PERSISTENCE OF THE ENDEMIC INTESTINAL PARASITOSES IN LATIN AMERICA[1]

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The major intestinal parasitoses of Latin America have been endemic there for many years and are an important index of fecal contamination. Their current prevalence in many regions is similar to that of 50 years ago. This article examines the extent, causes, consequences, and chances for resolution of this problem.

Introduction

We are concerned in this article with six intestinal parasitoses—the four main soil-transmitted helminthiases (ascariasis, trichuriasis, hookworm infection, and strongyloidiasis) and the two leading intestinal protozoan infections (amebiasis and giardiasis). These two groups of parasitoses depend on fecal contamination, but there is a significant epidemiologic difference between them. That is, the principal mechanisms for disseminating the four helminthiases involve fecal contamination of the soil and poor environmental sanitation; in contrast, dissemination of the protozooses results largely from poor personal hygiene, the infection being transmitted primarily from person to person via contaminated food, water, or hands.

In view of the fact that the intestinal parasitoses are closely linked with underdevelopment and poverty, and since underdevelopment and poverty have diminished little if any over the years among vast portions of the Latin American population, this article is dedicated to examining the connections linking these high levels of intestinal parasitism to the low standards of living prevailing among many of the people of our countries.

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The Problem

Over the past half-century, surveys of the prevalence of intestinal parasitism have been prepared and published in many Latin American countries; and although the groups studied and the methodologies adopted are not strictly comparable, the data obtained provide a basis for a general evaluation of the prevalence of intestinal parasitism in different periods. Therefore, it seems appropriate to review a number of surveys based on fecal examinations that have been made in various Latin American countries, countries whose situation can be regarded as illustrative of that found in the area as a whole.

Brazil

In 1968, according to the review by Camilo-Coura *(1)*, a total of some 2 million coprologic examinations performed by Brazil's National Department of Rural Endemic Diseases encountered prevalences of 63 per cent for *Ascaris*, 39 per cent for *Trichuris*, 28 per cent for hookworms, and 2.4 per cent for *Strongyloides*. In addition, working at the Medical School of the Federal University of Rio de Janeiro, the same author examined data obtained from 13,000 patients between 1960 and 1969. The results obtained were similar to those indicated above for *Trichuris*, higher for *Strongyloides*, and lower for the other two parasites. Over the course of this ten-year examination period, no significant reductions were

noted in the prevalences of these geohelminthic infections. Various studies made in Brazil 10, 20, and 30 years earlier had found prevalences of parasitism very similar to those found in 1968—indicating that, in the rural areas at least, there was no notable improvement over the three-decade period.

In 1950 Coutinho and Silvany Filho *(2)* published the results of a study of 500 patients of all ages made in Salvador (Bahia). This showed prevalences of 76 per cent for *Trichuris,* 72 per cent for *Ascaris,* 57 per cent for hookworms, 13 per cent for *Strongyloides,* 12 per cent for *Entamoeba histolytica,* and 3 per cent for *Giardia.*

Nine years later Ramos-Oliveira *(3)* made a study of 812 students in Manaus and obtained results very similar to those of the Bahia study. During the same period Moraes *(4)* undertook a survey in a small rural village of Amazonas, and the prevalences found were even higher. Specifically, the author found prevalences of helminthiases over 10 per cent higher than those reported in the two Bahia studies, and also found prevalences of amebiasis and giardiasis approximately twice as high as those cited in the other studies.

More recently, Marzochi and Carvalheiro *(5-7)* published the results of studies on the factors affecting the dissemination of intestinal parasites. They concluded that inadequate environmental conditions existed in the periurban region of Ribeirao Prêto (São Paulo) resulting in contamination of irrigation water, soil, and vegetables with infectious forms of geohelminths and cysts of pathogenic protozoa. It was confirmed that these parasitoses were common among populations with low sanitary standards and socioeconomic levels. This was especially true of the helminthiases, which showed a prevalence of nearly 30 per cent among 37 people of all ages living close to the city. On the other hand, it was also found that the highest prevalences of the protozooses occurred among rural dwellers with higher standards of living who consumed large quantities of locally-grown vegetables. In 1975 Marzochi and Chieffi *(8)* studied the prevalence of hookworm infection in the periurban and rural region surrounding the municipality of Londrina (Paraná); they found that 30 per cent of the study population was infected. This was the same prevalence found 10 years earlier in studies made by the National Department of Rural Endemic Diseases *(9).*

The ample statistics provided by Baruzzi and Coutinho *(9)* on the frequency of geohelminth and protozoan infections in Brazil's different geographic regions at various periods show that the problem has existed for many years and still persists in those areas that have not achieved the large cities' development levels. Similarly, the studies assessed by Pessoa *(10)* demonstrate that these infections are very common and intimately related to environmental, educational, and economic deficiencies. Prevalences based on statistics going back 40 and 50 years, in the case of both amebiasis and the soil-transmitted helminthiases, do not differ greatly from those of the recent studies cited.

Chile

Turning to a temperate country, the problem of intestinal parasitism has been a major one in Chile for many years and continues to be so. Studies performed by Neghme and Silva *(11)* between 1948 and 1954, based on coprologic examination of over 17,000 subjects, showed that in some regions over half the population was infected with *Ascaris* and *Trichuris.* In the country's central region some 18 per cent of the population was infected with *E. histolytica,* and a sample of 3,902 schoolchildren showed even higher figures for intestinal protozoan infections.

Twenty years later (in 1971 and 1972) Torres et al. *(12)* made a survey of schoolchildren in Valdivia. They found the following prevalences: 48 per cent for *Trichuris,* 37 per cent for *Ascaris,* and 28 per cent for *Giardia.* In 1978—some 30 years after Neghme's studies—Schenone and Villarroel *(13)* made a survey of children from orphanages in Santiago. They found very high levels of intestinal

parasitism, the recorded prevalences being 54 per cent for *E. histolytica,* 50 per cent for *Giardia,* and 21 per cent for *Trichuris.* The magnitude of these latter figures can be explained in part by the fact that the children came from economically deprived families.

Costa Rica

Hunter et al. *(14)* made a survey of three rural Costa Rican communities in 1964. They found that over 95 per cent of those examined had intestinal parasites—principally *Trichuris,* which infected 73 per cent. Prevalences of other parasites were *Ascaris,* 42 per cent; *E. histolytica,* 41 per cent; hookworm, 33 per cent; and *Giardia,* 22 per cent. During the same period another survey made by Kotcher et al. *(15)* produced similar results, leading to the conclusion that these parasitoses were very common in Costa Rica.

Comparison of these figures with those from studies made in 1975-1977 shows there was little abatement of *Trichuris* and *Strongyloides* infections, but that there had been a substantial drop in the prevalences of *Ascaris* and hookworms. This can be attributed mainly to extensive use of antihelmintics effective against the latter parasites but not against the other two forms.

Venezuela

Benarroch *(16)* compared the intestinal helminthiases detected in Venezuela between 1947 and 1961 with those found between 1926 and 1929. He found, among other things, that there had been a general abatement of hookworm infection, which was attributed to increased living standards derived from the oil boom. However, he found no significant changes in the prevalences of *Ascaris* and *Trichuris* infections, both of which remained around 50 per cent.

At the Fifth Venezuelan Public Health Congress in 1976 *(17)* an assessment was made of the status of intestinal parasitism. The conclusions were hardly encouraging, because the figures presented had changed little in 40 years. It was observed that three-quarters or more of the rural population was infected with intestinal worms, principally *Trichuris, Ascaris,* and hookworms.

Colombia

The situation in Colombia is not very different from those already described. Patiño-Camargo *(18),* reviewing studies made between 1920 and 1935, found prevalences ranging from 63 to 94 per cent for *Trichuris, Ascaris,* and hookworm. However, this account and another by Osorno-Mesa *(19)* note that since the early years of this century there has been especially great interest in hookworm infection (as compared to other helminthiases) because of the medical importance of tropical anemia. In 1909 the Colombian National Academy of Medicine recognized the seriousness of this disease, published information on the nature of the infection and its control, and laid some of the groundwork for establishment (in 1920) of the Uncinariasis Department attached to the Ministry of Agriculture; this department worked with the Rockefeller Foundation in a campaign against hookworm.

Initial hookworm prevalence studies examined over 500,000 people in affected areas. Positive results indicating infection were obtained in 78 per cent of the cases.

The ensuing antihookworm campaign was intense, well-organized, and amply funded. Mass treatment was provided for over 1.5 million people, who received over 3 million doses of antihelmintic drugs. Extensive publicity and instruction was provided, latrines were built, and steps were taken to improve environmental sanitation.

This program continued for 15 years. Thereafter, however, the Rockefeller Foundation focused its attentions on yellow fever, and the hookworm campaign soon came to an end. Its positive results were ephemeral. The recommendations made were soon forgotten;

a new generation grew up uninstructed about proper hygiene; the latrines fell into disrepair; and antihelmintic treatments were no longer provided. As a result of all this, the situation rapidly reverted to what it had been prior to the campaign. We find today, 50 years afterward, that rural living conditions have changed little and that the prevalence of parasitism is about the same as it was before.

A 1965 study by Faust, García-Laverde, and Botero *(20)* found that hookworms infected about half the population in rural and suburban areas, while *Ascaris* and *Trichuris,* respectively, were present in 60 and 80 per cent of those examined. In addition, a Cali study by Faust and González-Mugaburu *(21)* involving a four-year follow-up of 233 families in a poor district of that city found that high levels of intestinal parasitosis did not decline during the four-year period, despite health education programs undertaken in those years.

The National Investigation of Morbidity carried out in Colombia between 1965 and 1966 *(22)* demonstrated the existence of pathogenic parasites in 80 per cent of the population. Nearly half the people involved were infected by *Ascaris* and *Trichuris,* and a quarter were positive for hookworms and *E. histolytica.* These figures, based on a study covering all social and economic groups, must be regarded as profoundly disturbing.

The three forementioned Colombian studies, which cover the 1960s and which are consistent with concurrent and later studies by the Parasitology Department of the University of Antioquia *(23, 24, 25),* show that the parasitoses resulting from fecal contamination continue to persist at very high levels in Colombia, and that the situation is tending to deteriorate in periurban areas as a result of overcrowding. The prevalence of hookworm infection in endemic areas is as high as it was 50 years ago, and in many population groups studied the prevalences of *Ascaris, Trichuris,* and pathogenic protozoan infections have shown no tendency to decline.

The Causes of Infection

Intestinal parasitoses are communicated through human feces. Contaminated soil is the principal vehicle for transmitting the helminths, while contaminated food, water, or hands are the vehicles most frequently transmitting the protozoa. The main patterns of human behavior that promote transmission of these parasitoses can be described briefly as follows:

- *Defecation on the ground.* Many rural and periurban dwellings lack any sanitary facilities, and their residents are obliged to defecate on the ground. This means that in marginal districts, where primitive dwellings lack sewerage and the residents' economic resources are minimal, contamination of the soil with feces is a general practice. Campaigns to build latrines have not always been successful, as a result of indifference to their use and ignorance of the potential benefits involved.
- *Soil contamination by rural workers.* Even assuming that dwellings are provided with latrines, rural laborers working away from them must necessarily defecate on the ground. A lack of water at many workplaces makes it difficult even to wash the hands; and contamination of hands with infected soil commonly leads to oral ingestion of parasites. The widespread custom of going without shoes in rural areas also contributes to high prevalences of parasitism by permitting entry of helminths through the skin.
- *Inadequate education.* Lack of knowledge about parasite transmission and communicable disease prevention is widespread among much of the Latin American population. The high levels of illiteracy prevailing in rural areas testify to the utter lack of even minimal cultural and educational levels.
- *Other behavior patterns.* Even where the foregoing deficiencies do not exist, intestinal parasitoses may appear as a result of things that are harder to control—such as contamination of food and water or direct transmission

of parasites on the hands of infected people. Food handlers play an important role in this common type of disease transmission.

Considering these various factors, it seems evident that the causes of intestinal parasitism are more socioeconomic than medical. Poor housing, unregulated rural working conditions, lack of education, and fecal contamination of the soil, water, and food are all distinguishing features of underdevelopment.

Disease Effects

Although a substantial number of intestinal parasite cases are asymptomatic, it is also true that symptoms are often present and that the infections prompt a large share of the medical consultations in endemic areas. The costs entailed in supplying medical care and drugs to parasitized people are considerable, and are generally higher than those required to treat many other kinds of diseases.

Also, inability to work and reduced working efficiency are important consequences of parasitic infections, consequences ultimately reflected in financial losses to the worker's country and family. Such consequences assume particular importance when we recall that agriculture provides the major source of income for a number of Latin American countries. To cite one example, hookworm infection is a significant debilitating disease—detrimental to the rural worker, his family, and the national economy—in countries where coffee and other tropical crops are an important source of exports.

A number of studies have sought to estimate the expenses ascribable to the intestinal parasitoses. Biagi in Mexico *(26, 27)* examined losses attributable to absence from work, reduced productivity, poor scholastic performance, the cost of medical and paramedical services and drugs, and expenses occasioned by the death of some patients. After estimating the total cost, he related this to weekly family earnings and found that 54 per cent of the families involved suffered annual losses equivalent to seven weeks' earnings.

Díaz-Gómez *(28)* studied the economic repercussions of intestinal parasitism in Colombia. He concluded that this health problem was the most serious in the country on the basis of four considerations: (1) intestinal parasitism is an important type of disease within the broader category of gastrointestinal diseases and colitis, which in turn is a major cause of death; (2) intestinal helminthiases are among the 10 leading causes of illness; (3) morbidity studies made in Colombia between 1965 and 1967 have revealed high rates of parasitism and correspondingly high frequencies of disease and hospitalization; (4) 3 per cent of all disability costs are attributable to intestinal parasitism, and to these must be added the costs of medical care—as well as the costs of reduced efficiency (arising from residual disability) and premature death.

Obviously, the economic costs pointed out by these two studies cannot be regarded as the sole harmful consequences involved. The suffering and death caused by the intestinal parasitoses, as well as their interference with proper nutrition, physical growth, and mental development, represent consequences of importance that cannot be assessed merely in monetary terms.

Possible Solutions

Considering the many factors favoring their transmission, eradication of these intestinal parasites is a complex task. Even in the world's most highly developed countries, where control campaigns have operated continuously and have been accompanied by high levels of socioeconomic development, it has not been possible to completely eliminate the problem. Nevertheless, in many places it has been possible to reduce the problem to levels that are minimally harmful to health—and to a point where the intestinal parasitoses can be considered exotic diseases.

But in the regions of the world where these

infections are endemic, regions specifically including Latin America, the problems associated with fecal contamination are very hard to solve. That is because there is no assurance that any action taken will be positively beneficial and lasting unless that action is associated with a general rise in living standards encompassing improvements in food, housing, education, clothing, and environmental sanitation.

Measures for combating the parasitoses can be subdivided into categories that have been well-understood for many years. These include the installation of latrines, wearing of shoes, provision of information about parasite transmission, improvement of personal hygiene, provision of potable water, and mass drug treatment. All these measures have been tried in various different places, but in Latin America their results have been discouraging. The reason: they have been sporadic, limited in scope and duration, and unassociated with fundamental changes in the way of life of the populations involved. In this vein, it is worth comparing this experience with the marked success of antiparasite campaigns in the southern United States, where fundamental changes in the people's style of life were occurring; for although the procedures and investments were similar in both cases, the results were radically different.

In summing up, it can be said that the prevalence of intestinal parasites in Latin America is still high, and is similar in many areas to that existing 50 years ago. The present causes and consequences of the problem also remain essentially unchanged; and the measures needed to solve the problem, though long understood, have not been applied within an integrated framework, and so the results obtained have been unsatisfactory.

SUMMARY

The purpose of this article is to examine the epidemiology of six intestinal parasite infections. Four of these (ascariasis, trichuriasis, hookworm infection, and strongyloidiasis) are helminthic in origin, while the other two (amebiasis and giardiasis) are caused by parasitic protozoa. All these parasites depend on dissemination of fecal matter for transmission; but the helminths depend more on contact between people and contaminated soil, while the protozoa are more apt to be transmitted by contaminated hands, food, and water.

Old and recent surveys of these parasites' prevalences in Brazil, Chile, Colombia, Costa Rica, and Venezuela reveal that they are still prevalent in many areas, and that in many regions their prevalence is similar to that found 50 years ago. There is no reason to doubt that data from other countries would reveal a similar situation in the rest of Latin America.

The root cause of this situation is fecal contamination of the soil resulting from poor socioeconomic conditions. Specifically, lack of latrines, primitive customs, and inadequate education are largely responsible. Other contributing factors include lack of sanitary facilities, lack of water near rural laborers' work areas, and the common custom of walking barefoot in rural zones.

Because of the immense numbers of people parasitized, the demand for medical care prompted by these parasites—and the cost of medical and paramedical work, hospitalization, and drugs—is considerable. To this, of course, must be added the human cost in suffering and premature death, as well as the economic cost of absenteeism and reduced productivity. Regarding the economic costs alone, a Mexican study found that 54 per cent of a group of rural families suffered annual losses equivalent to seven weeks' income; and a Colombian study estimated that 3 per cent of all leaves of absence were prompted by intestinal parasitic disease.

Despite successful campaigns against these diseases in developed countries, little progress has been made in Latin America. Many of the campaigns conducted have failed because they were short-lived or sporadic; but more fundamentally, none were supported by the necessary permanent improvement in living conditions needed for success.

In this vein, it should be noted that major antihookworm campaigns supported by the Rockefeller Foundation in Colombia and other Latin American countries failed despite sound funding and a long-term commitment to the effort. It may therefore be

concluded that the problem of intestinal parasitic infections in Latin America is still important, in many areas resembling that existing half a century ago. Nevertheless, these fecally acquired infections seem an all but inescapable accompaniment of underdevelopment. So the problem seems unlikely to be solved without a marked improvement in the region's socioeconomic conditions.

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PORTABLE LABORATORY KIT FOR RAPID FIELD DIAGNOSIS

A portable laboratory kit designed and tested by the United States Naval Health Research Center in San Diego, California, seems likely to become a valuable accessory for diagnosing communicable diseases in the field. The kit comes in a case measuring 8 x 15 x 18 inches (21 x 39 x 47 cm) that is packed with shock-resistant insulation. The contents include a compact McArthur microscope; slides stains; all instruments and reagents needed to perform counterimmunoelectrophoresis (CIE) and coagglutination (COAG) tests; a compact incubator-water bath; transformers and inverters to permit operation off of 110-volt or 220-volt line current or a 12-volt car battery; an alcohol burner; bacteriologic loops; and tubes of selective enrichment broth permitting the culturing of such organisms as *Salmonella spp.* and *Vibrio cholerae.* The CIE test can show results in as little as 45 minutes.

The kit was tried out in Upper Volta during a 1979 meningitis epidemic. CIE testing of cerebrospinal fluid specimens detected Group C meningococcal antigen in 10 cases; this permitted supplies of specific vaccine to be ordered and administered to the population. Single specimens also yielded positive CIE results for *H. influenzae* type b and *S. pneumoniae.* These findings were confirmed by the COAG test, using antibody-coated *Staphylococcus aureus* cells.

If suitable reagents are included, the kit has the potential to permit diagnosis of amebiasis, histoplasmosis, malaria, myoglobinemia, serum hepatitis, and other diseases (by CIE); to detect toxins and antibodies (also by CIE); and to identify *E. coli* enterotoxin, *Mycobacterium spp., N. gonorrhoeae,* and *Shigella spp* (by COAG). However, these potential applications have not yet been field-tested. [*Source: ATH Newsletter,* Nos. 7 and 8, 1981.]