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Parasitological observations on three Bolivian localities including rural communities, cities and institutions

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Three hundred of 381 subjects examined from the Camiri, Boyuibe and Gutierrez areas (Santa Cruz Department) harboured one to six species of intestinal helminths and/or protozoa. High infection rates were found in Camiri in the orphanage (43 of 44 persons) and in the Military Hospital (10 of 10 persons), as well as in Itanambicua (97·4%), a rural community close to the city (38 of 39 persons). No significant differences were noted between the overall parasitic prevalences observed in rural and urban environments, but the frequency of species was different. Indiscriminate defaecation, the habit of living in close association with animals, overcrowding, and especially lack of health education, are some of the factors responsible for the parasitic situation observed.

Epidemiological studies have shown that the prevalence of intestinal parasitic infections in Bolivia is high, with 65% of the people being polyparasitized (Lagrava, 1985). Available data for the north-central area of the Santa Cruz Department indicate that the infection rate in rural communities and cities ranges from 85·4% to 99·5% (De Muynck *et al.*, 1975, 1976; De Muynck and Silva de Lagrava, 1976; Silva de Lagrava *et al.*, 1977; 1978). In collaboration with the local Unidad Sanitaria, a coproparasitological survey was carried out in November 1987 to examine the sanitary situation in the southern area of this Department.

MATERIALS AND METHODS

The study was carried out in Camiri, Boyuibe and Gutierrez. Camiri is a city of about 25000 inhabitants (including the population of the surrounding area) situated in the foothills of the Andes. Gutierrez is a town 60 km north of Camiri, with about 850 residents, and Boyuibe is a town of about 2500 inhabitants, approximately 60 km south of Camiri. The three localities are at an altitude of 800–900 m above sea level.

The survey was carried out on 381 apparently healthy individuals (201 females and 180 males). The study population of Camiri included 102 city residents, 44 subjects (three months to 18 years-old) living in an orphanage, and 39 individuals of Itanambicua, a rural community close to the city. In addition, 10 soldiers hospitalized in the Camiri Military Hospital because of accidental wounds were also examined. The Gutierrez sample population consisted of 81 town dwellers and 54 individuals living in different communities in the surrounding rural area. The study population of Boyuibe included 51 town residents only. Children three to nine-

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TABLE

Prevalence of intestinal parasites in the Boyuibe, Camiri and Gutierrez areas

Localities:	*Boyuibe*	*Camiri*					*Gutierrez*		
Subjects	*Urban population*	*Urban population* a	*Urban population* b	*Urban population* c	*Rural population*	*Total*	*Urban population*	*Rural population*	*Total*
Examined	51	44	10	102	39	195	81	54	135
Parasitized	39	43	10	73	38	164	58	39	97
(%)	(76·5)	(97·7)	(100·0)	(71·6)	(97·4)	(84·1)	(71·6)	(72·2)	(71·9)

a = Orphanage; b = military hospital; c = other people living in the city.

years-old were treated with mebendazole (400 mg single dose) five weeks before the survey during a Ministry of Health Programme of Parasitic Disease Control.

A single normally-passed stool sample from each person was collected in a labelled plastic container with 10% buffered neutral formalin and then taken to Italy. All specimens were processed in the Istituto di Parassitologia, Universitâ 'La Sapienza', Roma, Italy. Examinations consisted of a direct Lugol stained smear, and the sedimentation-flotation technique commonly used in our laboratory (Di Felice and Ferretti, 1962). Positivity for *Cryptosporidium* was further verified by the Kinyoun modified technique and carbol-fuchsin counterstaining. Specially prepared forms were used to record personal and clinical data for each individual, and the parasitological results.

RESULTS AND DISCUSSION

Intestinal parasites and non-pathogenic protozoa were found in 300 out of 381 stool samples (78·7%); no differences were seen between the overall and single parasitic infection rates of males and females. Ninety-seven of the 300 positive subjects (32·3%) showed one parasite only; multiple infections were observed in 67·7% of the parasitized individuals: 85 (28·3%) had two, 71 (23·7%) three, 31 (10·3%) four, 12 (4·0%) five and four (1·3%) harboured six species of parasites and non-pathogenic protozoa.

Among the protozoan parasites found were *Entamoeba coli* (40·7%), *Giardia intestinalis* (30·7%), *Iodamoeba bütschlii* (10%), *Chilomastix mesnili* (8·7%), *Enteromonas hominis* (3·4%), *Retortamonas intestinalis* (2·4%), *Cryptosporidium* (2·1%), *Endolimax nana* (2·1%), *Balantidium coli* (1·8%), and *Pentatrichomonas hominis* (0·8%). The helminths found were hookworms (28·6%), *Trichuris trichiura* (19·7%), *Ascaris lumbricoides* (9·7%), *Hymenolepis nana* (8·7%), *Trichostrongylus* (5·5%) and *Strongyloides stercoralis* (1·8%). Eggs of *Taenia* and *Enterobius* (five and six cases, respectively) were also detected. As far as age-specific prevalence is concerned, high infection rates were demonstrated in infants (79·3% of the one to two-years-old group were parasitized).

Comparing the data for the three areas studied (Table) we noted a statistically significant higher prevalence in the sample population from the Camiri area ($P<0·05$); this was mainly because of the high prevalences in the rural community of Itanambicua and the two institutions of the city, the orphanage and the Military Hospital. In Itanambicua the infection rate (97·4%) was significantly higher ($P<0·005$) than that of the rural communities in the Gutierrez area (72·2%). This difference is particularly evident in the prevalence of hookworms and *T. trichiura*, 64·1 and 25·6% respectively in the rural community of Itanambicua and 33·3 and 7·4% in that of Gutierrez. It is difficult to explain the reason(s) for this difference, considering that the people compared have the same habits and live in communities with

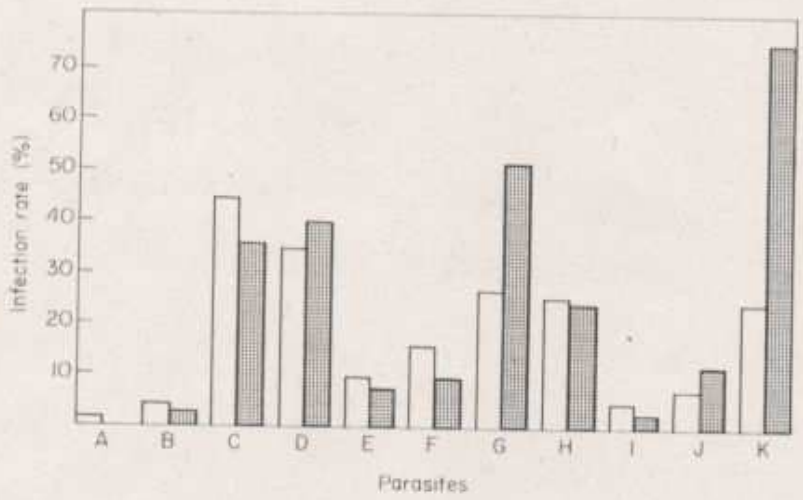

Fig. 1. Spectrum of parasitic infections shown by the population living in the city and the orphanage of Camiri. (A = *B. coli*, B = *Cryptosporidium*, C = *E. coli*, D = *G. intestinalis*, E = *I. bütschlii*, F = *H. nana*, G = hookworms, H = *A. lumbricoides*, I = *S. stercoralis*, J = *Trichostrongylus*, K = *T. trichiura*). □, City ($N = 73$); ▨, orphanage ($N = 43$).

similar soil characteristics and poor sanitary conditions. One important factor might be the overcrowding of the Itanambicua community. Forty-three of the 44 young people in the orphanage, and all 10 soldiers examined in the Military Hospital, were parasitized, a significantly ($P < 0{\cdot}001$) higher infection rate than that in the rest of the population (71·6%). Probably the extremely high prevalence in both institutions is related to extraordinarily polluted environment; although the people do have latrines and rudimentary sanitary facilities, indiscriminate defaecation in the yard is usual as is also the habit of walking without shoes.

Figure 1 shows the parasitological situation for Camiri city, comparing parasitized normal residents with those living in the orphanage. Significant differences were observed only for infection rates with hookworms ($P < 0{\cdot}01$) and *T. trichiura* ($P < 0{\cdot}001$), in spite of the treatment previously given.

Figure 2 summarizes the parasitological findings for Camiri and Gutierrez, showing the differences in urban and rural area. Comparison of the overall prevalence observed in town/city residents with that of people living in rural communities did not show any statistically-significant differences ($P = 0{\cdot}3$). However there was a difference in the spectrum of parasites, particularly *Entamoeba coli* ($P < 0{\cdot}01$) and hookworm ($P < 0{\cdot}001$), which were detected more frequently in the rural populations.

The general hygienic and sanitary conditions in this region are very poor: our findings, although based on a single stool sample per person, indicate that in both urban and rural environments, and in all three localities, exposure to contamination with human faeces is very frequent. Animal reservoirs could play a significant role in the transmission of species as *S. stercoralis*, *Trichostrongylus*, *Cryptosporidium*, *B. coli* and *I. bütschlii* because of close association of the population with dogs, goats, donkeys and pigs. Overcrowding and poor sanitation habits in rural communities, as well as in institutions, may also explain the extraordinarily heavy infection rates observed.

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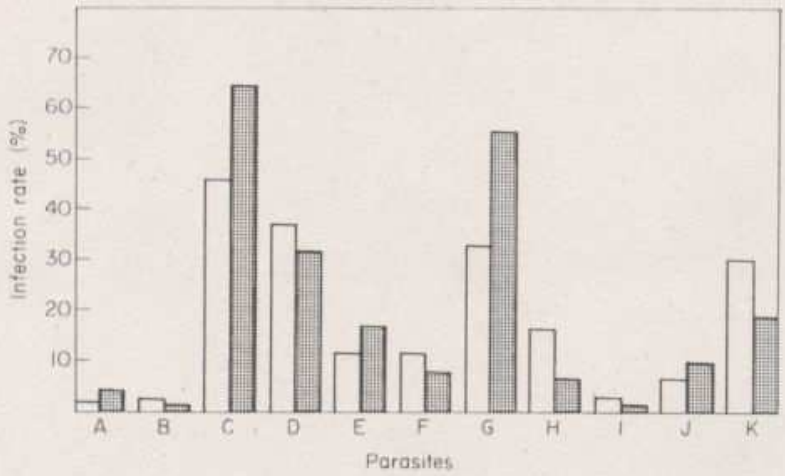

Fig. 2. Spectrum of parasitic infections shown by the population living in two different environments, urban and rural. (A = *B. coli*, B = *Cryptosporidium*, C = *E. coli*, D = *G. intestinalis*, E = *I. bütschlii*, F = *H. nana*, G = hookworms, H = *A. lumbricoides*, I = *S. stercoralis*, J = *Trichostrongylus*, K = *T. trichiura*). □, Urban ($N = 184$); ⊠, rural ($N = 77$).

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