of age, there was no selection of specimens by age, sex, race, occupation, or clinical history of the patients. The presence of the organism was not suspected clinically in any of the 89 individuals who harbored cysts. Several patients gave vague histories of rheumatism or "growing pains" but these symptoms could well be attributed to some condition other than infestation with trichinae. Schwartz (*5*) explains in his article on the occurrence, significance, and control of trichinosis that the presence of trichinae in the diaphragm at autopsy does not mean that the person necessarily had previously existing clinical trichinosis. Those persons with relatively few trichinae per gram of diaphragm probably experienced little, if any, inconvenience, and their medical histories would not suggest the symptoms characteristic of the clinical entity called trichinosis. Schwartz states that these light infections have only zoölogical significance, and the surveys demonstrate that trichinae is consumed in pork eaten by the public and that many Americans eat insufficiently cooked or inadequately cured pork.

By the direct microscopic method, 35 (11.2 percent) of the 311 diaphragms of series 1 were found to contain *T. spiralis*, and 47 (18.1 percent) of the 259 diaphragms of series 2 were positive. When subjected to statistical analysis, however, the difference in incidence of trichinae in the two series was insignificant.

There was a marked difference in the incidence of infestation with trichinae in the human diaphragms as determined by the direct microscopic examination in series 1 and that detected by the combination of the direct microscopic and the modified digestion-Baermann methods in series 2. This discrepancy between results of the direct microscopic method and the digestion method is to be expected from the work of Hall and Collins (*6*), who found that either method alone failed to detect trichinae in a certain number of cases. This fact has been supported by the findings of Nolan and Bozicevich (*2*), who stated that the microscopic method failed in a number of cases of light infestation. Conversely, the digestion method was reliable in detecting even very light infestations, although it was valueless in detecting dead trichinae.

The 20.8 percent of human infestation with trichinae as determined by the combined direct microscopic and modified digestion-Baermann tests is rather high for this area of the country. The southern States have, according to other investigators, a much lower incidence of trichinosis than that reported in other geographic sections of the United States. Hinman (*7*) in 1936 reported that 7 (3.5 percent) of 200 diaphragms from human autopsies at the Charity Hospital, New Orleans, La., were positive for trichinae when examined by the digestion method.

Sawitz (*8*), in a study of 200 autopsies from the Touro Infirmary and Charity Hospital, New Orleans, found that 5.0 percent contained *T. spiralis*. The diaphragms and pectoral muscles were examined by the compression and digestion methods. Two years later, in 1939, Sawitz (*9*) published an article on the incidence of trichinosis in man, dogs, and cats in the New Orleans area. In addition to the 200 cases just described, his study included material from 200 unselected routine autopsies of patients from the same institutions. Essentially, the same methods of examination were employed. Of the 400 cases, larvae of *T. spiralis* were found in 24, an incidence of 6.0 percent in the human population of the New Orleans area.

Meleney (*10*), in 1941, reported that among 209 human diaphragms from persons who died at the Vanderbilt University Hospital and the Nashville General Hospital, in Nashville, Tenn., 10 percent were positive for *T. spiralis* when examined by the combined digestion and microscopic press methods. However, in a preliminary report on the incidence of trichinosis in Alabama, Walker and Breckenridge (*11*) in 1938 reported that they had examined the diaphragm, intercostal, pectoral, and rectus abdominis muscles from 100 patients at autopsy by the digestion and press methods and found an incidence of 33 percent.

In 1943, the results of a very extensive survey of the incidence of *T. spiralis* in the population of the United States were published by Wright, Kerr, and Jacobs (*12*). Diaphragms were examined from a total of 5,313 individuals coming

to necropsy in 189 hospitals located in 114 cities in 37 States and the District of Columbia. These diaphragms were examined by both the direct microscopic and the digestion-Baermann methods. Of these 5,313 diaphragms, 855 (16.1 percent) were positive for *T. spiralis*. Omitting results of examination in a series of 200 diaphragms from persons of Jewish faith, of which only one was positive, the representative cases totaled 5,113, of which 854 (16.7 percent) were positive. Several papers in the series contained summaries of the finding of trichinae in surveys conducted by other investigators already referred to in this article. Although no statistics were given for Kentucky, the State was included in the East South Central group with Tennessee, Alabama, and Mississippi. Of the total 5,313 diaphragms examined, 85 were from this area and 15 (17.6 percent) of these were positive for trichinae. However, the interpretation was to the effect that, on the basis of this small number of cases, conclusions could not be drawn as to the probable incidence of human infection with trichinae in these areas.

Even though trichinosis has been a reportable disease in Louisville since 1917, an examination of the Louisville and Jefferson County Health Department records for the past 20 years failed to disclose a single case.

The low incidence of trichinosis in the south is explained by the fact that the majority of hogs in that area are peanut or grain fed, whereas many of those in more densely populated sections of the country are garbage fed. Hall (*13*) stated that the incidence of trichinae in swine is approximately as follows: Pasture-raised swine, mostly in the midwest, are free or practically free from trichinae. The so-called grain-fed swine in the midwest are in reality a mixture of some pasture-raised and some garbage-fed swine, and the mixture has an average infestation of about 1.5 percent. Southern swine have an average infestation of less than 1 percent. Garbage-fed hogs, which are more numerous along the southern part of the Pacific coast and the northern part of the Atlantic coast, have an average incidence of about 5 percent. The last group, which has practically disappeared, is the offal-fed hog, which has the highest incidence of infestation, about 18 percent.

The swine examined in the present study would be classified by Hall and others as grain fed, for, although the exact feeding could not be determined precisely, these swine were raised in a section of the country in which grain feeding predominates and were purchased for slaughter in the belief that they had been grain fed. It is estimated that approximately 50 percent of the swine were raised within a 100-mile radius of Louisville and that the remaining 50 percent were predominantly from north central Indiana and Illinois. The 0.2 percent infestation found in these swine is lower than the average given by Hall. However, similarly low incidences have been found in some other surveys. For example, Kerr (*14*) found 3 cases of infestation in a group of 566 grain-fed swine examined, and Cameron (*15*) in 1940 reported 2 positives in a group of 995 swine examined in Canada. It is evident that with such a small number of positives a difference of several tenths of 1 percent is not significant.

In 1953, Schwartz (*5*) reported a survey conducted over a 3-year period in which the diaphragms of 3,031 hogs from the midwest (Corn Belt hogs) were examined by the digestion method and 19 (0.63 percent) were found to harbor trichinae. The direct microscopic examination of small samples from a fairly large proportion of these diaphragms gave consistently negative results. The maximum number of parasites recovered from any diaphragm was between 7 and 8 per gram, most containing only 5 trichinae per 1,000 grams to 2 trichinae per gram. A parallel study of garbage-fed hogs carried out during the same period on 1,328 diaphragms revealed 149 (11.21 percent) infected with trichinae when the digestion method was used. Sixty-four (4.81 percent) of the diaphragms were found to be infected when examined by the direct microscopic method alone, and counts by the artificial digestion method were 100 or more parasites per gram of tissue. In 1 case there were 2,741 parasites per gram of tissue.

The greater part of the pork consumed by the people of Louisville is from hogs that have been slaughtered in the local abattoirs. Louisville maintains meat inspection and slaughterhouse ordinances, and no meat is placed on the local market until it has been inspected and

passed by a duly authorized inspector of the United States Government or by an authorized inspector of the Louisville and Jefferson County Health Department. However, the routine inspection does not include an examination for trichina larvae.

To be able to draw a comparison between the incidence of trichinosis in humans and in swine in the Louisville area as shown by this study, it becomes necessary to consider those factors which can account for the difference between 0.2 percent infestation in swine and 20.8 percent infestation in humans. First, it is possible that the high incidence of trichinous infestation in patients in the Louisville General Hospital may not be representative of the population as a whole. A large percentage of these patients are charity cases and their economic and social status tends to be low. Pork, particularly sausage, probably was a common item of the diet since it is usually less expensive than other meat. It is possible that some of these patients consumed large quantities of so-called country sausage. Second, records of these patients with respect to period of residency in the city are incomplete, and it is reasonable to suppose that a large portion of the life of at least some of them was spent in other localities. Third, one infected hog can be the source of disease for a large number of persons, and, by the same token, during a lifetime the average individual consumes meat from an extremely large number of hogs.

Peres (*16*) in 1942 reported the data from surveys conducted by different investigators almost simultaneously engaged in the study of the incidence of *T. spiralis* in the human and porcine population of the New Orleans area. The incidence in both the human and porcine populations was lower than that found in this study, but Peres likewise found a sharp difference between the incidence of trichinae in the two groups. He used the statistics of Hinman (*7*) and Sawitz (*9*) for the incidence of trichinae in man. Studying 2 square inches of diaphragm from each of 200 autopsies, Hinman found an incidence of trichinae of 3.5 percent. Sawitz, using larger samples and examining diaphragms obtained from 400 autopsies, found the incidence to be 6 percent. Peres during 1938 and 1939 examined the diaphragms of 516 southern hogs and the loins of 399 midwestern hogs for the presence of *T. spiralis* in the artificially digested material. None was found infected with trichinae. Likewise, none of 50 samples of sausage from local butchers revealed infection. Pork consumed in the New Orleans area comes from hogs that are raised in the south (Louisiana, Mississsippi, and Alabama), hogs that are raised on the outskirts of the city, and those that are raised in the midwest. Those hogs from the outskirts are raised mostly on garbage; those from the other parts of the south are allowed to roam the fields and to feed on peanuts; and those from the midwest are raised largely on grain. About four-fifths of the hogs consumed in the New Orleans area are from the midwest. Certainly, the low incidence agrees with the low infection rate in man in the New Orleans area, as contrasted with other areas of the United States.

Summary

The direct microscopic examination of 311 human diaphragms from routine autopsies at the Louisville General Hospital, Louisville, Ky., revealed an 11.2 percent incidence of *Trichinella spiralis*. A second series of examinations, using both the direct microscopic method and a modification of the digestion-Baermann methods, detected an incidence of 20.8 percent in the 259 human diaphragms studied. No selection of material was made, except that the diaphragms of all children under 1 year of age were excluded.

No conclusion could be drawn statistically as to the difference in incidence of infestation with *T. spiralis* by race, sex, or age because of the limited number of patients in each category.

The incidence of human infestation with trichinae in Louisville is somewhat higher than that reported by other investigators in studies of human diaphragms taken at autopsy in various other cities in the southern part of the United States. However, there is no statistically significant difference between the incidence of *T. spiralis* reported in this study and that found by Wright in either the human population of the United States as a whole or in that section designated by him as the East

South Central group of States to which Kentucky belongs.

In the examination of 1,000 diaphragms collected from swine slaughtered in Louisville abattoirs, 2 were found infested with trichinae by a modification of the digestion-Baermann method and one of these was also found infested by the direct microscopic method, an incidence of 0.2 percent. Although the exact type of feed is unknown, these swine may be classified as grain fed in conformity with the method used by Hall and others of classifying swine according to the type of feeding most prevalent in the section of the country in which the swine were raised. The incidence reported here is lower than the estimated average of 1.5 percent for the United States, but many other investigators have reported similarly low degrees of infestation.

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