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A Comparative Study of the Incidence of Intestinal Parasites of Children in Des Moines, Iowa

By BARRON M. F. PALMER

In the fall of 1950 the author undertook a study of the incidence of intestinal parasites of children in Des Moines. Specimens were collected on the basis of daily admissions to the pediatric section of the Iowa Methodist Hospital and Broadlawns General Hospital and to the Des Moines Veterans Hospital. In the two former hospitals the specimens were all collected from children less than one year to sixteen years old, while in the Veterans' Hospital the specimens were all from adults above sixteen years old. Since these patients were not admitted to hospital for any gastro-intestinal disturbance it was assumed that they would constitute an unbiased sample of the Des Moines population, of their age group, and their neighborhood. This latter group from the Veterans hospital was included to permit the comparison of the fauna of Des Moines children with that of individuals most of whom have been abroad in various endemic areas.

The Alli Flootation-Sedimentation method was used throughout the study. It differs from the Craig and Faust method in the following respects:

1. A larger amount of specimen is used.
2. Saline (Alli) is used in place of luke warm water (Craig and Faust).
3. More of the suspension is used for the centrifugation.
4. After the Zinc sulphate solution is added no further centrifugation is done (Alli).
5. Instead of loopfuls of material used (Craig and Faust) only that which adheres to the cover glass is used.
6. A sedimentation wash method is used in addition to the Flootation method (Alli).

The summary of the results are as follows:

Table 1

Incidence of Intestinal Parasites in 123 Children Less Than 1 Year Old.
Des Moines, Iowa, 1951.

Name of Parasite	Number Infected	Per cent Infection
Endamoeba coli	4	3.2
Giardia lamblia	1	0.9
Total	5	4.1

Table 2

Incidence of Intestinal Parasites in 165 Children 1 to 6 Years Old.
Des Moines, Iowa, 1951.

Name of Parasite	Number Infected	Per cent Infection
Endamoeba coli	5	3.0
Endamoeba histolytica	2	1.2
Endolimax nana	1	0.6
Giardia lamblia	2	1.2
Enterobius vermicularis	3	1.8
Total	13	7.8

Table 3

Incidence of Intestinal Parasites in 52 Children 7 to 11 Years Old.
Des Moines, Iowa, 1951.

Name of Parasite	Number Infected	Per cent Infection
Endamoeba coli	2	3.9
Enterobius vermicularis	2	3.9
Dientamoeba fragilis	1	1.9
Total	5	9.7

Table 4

Incidence of Intestinal Parasites in 30 Children 12 to 15 Years Old.
Des Moines, Iowa, 1951.

Name of Parasite	Number Infected	Per cent Infection
Endamoeba coli	2	6.7
Endamoeba histolytica	2	6.7
Enterobius vermicularis	1	3.3
Iodamoeba williamsi	1	3.3
Total	6	20.0

Table 5

Incidence of Intestinal Parasites in 132 Adults Over 16 Years Old.
Des Moines, Iowa, 1951.

Name of Parasite	Number Infected	Per cent Infection
Endamoeba coli	11	8.3
Endamoeba histolytica	6	4.5
Endolimax nana	1	0.8
Chilomastix mesnili	1	0.8
Giardia lamblia	4	3.0
Hymenolepis nana	1	0.8
Trichuris trichuria	2	1.5
Enterobius vermicularis	3	2.3
Necator americanus	4	3.0
Total	33	25.0

The overall finding of 20% infection for *Endamoeba coli*, *Endamoeba histolytica*, *Enterobius vermicularis*, and *Iodamoeba williamsi* compares favorably with 22.2% found in a similar survey conducted on Freshman students at Purdue University by Headlee and Hopp in 1943, although the percentage difference of *Endamoeba coli* and *Endamoeba histolytica* in the Purdue survey is quite different than that found in the Des Moines area. As 20% of the oldest Des Moines children were infected it may be supposed that the infection rate is about the same in both states. The common species recovered were present in about the same per cent of cases. *Dientamoeba fragilis* was found in the Iowa survey and not in the Indiana survey, and *Iodamoeba williamsi*, *Chilomasti mesnili*, and *Necator americanus* found in the Indiana survey but not in Des Moines were all relatively rare in Indiana also. Had larger samples been taken it is probable that the same species might have been found in both states. *Ascaris* is lacking from the Indiana group as from the Iowa group. Apparently, it is becoming relatively uncommon in the midwest agricultural area. The most striking difference between the two sets of data is the scarcity of *Endolimax nana* in the Iowa samples. Of the total number examined in the survey, 193 or 95.1% were in the 16 to 20 year old group. 8 were 21 to 25 years of age and 2 were above 25 years. From this survey, the one now under review, and other similar surveys it is evident that during the childhood years the number of infected individuals gradually increase. The number of new infections is at a maximum during this part of the life span. Eventually a point of maximum infection is reached at which time there is a balance between cured infections and new infections. The cure may be effected by drugs or treatment but in most cases cure must be spontaneous, since most of these infections do not result in clinical symptoms.

The city of Des Moines was divided into ten sections as shown in Fig. 1. Sanitation and economic factors are involved in explaining the results of this survey. Of the children examined in this area, those from the eastern sector of the city where sanitation and general living conditions are inferior, on the whole, to that of the other sectors, show the greatest percentage of infection. The same is true of the southern sector as compared with that of either the west or north where living conditions are, on the whole, most satisfactory. In so far as the material examined represents a random sample from the children of Des Moines it would appear that the most heavily infested areas were those located in industrial sections and perhaps nearer the river. It is noteworthy, however, that proximity to the

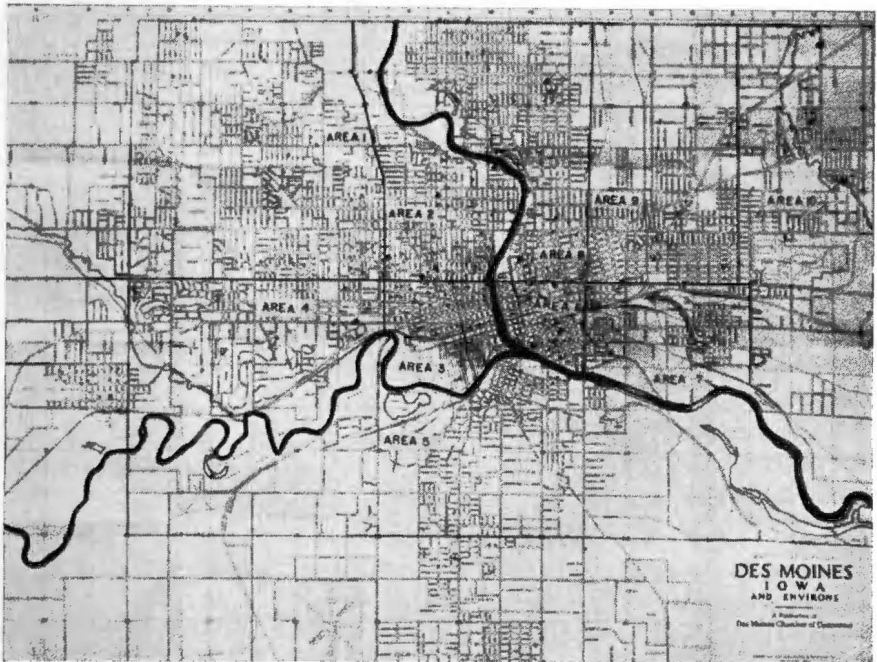


Figure 1.

river, if in the "better" part of town, is apparently not accompanied by an increase rate of infection. Looking at areas 3, 4, 7, 8, and 10 it is observed that infection is by no means uniform with regards to geographic location. This, however, can be easily explained if one is familiar with housing conditions of Des Moines. In some of the poorer areas there are many excellent houses and one occasionally sees small run down areas in the regions where housing is predominantly good.

It is interesting to see that within the limits of a typical midwestern city the parasitic fauna of the intestines is by no means uniform. There are apparently areas of higher parasitic concentration and areas in which few are to be found, which, in the present study, appear to be correlated with income and general living conditions. Superimposed on this spacial pattern of differing parasite densities, there is apparently an infection gradient, low in infants, and rising to a plateau during early adulthood.

SUMMARY

This survey was undertaken in an effort to study the incidence of intestinal parasites in Des Moines children in relation to their residence in the city. The following conclusion was reached:

1. Intestinal parasites are probably to be found everywhere in this area.
2. The distribution within the city limits of Des Moines is not uniform despite the general climatic condition to which all are similarly exposed.
3. Although the river may influence the pattern of distribution, and there is some evidence of a concentration of parasites in areas near the river the influence of economic status appears to be more important.
4. Superimposed on a distributional gradient resulting from topography and economic status, there is a variation in the incidence of parasites related to the age of the host.
5. Among the children below one year of age, 2.4% were found to harbor intestinal parasites. In the group age 1 year to 6 years, there was an infection rate of 7.8 per cent. In the group 6 to 11 years old, the infection rate was 9.5 per cent. In the group 11 to 16 years old, there was an infection rate of 20 per cent. In the oldest group, age 16 years and over, the infection rate was 25 per cent.

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