

Estrongiloidiasis

PROF. ALFONSO J. RODRÍGUEZ-MORALES

PARASITOLOGÍA GRUPOS 4 Y 5

SEMESTRE I-2015

ATLAS

DE

PARASITOLOGIE

Le Docteur Paul HAUDUROY
PRÉPARATEUR À LA FACULTÉ DE MÉDECINE DE STRASBOURG

25 PLANCHES EN PHOTOGRAVURE

PARIS
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Phylum

Classes

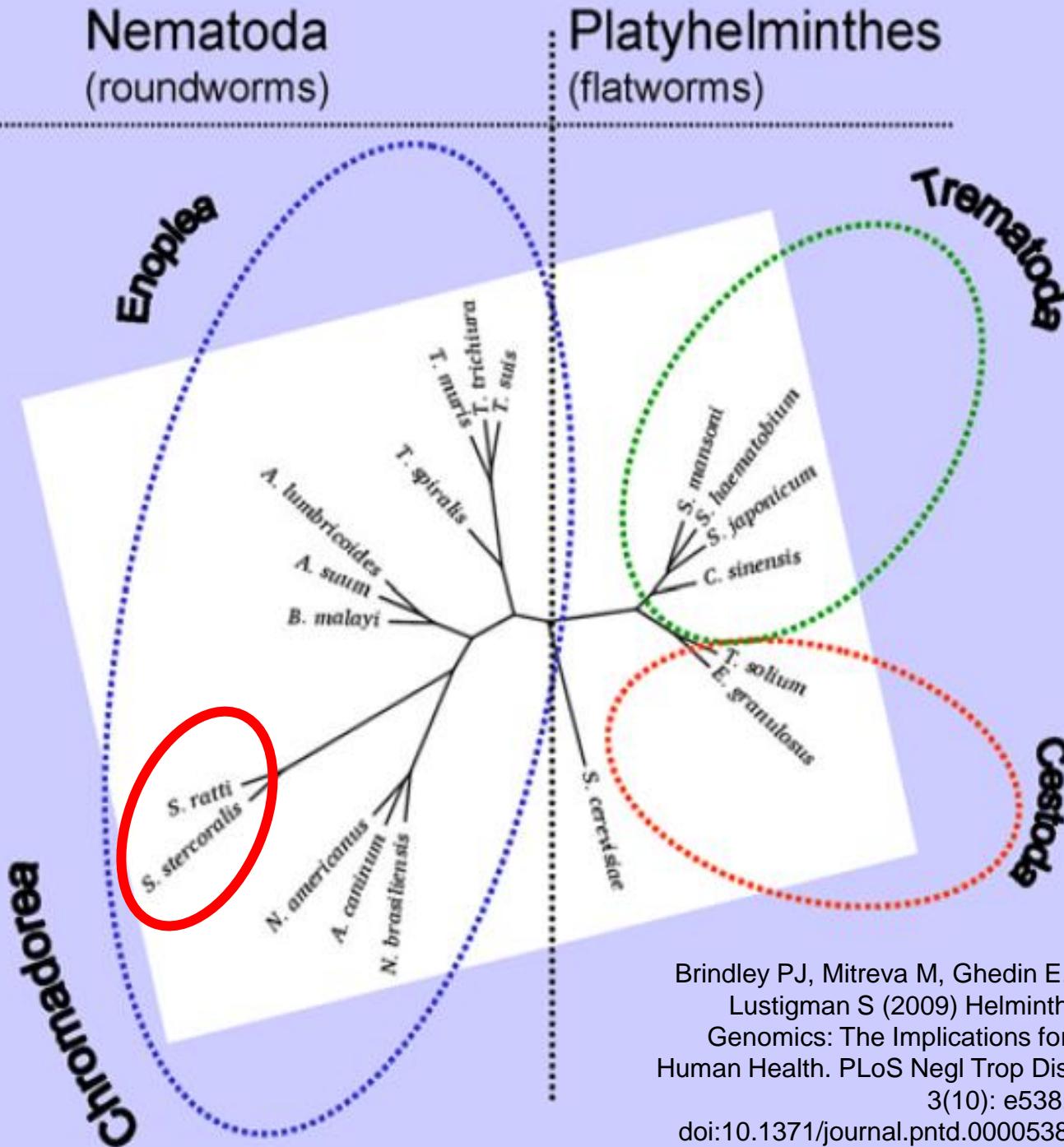
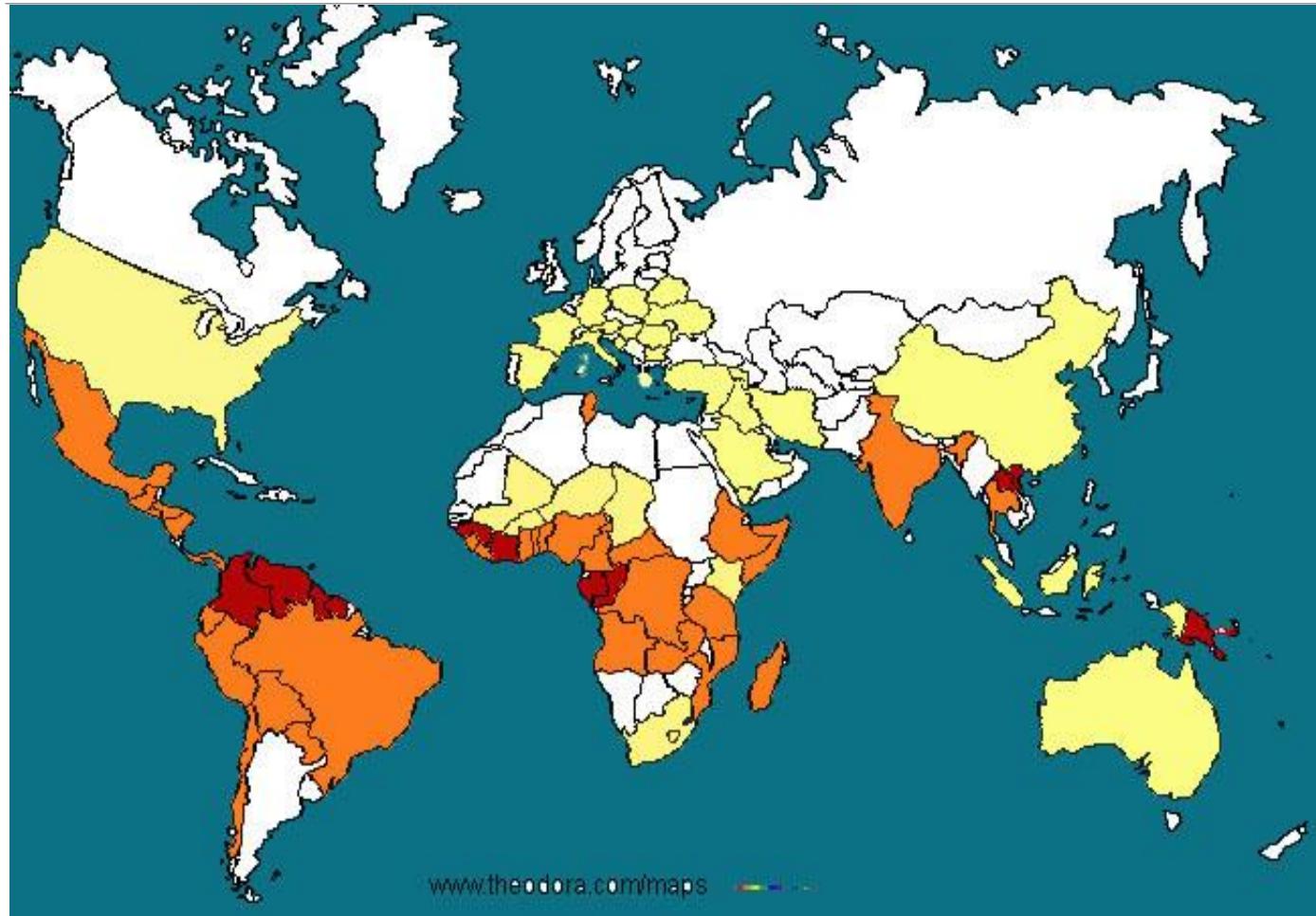


Figure 2. Phylogeny of the major taxa of human helminths—nematodes and platyhelminths—as established by maximum likelihood (ML) analysis of 18S ribosomal RNA from 18 helminth species.

Importancia mundial



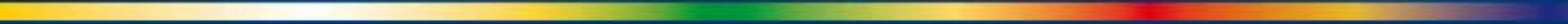
The countries highlighted in **yellow** have sporadic endemicity, on the range of 1-3%. Those that are **orange** are endemic, while those that are **red** are generally hyperendemic, with the highest frequency of *Strongyloides* infection.



438. Distribución de la estrongiloidiasis

ENTEROPARASITOSIS

Prevalencia Mundial



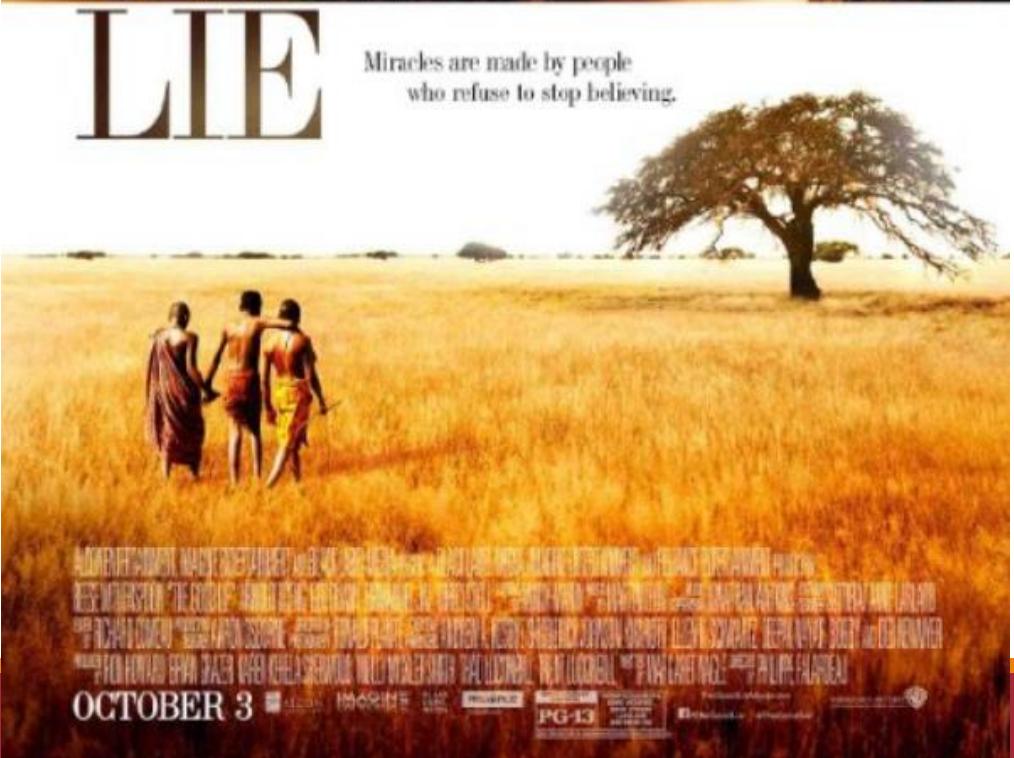
<i>Ascaris lumbricoides</i>	<i>1,300 millardos</i>
<i>Trichuris trichiura</i>	<i>1,049 millardos</i>
<i>Anquilostomideos</i>	<i>1 millardo</i>
<i>Complejo E. histolytica/dispar</i>	<i>500 millones</i>
<i>Enterobius vermicularis</i>	<i>400 millones</i>
<i>Schistosoma mansoni</i>	<i>200 millones</i>
<i>Giardia lamblia</i>	<i>200 millones</i>
<i>Strongyloides stercoralis</i>	<i>100 millones</i>
<i>Taenia sp</i>	<i>70 millones</i>

Table 2. Estimated Prevalence of Neglected Infections of Poverty in the US.

Neglected Disease Category	Disease	Estimated Number of Cases	Major Regions or Populations at Risk	References
Soil-transmitted helminth infections	Ascariasis	<4 million	Appalachia, American South	[29]
	Toxocariasis	13–2.8 million	Inner cities, American South, Appalachia	[14,79,84]
	Strongyloidiasis	68,000–100,000	Appalachia, African refugees	[14,19,25,35]
	Trichinellosis	16 (insufficient data)	Arctic Alaska	[149]
Platyhelminth Infections	Cysticercosis	41,400–169,000	US–Mexico borderlands	[19,96,113]
	Schistosomiasis	8,000	African refugees	[89,90]
	Echinococcosis	Insufficient data	Tribal Lands and Arctic Alaska	—
Protozoan Infections	Giardiasis	2.0–2.5 million	All regions	[123,147]
	Trichomoniasis	880,000 (black women)	American South, inner cities	[14,66]
	Cryptosporidiosis	300,000	All regions	[123]
	Chagas disease	3,000 to >1 million	US–Mexico borderlands, American South	[11,102,103,105,109]
	Cyclosporiasis	16,624	All regions	[123]
	Congenital toxoplasmosis	≤4,000 annually	American South, inner cities, US–Mexico borderlands, Arctic Alaska	[65]
	Leishmaniasis	Insufficient data	US–Mexico borderlands	—
Bacterial Infections	Amebiasis	Insufficient data	US–Mexico borderlands	—
	Congenital syphilis	1,528 between 2000 and 2002	American South, inner cities	[62]
	Brucellosis	1,554	US–Mexico borderlands	[122,123]
	Bovine tuberculosis	129 cases between 1994 and 2000	US–Mexico borderlands	[124]
	Leprosy	166	US–Mexico borderlands	[148]
	Trench fever	Insufficient data	Inner cities	—
	Leptospirosis	Insufficient data	Inner cities	—

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Refugiados y *Strongyloides*

Los Niños Perdidos de Sudán es el nombre dado a los grupos de más de 20 mil niños de los grupos étnicos Nuer y Dinka que fueron desplazados o quedaron en orfandad durante la Segunda Guerra Civil sudanesa (1983-2005); aproximadamente 2,5 millones de personas murieron y millones fueron desplazados.

El nombre "Niños Perdidos de Sudán" fue utilizado coloquialmente por los trabajadores de ayuda humanitaria en los campos de refugiados donde los niños residían en África. El término fue revivido cuando cientos de niños huyeron de la violencia posterior a la independencia de Sudán del Sur durante 2011-13.



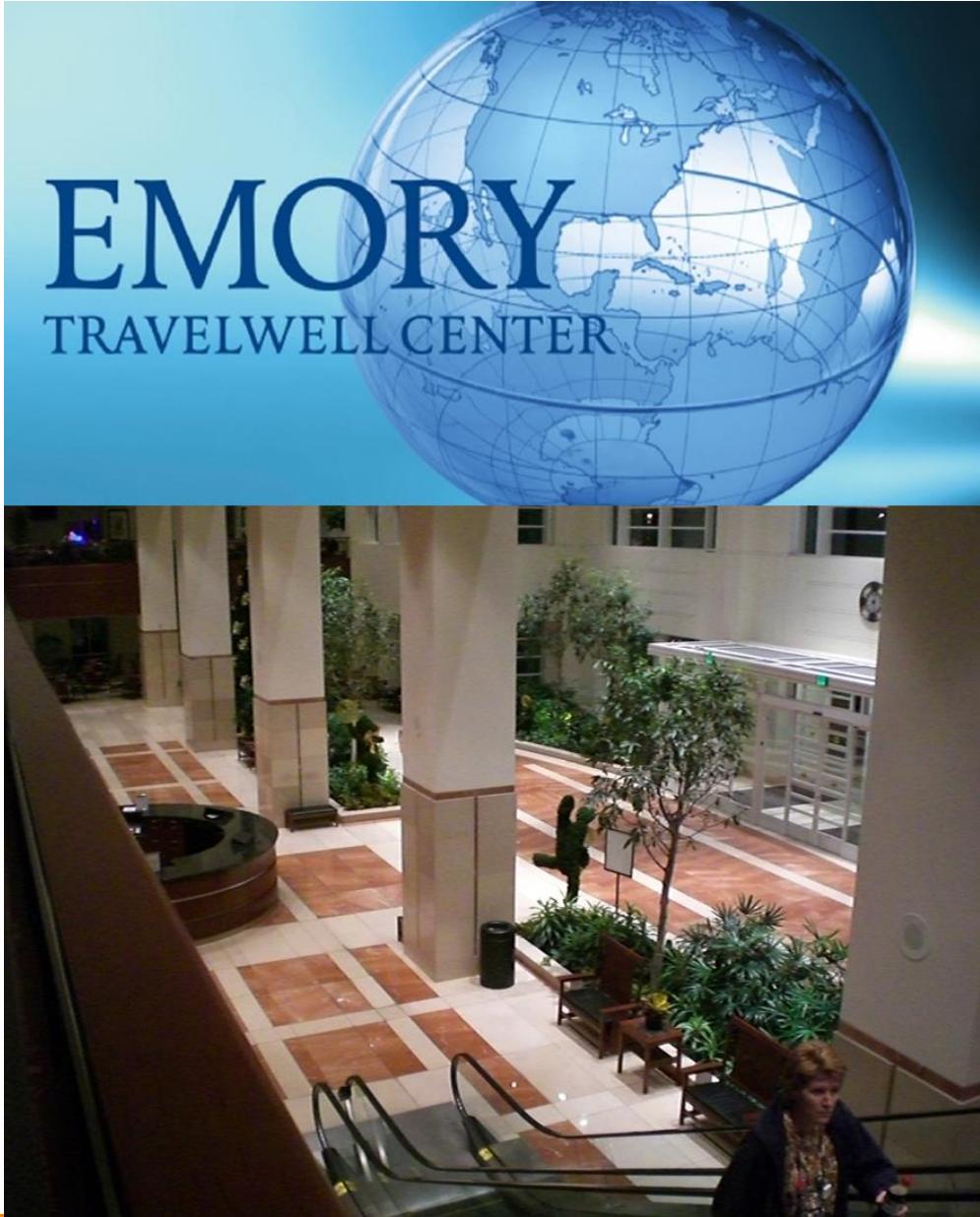
Miracles are made by people
who refuse to stop believing.





The Centers for Disease Control and Prevention (CDC) recently conducted a serologic evaluation of attendees to a Lost Boys reunion in 2004.^{2,3}

A high prevalence of exposure to *Schistosoma mansoni* or *Schistosoma haematobium* (44%), and ***Strongyloides stercoralis* (46%)** was identified.



Am. J. Trop. Med. Hyg., 77(4), 2007, pp. 633–635
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Short Report: Persistent and Untreated Tropical Infectious Diseases Among Sudanese Refugees in the United States

Carlos Franco-Paredes,* Roberta Dismukes, Deborah Nicolls, Alicia Hidron, Kimberly Workowski, Alfonso Rodriguez-Morales, Marianna Wilson, Danielle Jones, Peter Manyang, and Phyllis Kozarsky

Division of Infectious Diseases, Department of Medicine, Emory University School of Medicine, Crawford Long Hospital, Atlanta, Georgia; Instituto Experimental José Witremundo Torrealba (Center for Parasitological Research, José Witremundo Torrealba), Universidad de Los Andes, Trujillo, Venezuela; Division of Parasitic Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia; University of the South, Sewanee, Tennessee

Thus far, we evaluated 44 (30%) of the ~150 Lost Boys living in Atlanta, GA, that have regularly been followed at our Tropical Medicine Clinic at Emory University.

The *Strongyloides* ELISA was performed with *S. stercoralis* antigen.

In addition, 10 of 40 (**25%**) tested positive by serology (> 8 units) for ***Strongyloides***, and of these, 5/10 (50%) had concomitant evidence of positive filarial serologies.

¿Nuevos efectos de las protozoosis?

Rodríguez-Morales AJ, Barbella RA, Case C, Arria M, Ravelo M, Perez H, Urdaneta O, Gervasio G, Rubio N, Maldonado A, Aguilera Y, Viloria A, Blanco JJ, Colina M, Hernández E, Araujo E, Cabaniel G, Benítez J, Rifakis P. **Intestinal parasitic infections among pregnant women in Venezuela.** *Infect Dis Obstet Gynecol.* 2006;2006:23125.

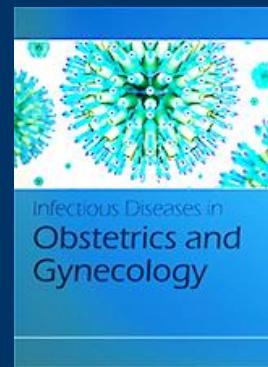


TABLE 1: Parasite positivity in stool specimens examined from pregnant women studied.

	Number	(%)	Helminths		
Protozoans			<i>Ascaris lumbricoides</i>	437	57.0
Nonpathogenic			<i>Trichuris trichiura</i>	276	36.0
<i>Entamoeba coli</i>	44	5.7	<i>Necator americanus</i>	62	8.1
<i>Endolimax nana</i>	30	3.9	<i>Enterobius vermicularis</i>	48	6.3
Pathogenic			<i>Strongyloides stercoralis</i>	25	3.3
<i>Giardia lamblia</i>	108	14.1			
<i>Entamoeba histolytica/dispar</i>	92	12.0			
<i>Cryptosporidium spp</i>	2	0.3			

TABLE 2: Relative risk for anemia at pregnancy according to the presence of intestinal parasitosis.

Variable (risk for anemia)	Anemia	Normal			χ^2_{Yates}	P
		Hb	RR			
Intestinal parasitosis at pregnancy						
Present	594	173	2.56	194.24	< .0001	
Absent	82	189	—	—	—	
Helminth infection at pregnancy						
Present	322	61	1.56	94.63	< .0001	
Absent	354	301	—	—	—	
Protozoan infection at pregnancy						
Present	179	23	1.49	59.65	< .0001	
Absent	497	339	—	—	—	

Enteropatógenos Crónicos en Viajeros

The NEW ENGLAND JOURNAL OF MEDICINE

REVIEW ARTICLE

CURRENT CONCEPTS

Enteropathogens and Chronic Illness in Returning Travelers

Allen G.P. Ross, M.D., Ph.D., G. Richard Olds, M.D., Allan W. Cripps, Ph.D.,
Jeremy J. Farrar, M.D., Ph.D., and Donald P. McManus, Ph.D., D.Sc.

Table 1. Enteropathogens Causing Chronic Illness in the Returning Traveler.*

Enteropathogen	Areas of High Risk	Mode of Transmission	Amount of Inoculum Required for Infection		Incubation Period	Common Symptoms	Diagnostic Method	Adult Treatment	Pediatric Treatment
			CFU/ml)						
Giardia	 South Asia, Middle East, South America	Drinking water, human contact	Low (<100 CFU/ml)	7–10 Days	Abdominal pain, nausea, persistent watery diarrhea	Stool microscopic examination and stool giardia antigen assay	Metronidazole, 250 mg, 3 times/day for 7–10 days or 500 mg twice a day for 5–7 days	Metronidazole, 5 mg/kg of body weight, 3 times/day for 7–10 days (maximum of 250 mg/dose)	
<i>Entamoeba histolytica</i>	 South Asia, Southeast Asia, Middle East, South America	Human contact, drinking water	Low (<100 CFU/ml)	11–21 Days	Abdominal pain, fever, persistent watery diarrhea	Stool <i>E. histolytica</i> antigen assay	Metronidazole, 500–750 mg, 3 times/day for 7–10 days; plus paromomycin, 500 mg, 3 times/day for 7 days	Metronidazole, 50 mg/kg, in 3 divided doses/day for 7–10 days (maximum of 750 mg/dose)	
Strongyloides	 Caribbean, Latin America, South America, Africa, Asia, Oceania	Contaminated soil	Low (third-stage larvae)	11–21 Days	Larva currens, abdominal pain, persistent diarrhea	Stool microscopic examination	Ivermectin, 200 µg/kg of body weight/day for 2 days	Ivermectin, 200 µg/kg/day for 2 days (for weight >15 kg)	
Schistosoma	 Africa, Asia, South America	Fresh-water contact where schistosoma is endemic	Low (few cercariae)	14–84 Days	Katayama syndrome, abdominal pain, persistent diarrhea, hematuria	Kato–Katz stool examination, urine microscopic examination	Praziquantel, 40 mg/kg twice a day for 1 day for <i>S. hematobium</i> and <i>S. mansoni</i> , and 60 mg/kg 3 times/day for 1 day for <i>S. japonicum</i>	Praziquantel (for patients ≥4 yr of age), 40 mg/kg twice a day for 1 day for <i>S. hematobium</i> and <i>S. mansoni</i> , and 60 mg/kg 3 times a day for 1 day for <i>S. japonicum</i>	

Helmintiasis

Epidemiología

Table 1

Prevalence of intestinal helminths and protozoa in individuals from North Central Venezuela (May 2007 to December 2008)

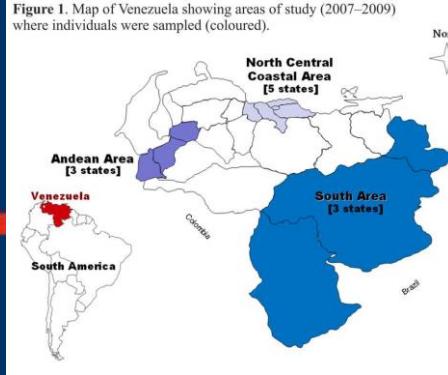
Parasite	n ^a	% (95% CI)
Helminths	209 845	4.49 (4.47–4.51)
<i>Ascaris lumbricoides</i>	174 257	3.73 (3.71–3.74)
<i>Trichuris trichiura</i>	53 031	1.13 (1.12–1.14)
<i>Enterobius vermicularis</i>	18 177	0.39 (0.38–0.40)
<i>Strongyloides stercoralis</i>	15 743	0.34 (0.33–0.35)
Hookworms	7 817	0.17 (0.16–0.18)
<i>Hymenolepis nana</i>	2 979	0.06 (0.05–0.07)
Protozoa	2 675 384	57.22 (57.18–57.27)
<i>Blastocystis hominis</i>	2 176 703	46.56 (46.51–46.60)
<i>Giardia duodenalis</i>	358 538	7.67 (7.64–7.69)
<i>Iodamoeba bütschlii</i>	150 032	3.21 (3.19–3.23)
<i>Dientamoeba fragilis</i>	76 086	1.63 (1.62–1.64)
<i>Entamoeba histolytica/dispar</i>	42 396	0.91 (0.90–0.92)
<i>Trichomonas hominis</i>	8 416	0.18 (0.17–0.19)
<i>Chilomastix mesnili</i>	4 675	0.10 (0.09–0.11)

^a n = number of positives in the population.



Helmintiasis

Epidemiología



**Epidemiology of intestinal parasitosis in eleven states of Venezuela:
partial results of an ongoing national survey
(N=7.120.744)**

Parasite	Prevalence (%)	95%CI	Parasite	Prevalence (%)	95%CI
<i>B. hominis</i>	45.632	45.596-45.669	<i>T. trichiura</i>	1.569	1.560-1.578
<i>E. nana</i>	12.573	12.548-12.597	<i>Hookworms</i>	0.664	0.658-0.670
<i>E. coli</i>	11.745	11.722-11.769	<i>S. stercoralis</i>	0.381	0.376-0.385
<i>G. intestinalis</i>	7.426	7.406-7.445	<i>E. vermicularis</i>	0.264	0.260-0.268
<i>A. lumbricoides</i>	3.974	3.959-3.988	<i>H. nana</i>	0.257	0.253-0.261
<i>I. bütschlii</i>	3.211	3.198-3.224	<i>C. mesnili</i>	0.246	0.242-0.249
<i>E. histolytica</i>	1.632	1.623-1.642	<i>T. hominis</i>	0.118	0.116-0.121

Helmintiasis

Epidemiología en Pacientes con VIH+

Table 2. Prevalence of intestinal parasitic infections (%)

Agent	Acute diarrhoea (n=104)	Chronic diarrhoea (n=113)	Control group (n=87)	Total population (n=304)
<i>Blastocystis hominis</i>	25	26	31	27
<i>C. parvum</i>	16	19	7	15
<i>E. histolytica/E. dispar</i>	16	15	5	13
<i>I. belli</i>	12	17	1	11
<i>S. stercoralis</i>	10	17	3	11
<i>G. intestinalis</i> (<i>lamblia</i>)	2	4	2	3

Arenas-Pinto A. et al.

International Journal of STD & AIDS 2003; 14: 487– 492

Table 3. Parasitic agents associated with acute and chronic diarrhoea

Associate factor	Univariate analysis			Multivariate analysis		
	OR	P	95% CI	OR	P	95% CI
Acute diarrhoea						
<i>I. belli</i>	11.22	0.022	1.43–88.1	10.2	0.035	1.17–88.79
<i>E. histolytica/E. dispar</i>	4.05	0.015	1.31–12.55	11.48	0.023	1.4–94.06
<i>C. parvum</i>	2.64	0.052*	0.99–7.02	2.6	0.07	0.93–7.26
Chronic diarrhoea						
<i>I. belli</i>	17.38	0.0003	2.1–143.24	16.43	0.01	1.95–138.42
<i>S. stercoralis</i>	5.66	0.003	1.57–20.46	4.29	0.043	1.04–17.66
<i>E. histolytica/E. dispar</i>	3.67	0.017	1.17–11.57	8.6	0.001	2.55–29.07
<i>C. parvum</i>	3.08	0.017	1.17–8.14	3.39	0.029	1.13–10.19

*Marginally associated: P value slightly over the significance level

Helmintiasis

Epidemiología en Colombia

Tabla 1. Prevalencia de parásitos intestinales en población general del corregimiento de Loma Arena Santa Catalina. 2004

Espece parasitaria	Nº	%
<i>Entamoeba coli</i>	210	60
<i>Entamoeba histolyca/dispar</i>	191	54
<i>Endolimax nana</i>	125	36
<i>Blastocystis hominis</i>	103	29
<i>Iodamoeba butschlii</i>	72	21
<i>Giardia duodenalis</i>	61	17
<i>Trichomonas hominis</i>	3	0,9
<i>Cyclospora sp</i>	2	0,6
<i>Ascaris lumbricoides</i>	196	56
<i>Trichuris trichiura</i>	185	53
<i>Uncinaria</i>	21	6
<i>Hymenolepis nana</i>	14	4
<i>Strongyloides stercoralis</i>	11	3
<i>Taenia sp</i>	3	0,9
<i>Enterobius vermicularis</i>	2	0,6

ARTÍCULO ORIGINAL

Prevalencia de helmintos intestinales en caninos del departamento del Quindío

María Isabel Giraldo, Nora Lizeth García, Jhon Carlos Castaño

Grupo de Inmunología Molecular, Centro de Investigaciones Biomédicas, Universidad del Quindío, Armenia, Colombia.

Presencia de parásitos

Se encontró que *A. caninum* fue el parásito más prevalente (13,9%), seguido por *T. vulpis* (4,3%), *S. stercoralis* (4,0%) y *T. canis* (2,5%). Además, se evidenció biparasitismo en 8 individuos, así: *A. caninum + T. vulpis* en 6 caninos (1,8%) y *S. stercoralis + T. vulpis* en 2 caninos (0,6%).



403. Letrina pública en Gedi (Kenya)

Esta letrina pública, consistente en un simple agujero, fue construida en el siglo XIV en la ciudad afroárabe de Gedi, cerca de Malindi, en la costa swahili de Kenya. El valor de una medida básica de salud pública de este tipo fue aparente incluso para los médicos del Imperio romano, una época en que los baños públicos bien dotados y con agua corriente eran concurridos lugares de reunión y de debate. El uso de este tipo de letrina en África oriental representó una contribución significativa para la limitación de las helmintiasis descritas en este capítulo, así como también de las infecciones causadas por los virus, las bacterias y los protozoos patógenos adquiridos a través del tracto gastrointestinal (v. cap. 4).

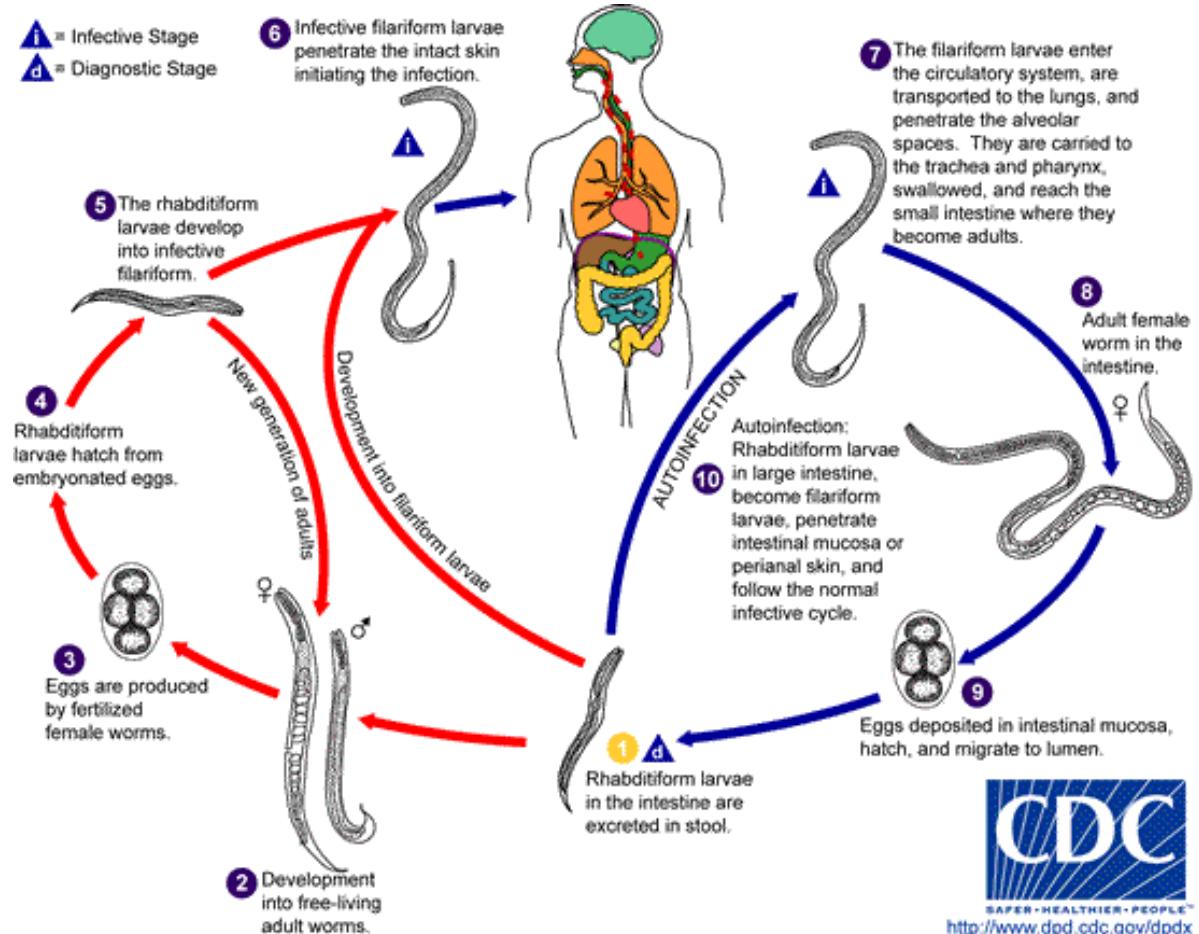
Cycles and transmission

- ❖ Type 1: Direct (*Enterobius vermicularis*, *Trichuris trichiura*)
- ❖ Type 2: Modified Direct (*Ascaris lumbricoides*, *Toxocara spp.*)
- ❖ Type 3: Penetration of the Skin (*Ancylostoma*, *Necator*,
Strongyloides, *Trichostrongylus*)

Type 3: Penetration of the Skin (*Ancylostoma*, *Necator*, *Strongyloides*, *Trichostrongylus*)

In this group, eggs are passed in the stools to the soil, where they hatch into larvae, which undergo **further development** before they are ready to **penetrate the skin** and reach the circulation and lungs, which they penetrate to enter the respiratory tract; they move up to enter the oesophagus and reach the small intestine, where they become adult.

The hookworms, *Ancylostoma duodenale* and *Necator americanus*, and *Strongyloides stercoralis* belong to this group, but differ in that *S. stercoralis* larvae are passed in the stool and **autoinfection can occur at the anal margin**, or independent development takes place in the soil, where they can exist in the absence of any further cycle through humans.



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Phylum

Classes

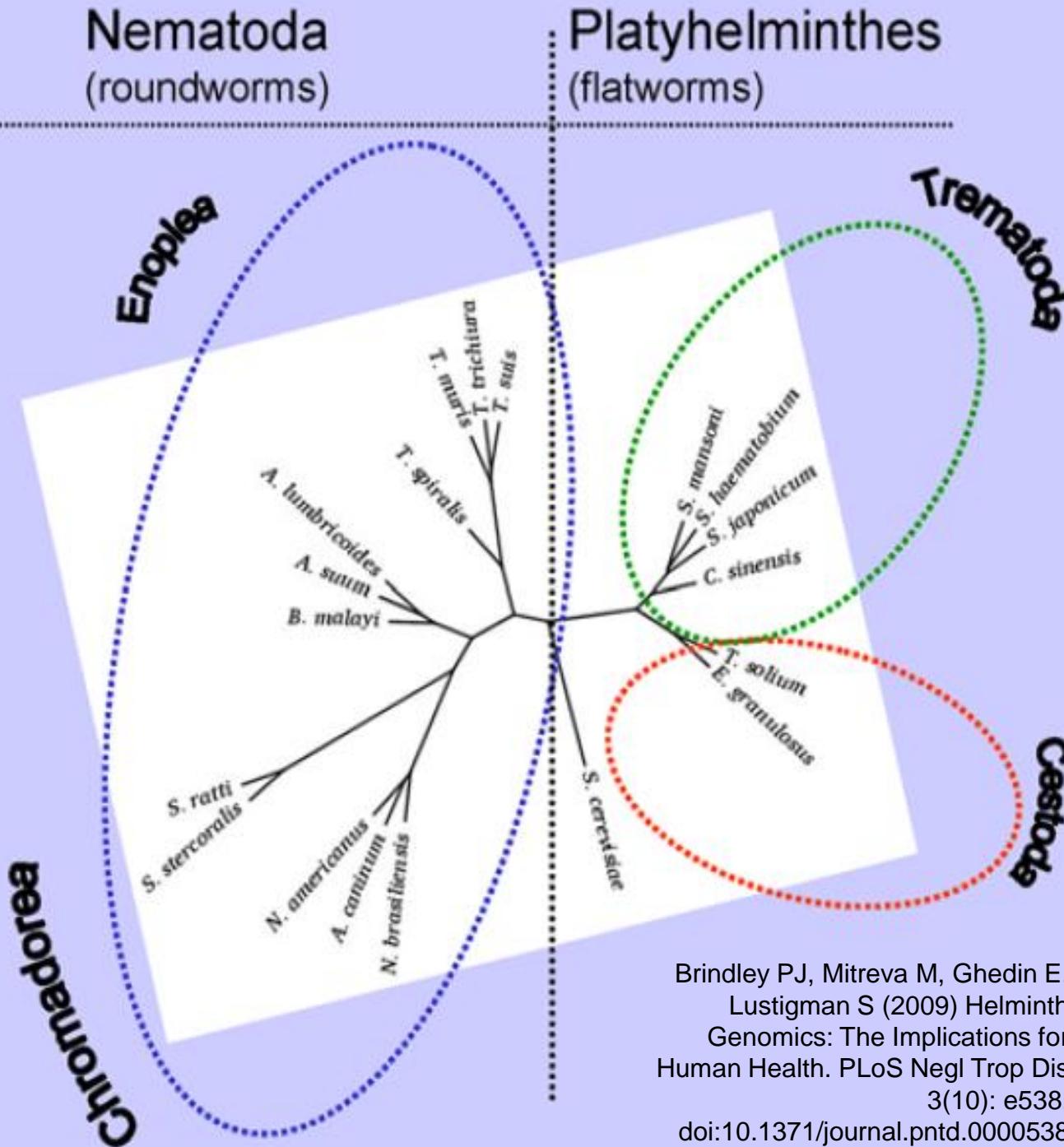


Figure 2. Phylogeny of the major taxa of human helminths—nematodes and platyhelminths—as established by maximum likelihood (ML) analysis of 18S ribosomal RNA from 18 helminth species.

Brindley PJ, Mitreva M, Ghedin E, Lustigman S (2009) Helminth Genomics: The Implications for Human Health. PLoS Negl Trop Dis 3(10): e538. doi:10.1371/journal.pntd.0000538

Tabla 11. Nematodos de importancia médica y su prevalencia¹

Subclase	Orden (Suborden)	Superfamilia	Género y especie	Prevalencia probable en el ser humano
Adenophorea	Enopliida	Trichuroidea	<i>Trichinella spiralis</i> <i>Trichinella papuae</i> <i>Trichinella zimbabwiensis</i> <i>Trichuris trichiura</i> <i>Capillaria hepatica</i> <i>Capillaria philippinensis</i>	49 millones Miles ? 500 millones Infrecuente Miles
Secernentea	Rhabditida Strongylida	Rhabditoidea Ancylostomatoidea	<i>Strongyloides stercoralis</i> <i>Strongyloides fulleborni</i> <i>Pelodera strongyloides</i> Género <i>Rhabditis</i> <i>Ancylostoma duodenale</i> } <i>Necator americanus</i> } <i>Ancylostoma caninum</i> <i>Ancylostoma braziliense</i> <i>Ancylostoma ceylanicum</i> <i>Ternidens deminutus</i> <i>Oesophagostomum bifurcum</i> <i>Syngamus laryngeus</i> Género <i>Trichostrongylus</i> <i>Metastrongylus elongatus</i> <i>Parastrengylus cantonensis</i> <i>Parastrengylus costaricensis</i> <i>Enterobius vermicularis</i> <i>Ascaris lumbricoides</i> <i>Toxocara canis</i> <i>Toxocara cati</i> <i>Lagochilascaris minor</i> <i>Baylisascaris procyonis</i> Género <i>Anisakis</i> <i>Pseudoterranova decipiens</i> <i>Gongylonema pulchrum</i> <i>Gnathostoma spinigerum</i> <i>Thelazia callipaeda</i> <i>Wuchereria bancrofti</i> <i>Brugia malayi</i> } <i>Brugia timori</i> } <i>Loa loa</i> <i>Onchocerca volvulus</i> <i>Mansonella perstans</i> <i>Mansonella streptocerca</i> <i>Mansonella ozzardi</i> Género <i>Dirofilaria</i> <i>Dracunculus medinensis</i>	70 millones Miles Infrecuente Infrecuente 700-900 millones Miles Miles Infrecuente Miles >250.000 Infrecuente 10 millones Infrecuente Miles Miles 400 millones 800-1.000 millones Miles Miles Infrecuente Infrecuente Infrecuente Miles Infrecuente Miles Infrecuente 120 millones ² 6 millones 33 millones <17 millones ³ 65 millones 2 millones 15 millones Infrecuente <3 millones ⁴
	Oxyurida Ascaridida	Oxyuroidea Ascaridoidea		
	Spirurida (Spirurina)	Spiruroidea Gnathostomatoidea Thelazoidea Filarioidea		
	Spirurida (Camallanina)	Dracunculoidea		

Ciclo *Strongyloides* *stercoralis*

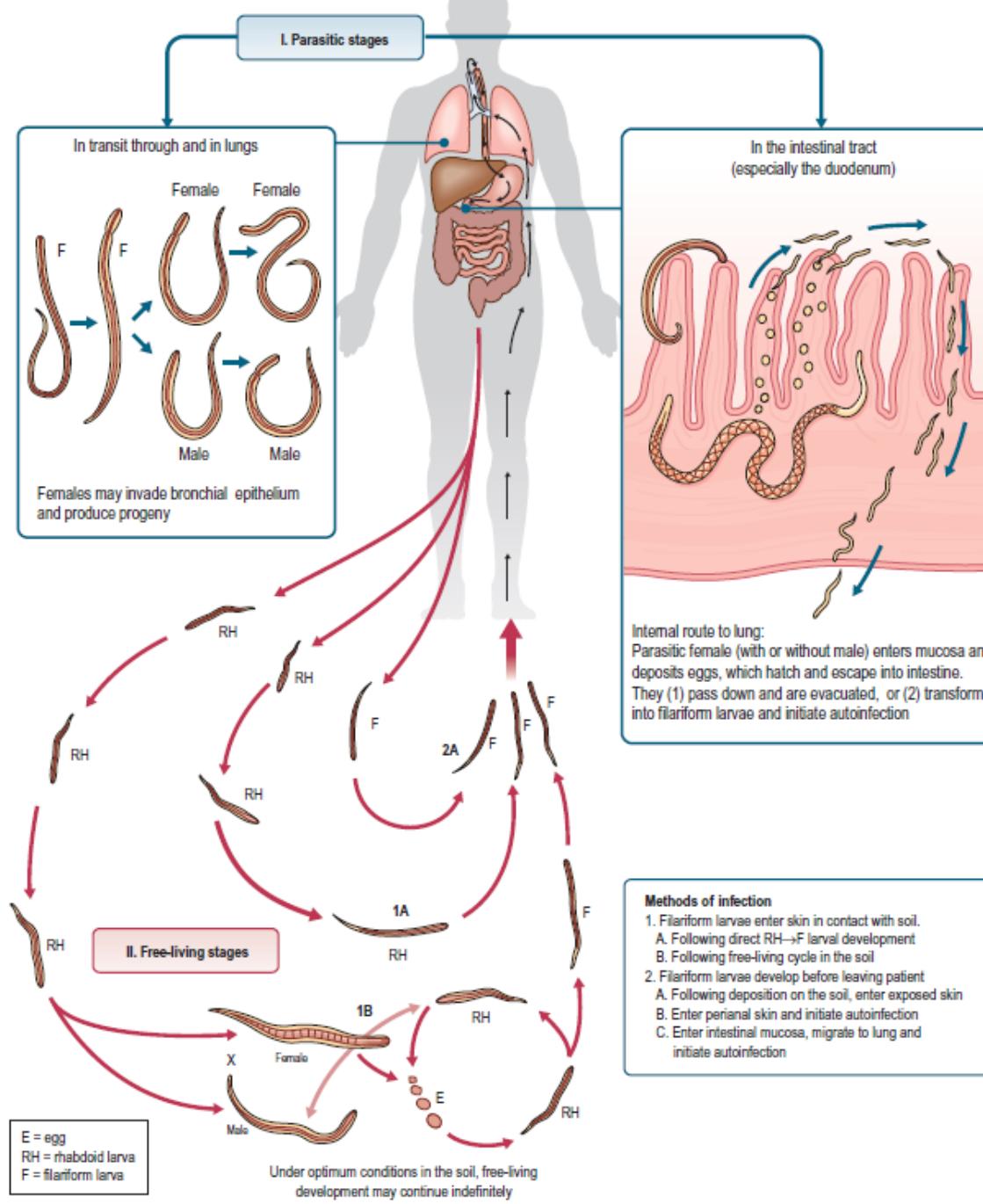
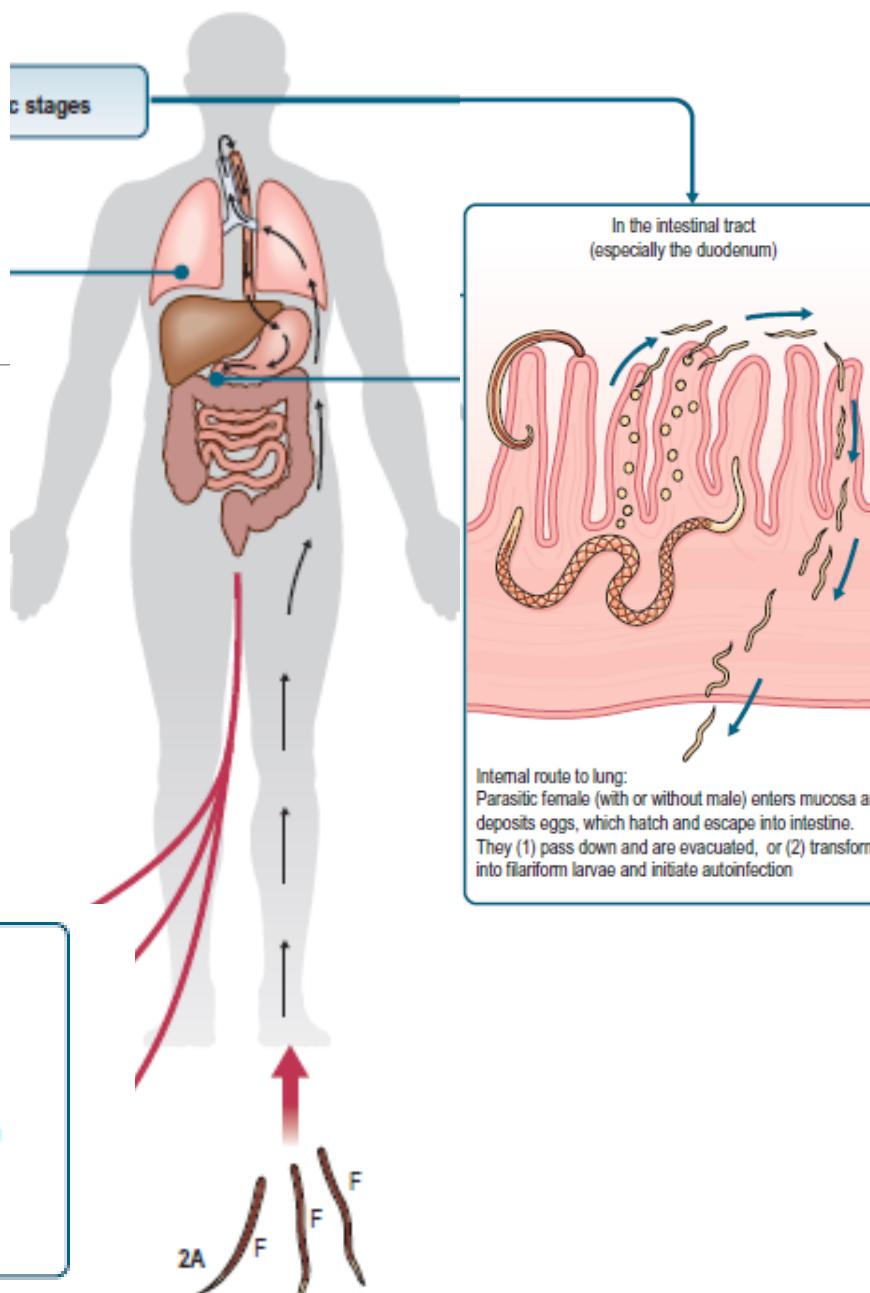


Figure 55.17 *Strongyloides stercoralis*. Rhabditiform larva in stool.
(Courtesy J. S. Tatz.)

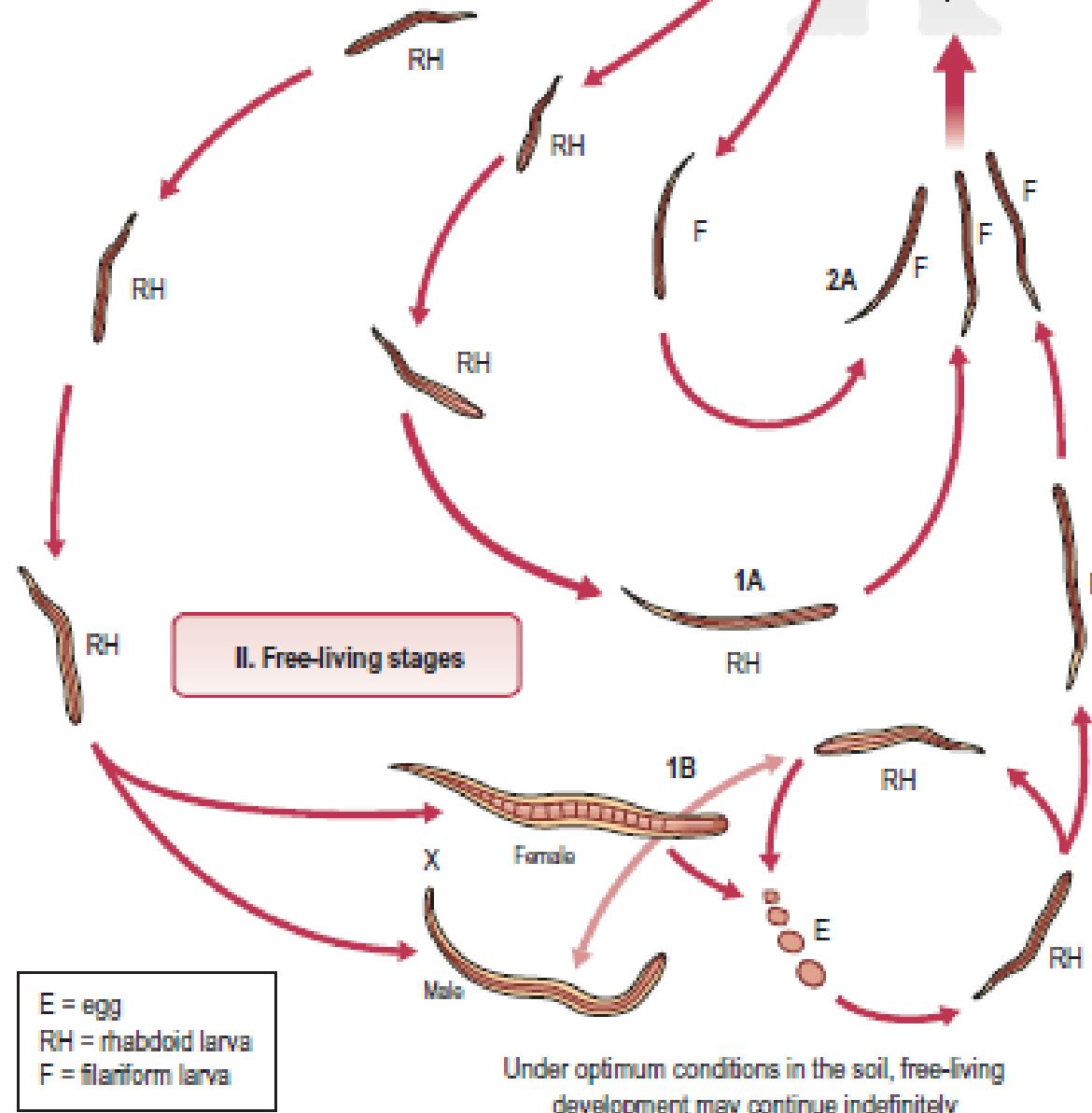
Ciclo *Strongyloides* *stercoralis*

Methods of infection

1. Filariform larvae enter skin in contact with soil.
 - A. Following direct RH→F larval development
 - B. Following free-living cycle in the soil
2. Filariform larvae develop before leaving patient
 - A. Following deposition on the soil, enter exposed skin
 - B. Enter perianal skin and initiate autoinfection
 - C. Enter intestinal mucosa, migrate to lung and initiate autoinfection



Ciclo *Strongyloides* *stercoralis*



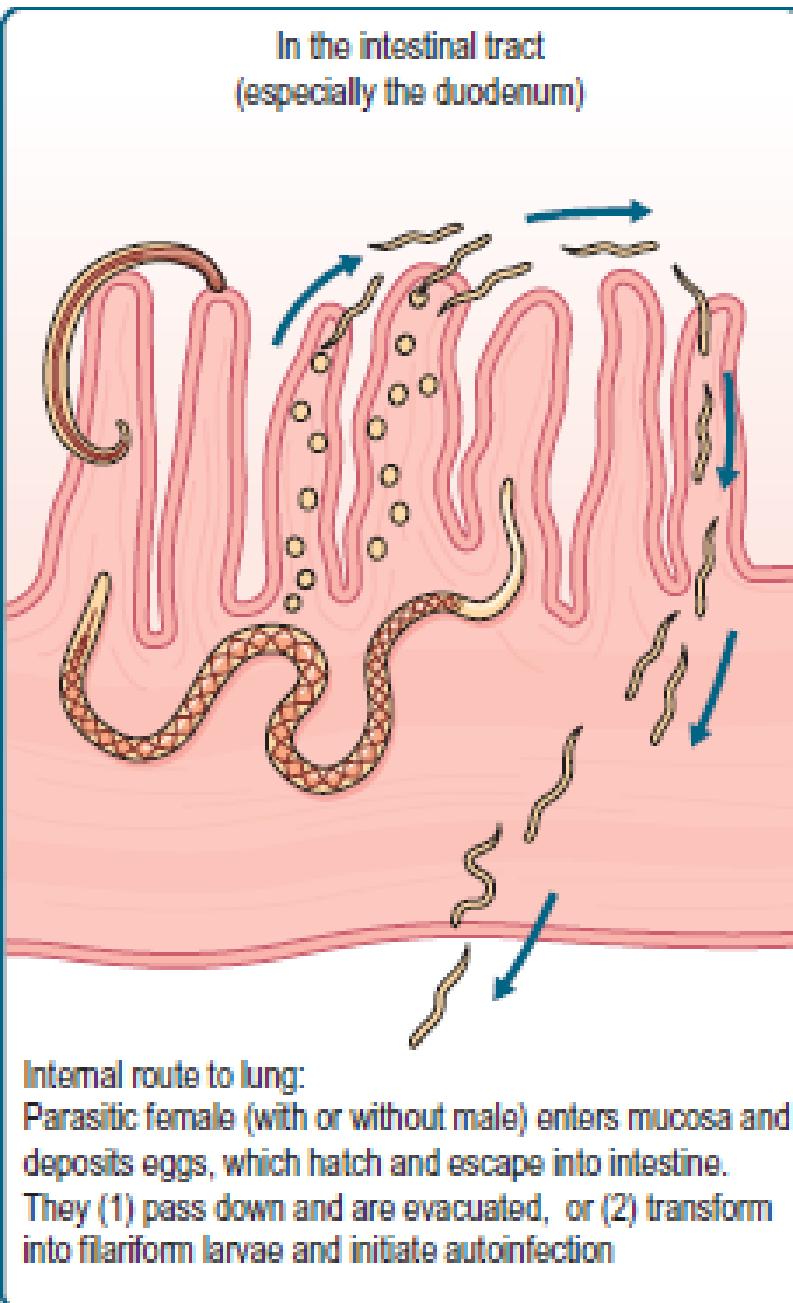
Internal route to lung:

Parasitic female (with or without male) enters mucosa and deposits eggs, which hatch and escape into intestine. They (1) pass down and are evacuated, or (2) transform into filariform larvae and initiate autoinfection

Methods of infection

1. Filariform larvae enter skin in contact with soil.
 - A. Following direct RH → F larval development
 - B. Following free-living cycle in the soil
2. Filariform larvae develop before leaving patient
 - A. Following deposition on the soil, enter exposed skin
 - B. Enter perianal skin and initiate autoinfection
 - C. Enter intestinal mucosa, migrate to lung and initiate autoinfection

Ciclo
Strongyloides
stercoralis





La infección por *Strongyloides stercoralis* se diagnostica de ordinario por la presencia en las heces de larvas rabditoides en primera, fase de 180-380 μm por 14-20 μm . Las larvas tienen una corta cápsula bucal, una cola tenue y un



▼ *Strongyloides stercoralis* first-stage rhabditiform (L1) larvae.

The first-stage rhabditiform larvae (L1) of *Strongyloides stercoralis* are 180-380 µm long, with a short buccal canal, a rhabditoid esophagus and a prominent genital primordium. These L1 larvae are usually found in stool, as the eggs embryonate and hatch in the mucosa of the small intestine of the host. They may also be found in soil and cultured feces.



Figure A: Rhabditiform larva of *S. stercoralis* in unstained wet mounts of stool. Notice the short buccal canal and the genital primordium (red arrows).



Figure B: Rhabditiform larva of *S. stercoralis* in unstained wet mounts of stool. Notice the short buccal canal and the genital primordium (red arrows).



Figure C: Close-up of the anterior end of a rhabditiform larva of *S. stercoralis*, showing the short buccal canal (red arrow) and the rhabditoid esophagus (blue arrow). Image taken at 1000x oil magnification.



Figure D: Rhabditiform larva of *S. stercoralis* in an unstained wet mount of stool. Notice the short buccal canal and the genital primordium (red arrow).

▼ ***Strongyloides stercoralis* first-stage rhabditiform (L1) larvae.**

The first-stage rhabditiform larvae (L1) of *Strongyloides stercoralis* are 180-380 µm long, with a short buccal canal, a rhabditoid esophagus and a prominent genital primordium. These L1 larvae are usually found in stool, as the eggs embryonate and hatch in the mucosa of the small intestine of the host. They may also be found in soil and cultured feces.



Figure E: Rhabditiform larva of *S. stercoralis* in an unstained wet mount of stool. Notice the rhabditoid esophagus (blue arrow) and prominent genital primordium (red arrow).



Figure F: Rhabditiform larva of *S. stercoralis* in an unstained wet mount of stool. Notice the prominent genital primordium (blue arrow), rhabditoid esophagus (red arrow) and short buccal canal (green arrow).

▼ *Strongyloides stercoralis* third-stage filariform (L3) larvae.

Infective, third-stage filariform larvae (L3) of *Strongyloides stercoralis* are up to 600 µm long. The tail is notched and the esophagus to intestine ratio is 1:1. Infective L3 larvae are found in soil and invade the human host by direct penetration of the skin. They may be found in respiratory specimens during cases of autoinfection.



Figure A: Filariform (L3) larva of *S. stercoralis* in an unstained wet mount.

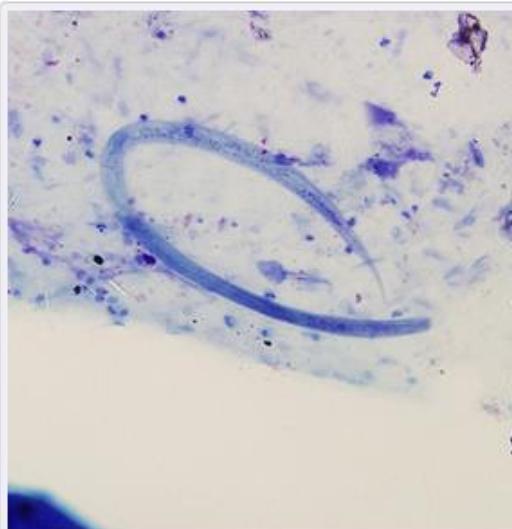


Figure B: Filariform (L3) larva of *S. stercoralis* in a sputum specimen, stained with Giemsa. Image taken at 200x magnification.

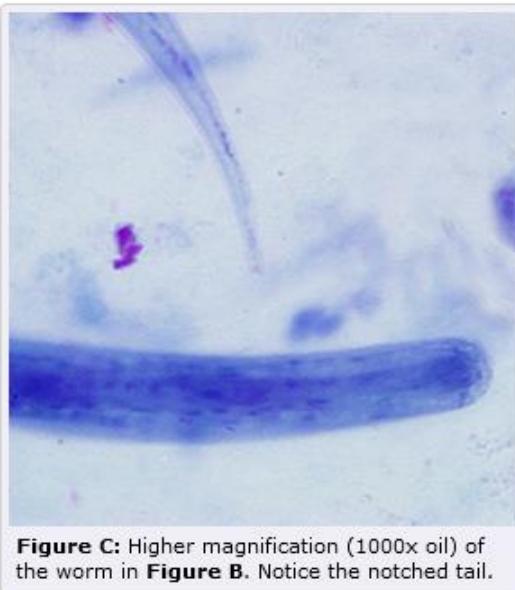


Figure C: Higher magnification (1000x oil) of the worm in **Figure B**. Notice the notched tail.

▼ *Strongyloides stercoralis* free-living adults.

Adults of *Strongyloides stercoralis* may be found in the human host or soil. In the human host there are no parasitic males, and parasitic females are long, slender and measure 2.0-3.0 mm in length. In the environment, rhabditiform larvae may develop into infective filariform (L3) larvae (direct cycle) or free-living adults that contain both males and females (indirect cycle). Free-living adult males measure up to 750 µm long; free-living females measure up to 1.0 mm long.



Figure A: Free-living adult male *S. stercoralis*. Notice the presence of the spicule (red arrow).



Figure B: Free living adult male *S. stercoralis*, showing a spicule (red arrow). A smaller, rhabditiform larva lies adjacent to the adult male.



Figure C: Adult free-living female *S. stercoralis* alongside a smaller rhabditiform larva. Notice the developing eggs in the adult female.



Figure D: Adult free-living female *S. stercoralis*. Notice the row of eggs within the female's body.

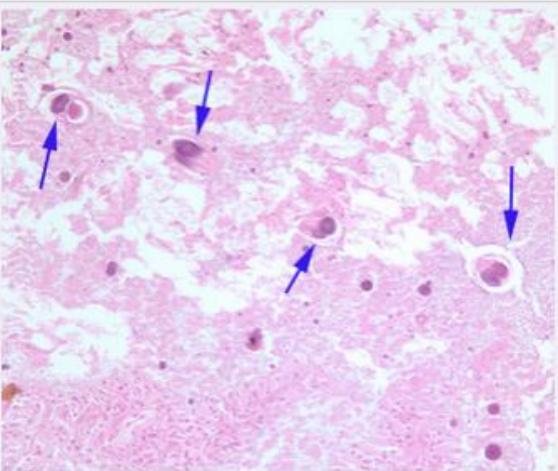


Figure A: Cross-sections of female *S. stercoralis* (blue arrows) in small intestine tissue, stained with H&E. Image taken at 200x magnification.

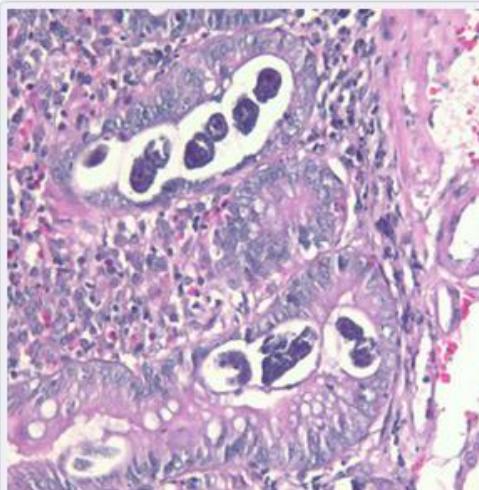


Figure B: Sections of *S. stercoralis* from a duodenal biopsy specimen, stained with H&E. Although strongyloidiasis could not be confirmed based on microscopy alone, this case was confirmed using molecular methods (PCR). Image taken at 200x magnification.

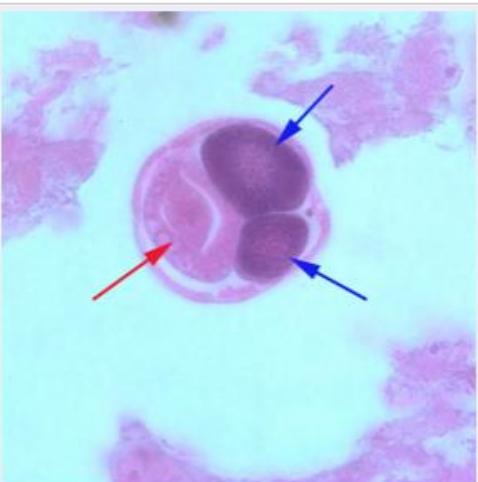


Figure C: Higher magnification (1000x oil) of a female of *S. stercoralis* from the same specimen as **Figure A**. Notice the intestine (red arrow) and ovaries (blue arrows).



Figure D: Higher magnification (1000x oil) of a gravid female of *S. stercoralis* from the same specimen as **Figure A**. Notice the intestine (blue arrow), ovary (red arrow) and an egg within the uterus (green arrow).

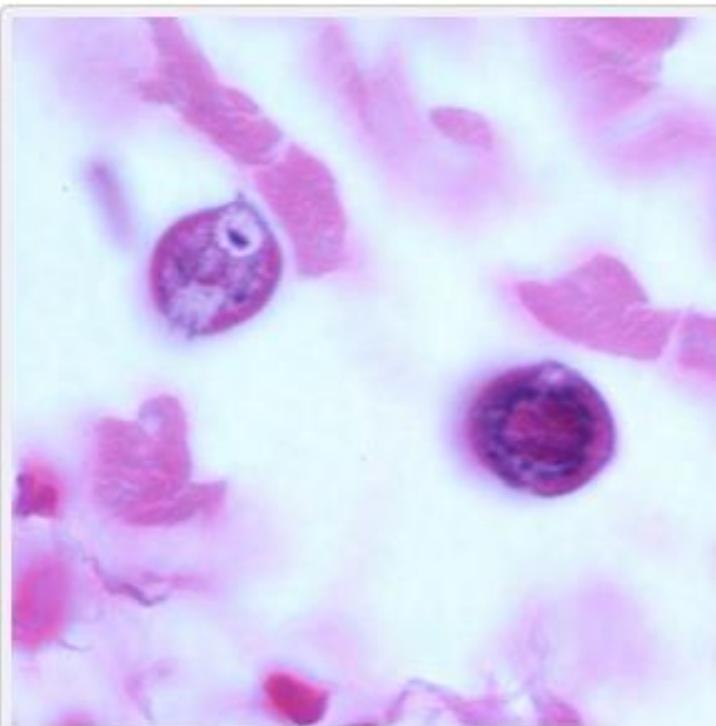


Figure E: Cross-sections of larvae of *S. stercoralis* in a intestinal biopsy specimen, stained with H&E. Image taken at 1000x oil magnification. The patient was infected with Strongyloides following transplant of an infected kidney.



Figure F: Longitudinal-section of a larva of *S. stercoralis* from the same specimen as **Figure E**. Image taken at 400x magnification.



447. Huevos de *Strongyloides fülleborni* en las heces

Strongyloides fülleborni es un nematodo intestinal frecuente en primates de África y de Asia que también se puede observar en el ser humano en varios países, entre ellos Zambia, donde el 10% de las infestaciones humanas por *Strongyloides* puede deberse a esta especie. Las infestaciones masivas por una subespecie de este nematodo, *S. fülleborni kellyi*, causan un cuadro a menudo mortal en los lactantes de las zonas meridional y central de Papúa Nueva Guinea, un país en el que no existen monos. Este trastorno, denominado «enfermedad del vientre protruyente», se caracteriza por dificultad respiratoria, distensión abdominal y edema generalizado. Como se observa en la imagen, en estos casos pueden aparecer grandes cantidades de huevos. La costumbre de las mujeres de llevar a los lactantes en el *billum* –bolsa de tejido revestida a menudo por un material empapado– facilita la autoinfestación y puede explicar las grandes cantidades de gusanos que presentan estos niños. ($\times 300$)

Pathology

The pathogenic effects begin with the entry of the infective larvae into the **skin**.

The filariform larvae cause **petechial haemorrhages** at the site of invasion accompanied by intense **pruritus, congestion and oedema**.

The larvae migrate into cutaneous blood vessels and are carried to the lungs.

In the lungs they enter the alveoli and pass up the respiratory tree, where they may be delayed by the host response, become adults and invade the bronchial epithelium.

Passing through the lungs the young worms may cause symptoms resembling those of **bronchopneumonia with some lobular consolidation**.

i. Acute infection with Loeffler's syndrome

Pathology

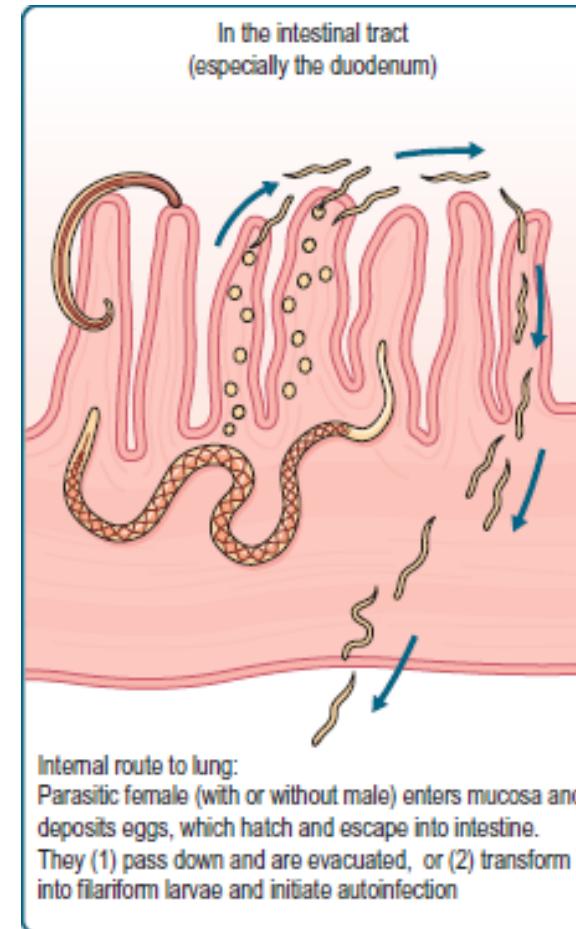
When they have become lodged in ***crypts in the intestine*** the females mature and **invade the tissues of the bowel wall** but rarely penetrate the **muscularis mucosae**, and move in tissue channels beneath the villi, where the **eggs are deposited**.

The eggs hatch out and first-stage larvae work towards the lumen of the bowel and are passed out in faeces.

ii. Chronic intestinal infection

iii. Asymptomatic autoinfection;

iv. Symptomatic autoinfection;



Pathology

In heavy infections, the first-stage larvae, instead of passing out in the faeces, develop in the intestine, bore into the wall of the duodenum and jejunum and develop to the adult stage, producing ova, while encysted in the bowel.

From here they spread throughout the lymphatic system to the mesenteric lymph glands and can enter the general circulation and be found in the liver, lungs, kidneys and gallbladder wall.

The ileum, appendix and colon are sites of reinvasion and here the worms cause **granulomas** with a central necrotic area often containing a degenerate larva. The mesenteric glands may be similarly affected.

The lungs may show abscesses and the liver may be enlarged with small pinpoint larval **granulomas**. The larvae may carry micro-organisms and an overwhelming septicaemia caused by *Escherichia coli* has been caused in this way. In light infections jejunal biopsy has shown oedema, cellular infiltration and eosinophilic infiltration of the mucosa with partial villous atrophy. At post-mortem, ulceration and atrophy of the mucosa are seen with numerous adult worms in the wall of the duodenum and jejunum. At times filariform larvae fail to break out of the alveoli, gain access to the general circulation and can invade the **brain**, intestine, lymph glands, liver, lungs and, rarely, myocardium.

v. hyperinfection syndrome (HS) with dissemination (DS)

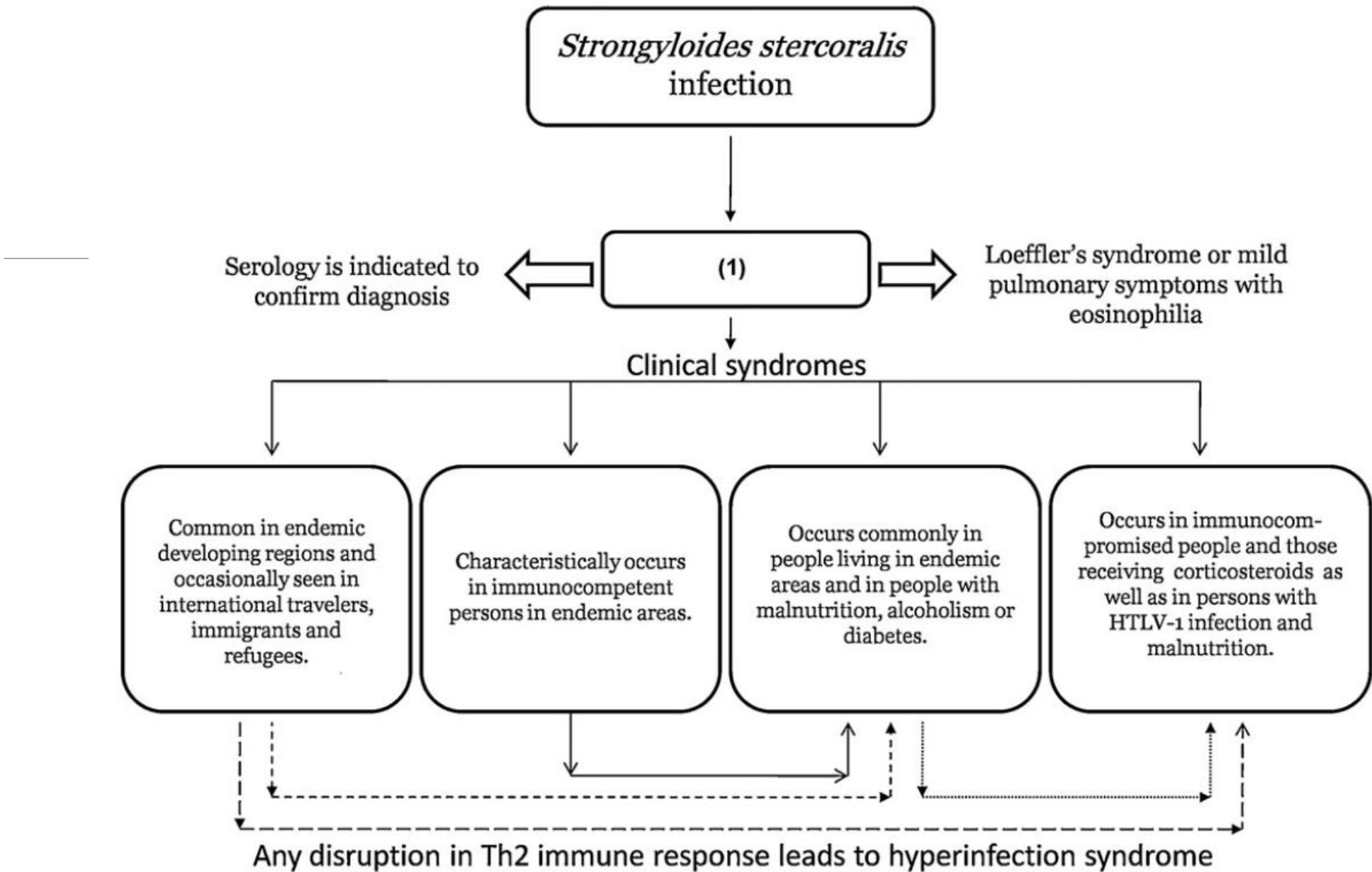
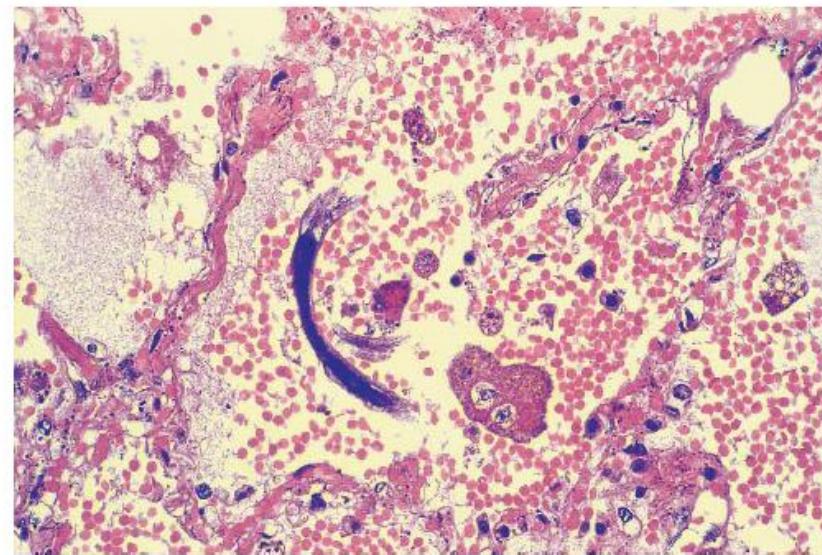


Figure 1 Clinical syndromes of *Strongyloides stercoralis* infection.



445. Neumonía hemorrágica en la infestación diseminada por *Strongyloides stercoralis*

La radiografía de tórax muestra una infiltración intersticial y alveolar, bilateral y confluyente.



446. Corte histológico del pulmón de un paciente con infestación diseminada por *Strongyloides stercoralis*

En la autopsia, los pulmones del paciente cuya radiografía de tórax se muestra en 445 presentaban una neumonía hemorrágica con engrosamiento de las paredes alveolares, infiltración inflamatoria con eritrocitos y eosinófilos, y fragmentos de larvas filariformes en el interior de los alvéolos (en la imagen). En algunos casos no se observan eosinófilos en este proceso, que causa una mortalidad del 50 al 75% de los casos incluso con tratamiento antihelmíntico intensivo. (Hematoxilina y eosina, $\times 100$)



444. Aspecto del colon en la autopsia

La administración incidental de esteroides y de fármacos inmunosupresores puede potenciar de manera importante la infestación por *Strongyloides stercoralis*, que puede llegar a causar la muerte del paciente, como en el caso de la imagen. Se pueden observar ulceraciones múltiples y engrosamiento de la pared del colon. También hay pruebas de que la infección simultánea por HTLV1 se puede asociar a un incremento en la cantidad de larvas en las heces, posiblemente debido a la supresión de la respuesta IgE normal frente a los helmintos.

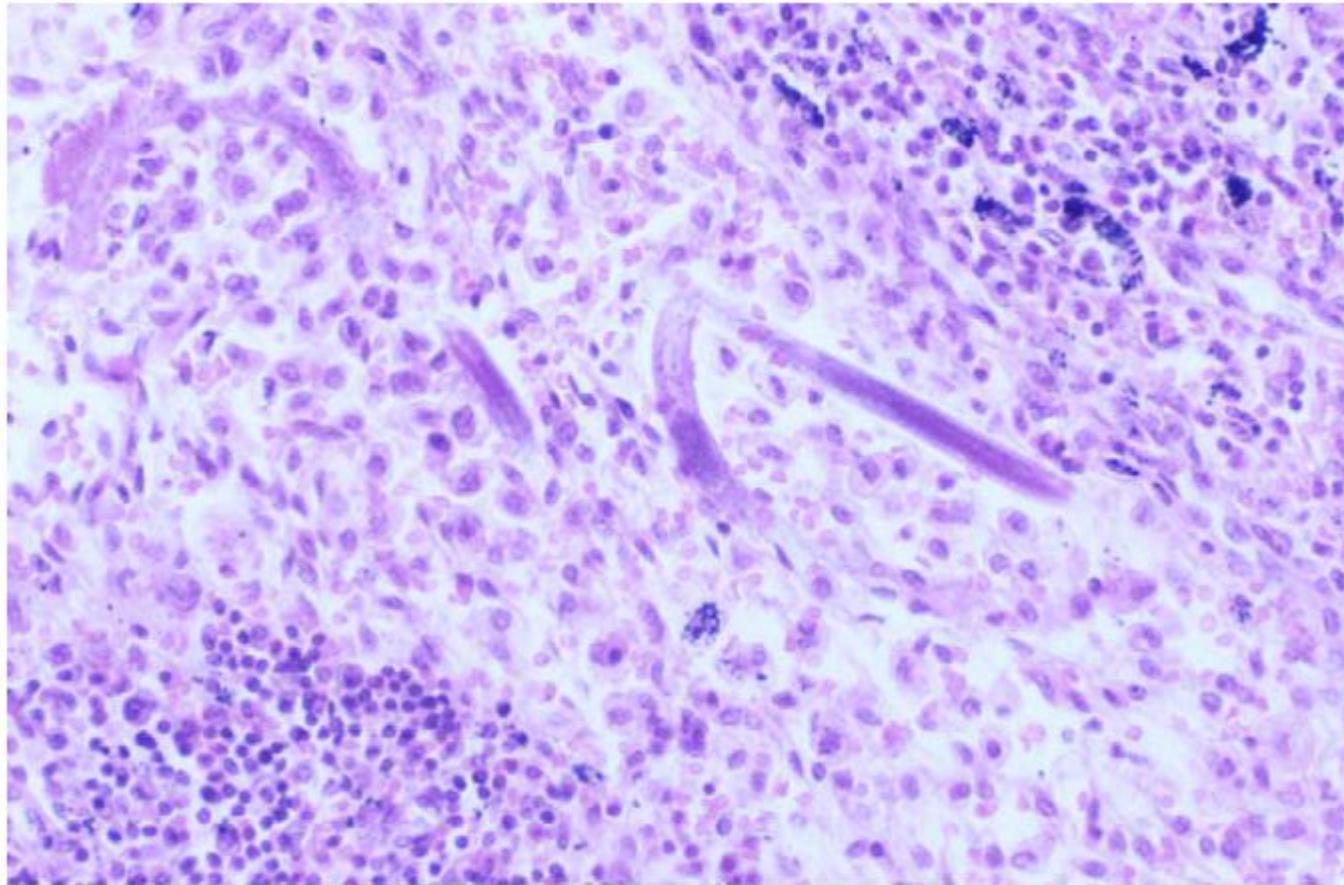


Figura 1. Ganglio linfático con larvas de *Strongyloides stercoralis*.

**Síndrome de hiperinfección por *Strongyloides stercoralis*
en un paciente colombiano con tratamiento inmunosupresor**

Enferm Infect Microbiol Clin.2009;27(7):425–434

Respuesta inmune

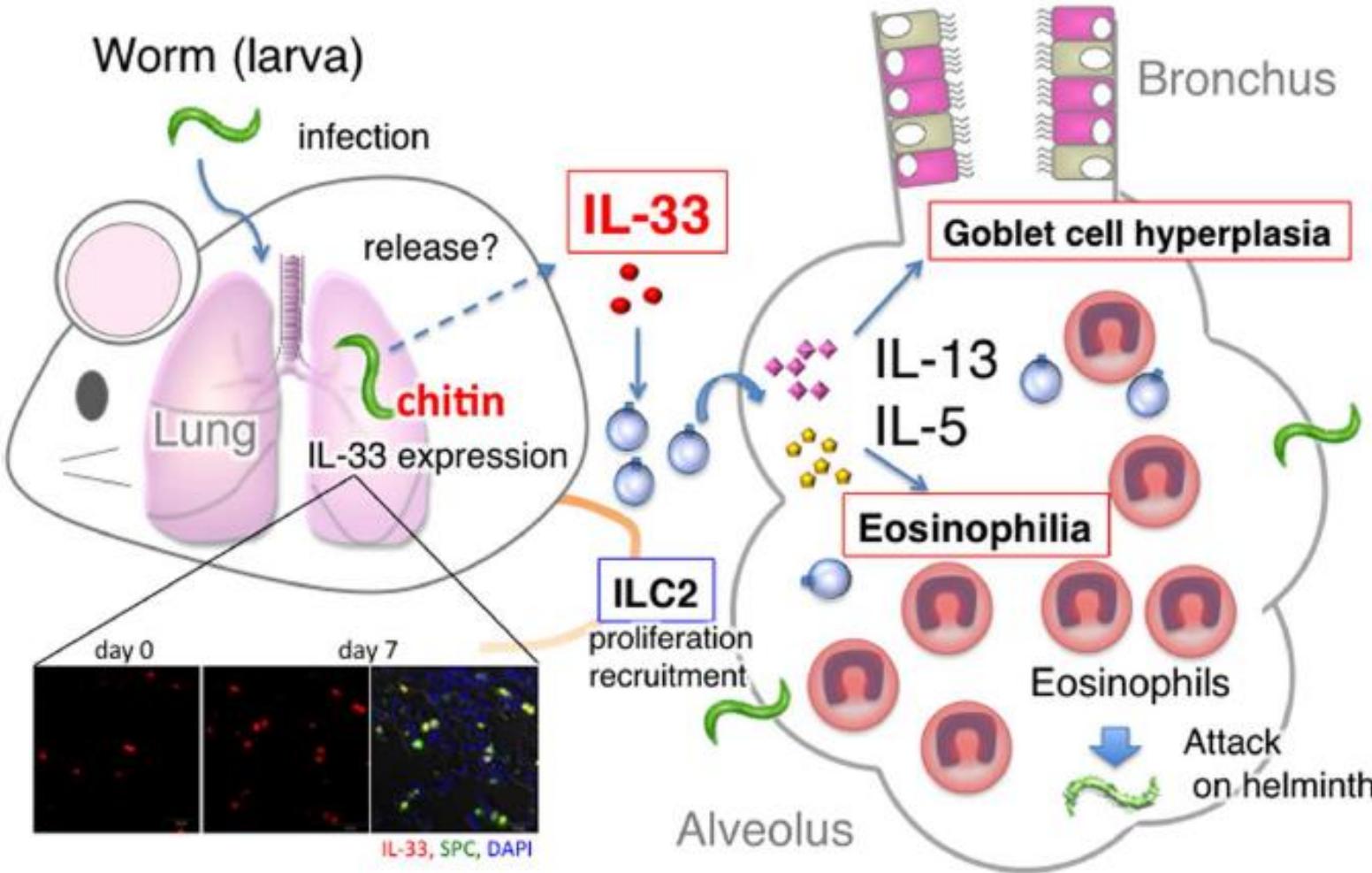


FIGURE 1 | Summary of host protective pulmonary eosinophilia.
S. venezuelensis infection of $Rag2^{-/-}$ mice induced severe eosinophilic inflammation, goblet cell hyperplasia, and accumulation of ILC2, and increased the number of IL-33 producing type II alveolar epithelial (ATII) cells. First, IL-33 from ATII cells induced and activated ILC2 to produce IL-5 and IL-13. Then, IL-5 and IL-13 in combination induced severe pulmonary eosinophilia. And, perhaps, these eosinophils, increase their capacity to kill helminth after stimulation with IL-33.

Images in Clinical Tropical Medicine

Strongyloides Pneumonia

Juan Carlos Cataño* and Miguel Alejandro Pinzón

Professors of Medicine, Infectious Diseases Section, Internal Medicine Department,
University of Antioquia Medical School, Medellín, Colombia

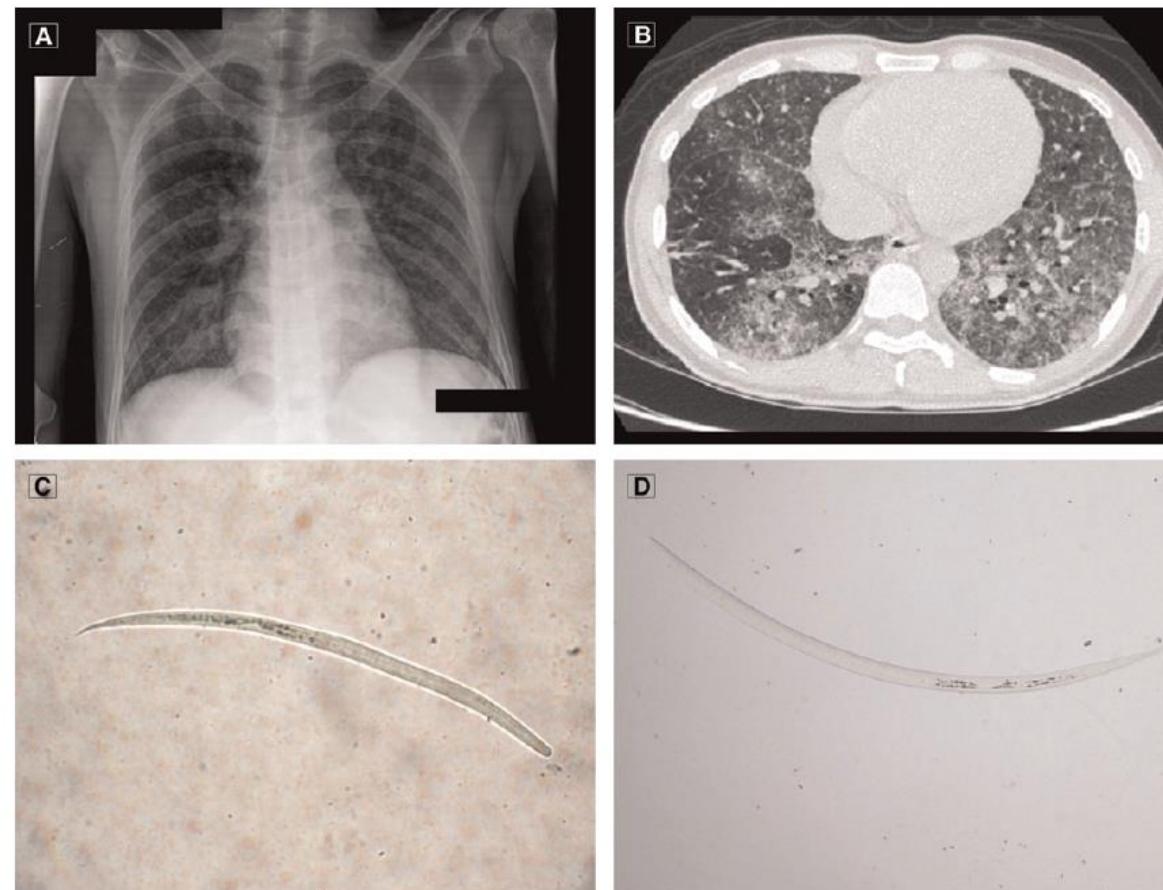
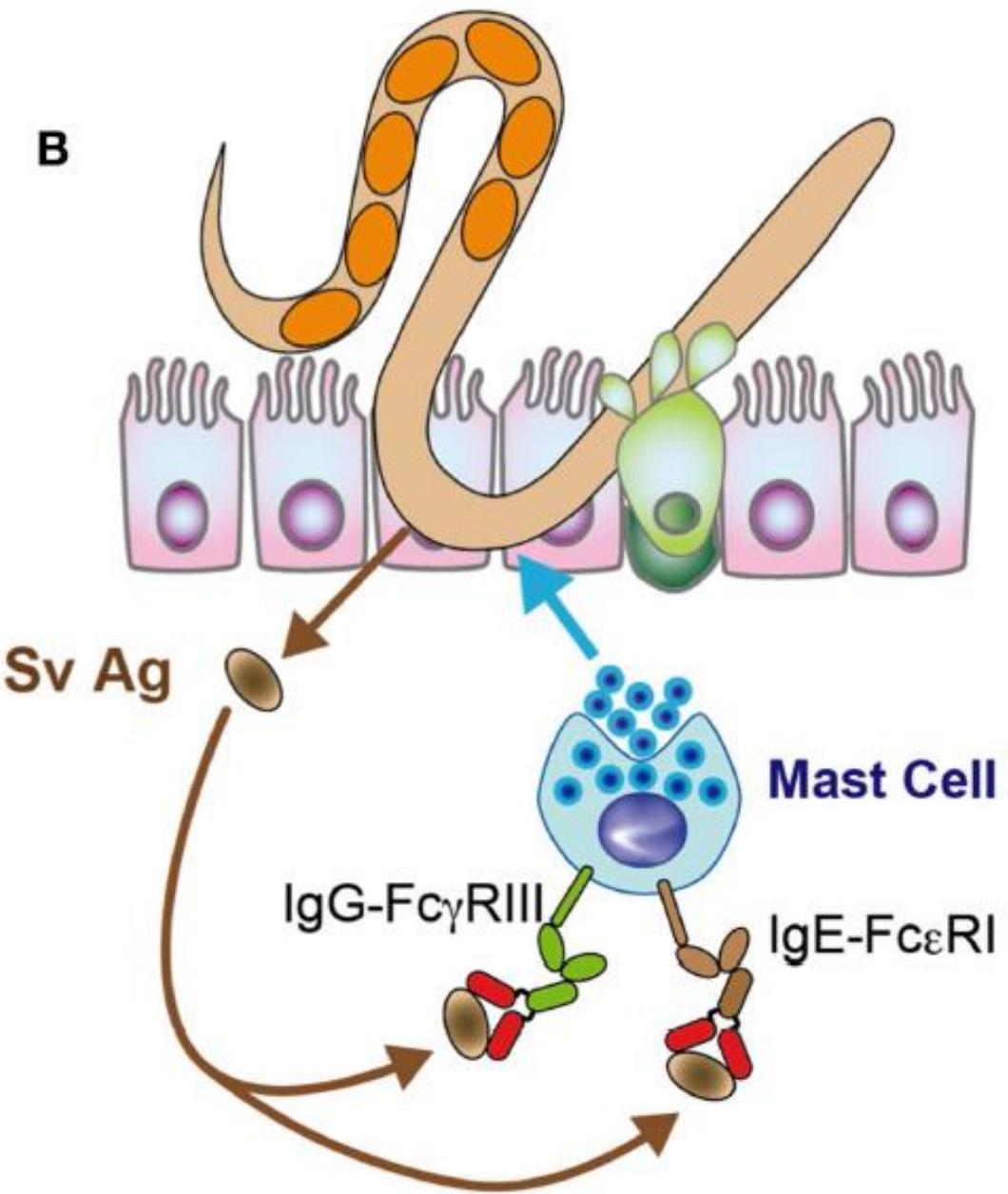


FIGURE 1. (A) Chest x-rays showing interstitial bilateral infiltrates. (B) High-resolution computed tomography scan showing bilateral ground-glass opacities. (C, D) Bronchoalveolar lavage with multiple *Strongyloides stercoralis* rhabditiform larvae.



Respuesta inmune

FIGURE 2 | IgG and IgE collaboratively accelerate expulsion of *S. venezuelensis* infection. | (A) To examine which classes of Igs are able to induce worm expulsion. We injected IgG Fr (1.8 mg), IgE Fr (5 μ g), or a mixture of IgG Fr (1.8 mg) and IgE Fr (5 μ g) into AID $^{-/-}$ mice on day 7 after infection with 4,000 L3, and adult worms were recovered at day 8. As shown here, IgG and IgE reduced worm burdens collaboratively. (B) Hypothetical mechanism of IgG- and IgE-mediated worm expulsion.

Clinical Features

Natural History.

In the majority of cases a small population of adult worms maintains itself in the **small intestine for many years (≥ 30)** in the absence of any further infection from the outside causing recurrent symptoms when filariform larvae enter the perianal skin, and cause a recurrent rash – ‘larva currens’ – associated with urticaria. In a small minority of cases the defences of the body break down and a generalized severe infection ensues.

Incubation Period.

The prepatent period from infection to the appearance of rhabditiform larvae in the stools is **one month.**

Tabla 3. Síntomas y signos físicos de la estrongiloidiasis

Aguda

- Larva currens (signo más característico)
- Prurito (habitualmente en los pies)
- Sibilancias/tos/febrícula
- Dolor epigástrico
- Diarrea/náuseas/vómitos

Crónico (habitualmente resultado de la autoinfección)



- Larva currens (signo más característico)
- Dolor epigástrico
- Asintomático o molestias abdominales vagas
- Diarrea Intermitente (alternando con constipación)
- Náuseas y vómitos ocasionales
- Pérdida de peso (si la infestación es mayor)
- Erupciones cutáneas recurrentes (urticaria)

Figure 55.18 Skin rash (larva currens) of *Strongyloides stercoralis*.

Tabla 3. Síntomas y signos físicos de la estrongiloidiasis

Severo (habitualmente como resultado de una hiperinfección o una infección diseminada)

- Instalación insidiosa
 - Diarrea (ocasionalmente sanguinolenta)
 - Dolor abdominal severo, náuseas y vómitos
 - Tos, sibilancias, síndrome funcional respiratorio
 - Rigidez cervical, cefaleas, confusión (meningismo)
 - Erupción cutánea (petequias, púrpura)
 - Fiebre, escalofríos
-

Fulminant gastrointestinal hemorrhage due to *Strongyloides stercoralis* hyperinfection in an AIDS patient

***Valdes Roberto Bollela^[1], Cinara Feliciano^[1], André Costa Teixeira^[2],
Ana Carolina Ribeiro Junqueira^[1] and Marcos Antonio Rossi^[2]***

[1]. Divisão de Moléstias Infecciosas e Tropicais, Departamento de Clínica Médica, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP. [2]. Departamento de Patologia e Medicina Legal, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP.

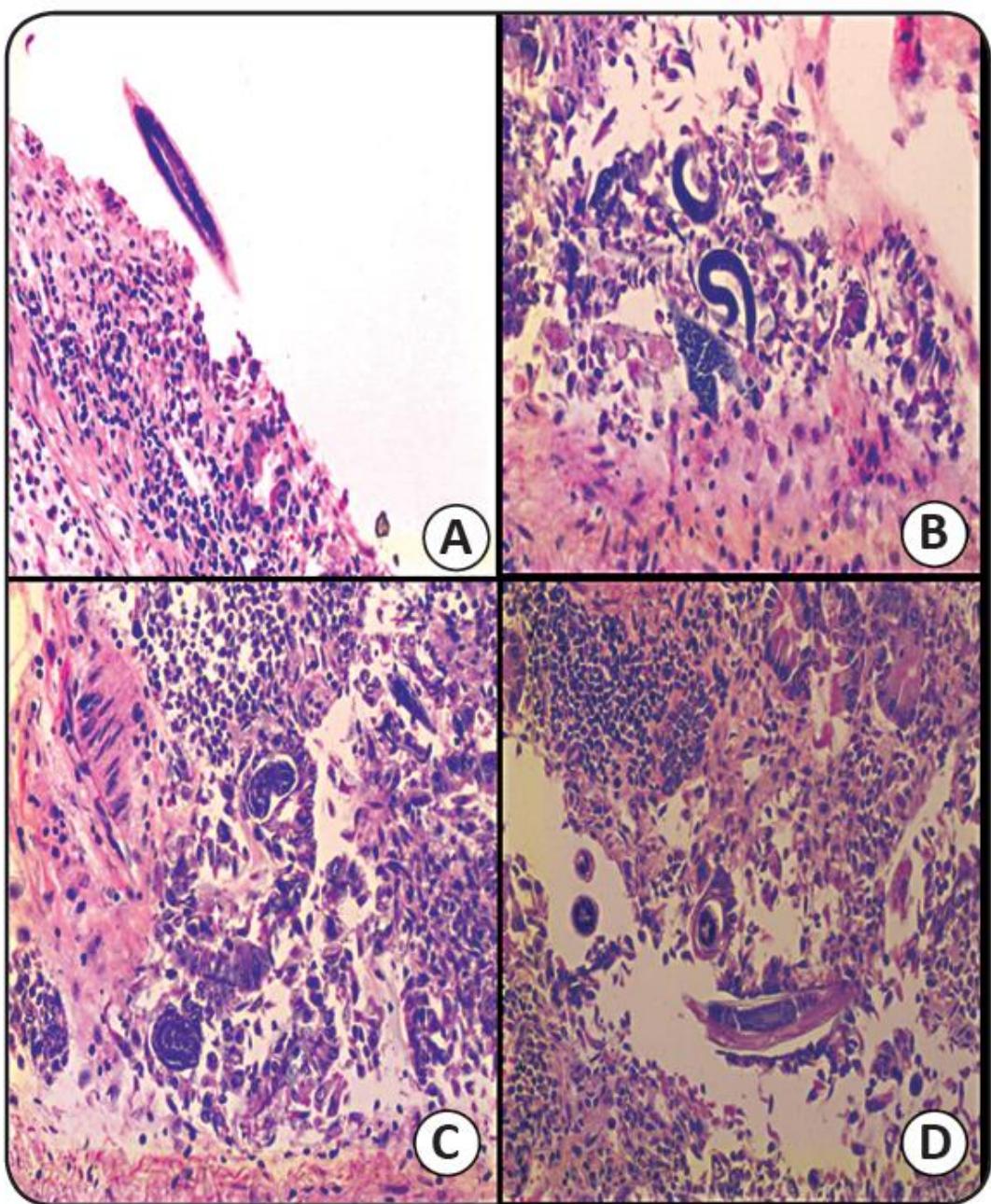


FIGURE 1 - *Strongyloides* worms in the gastroduodenal transition presented in different stages of maturation (A,B,C and D), associated with an intense inflammatory reaction and ulcerative mucosa.

Rev Soc Bras Med Trop 46(1):111-113, Jan-Feb, 2013

Case Report

***Strongyloides stercoralis* Infection in Kidney Transplant Recipients**

Baha A. Abdalhamid, Abdul Naser M. Al Abadi, Mohammed I. Al Saghier, Amani A. Joudeh,
Mahmoud A. Shorman, Samir S. Amr

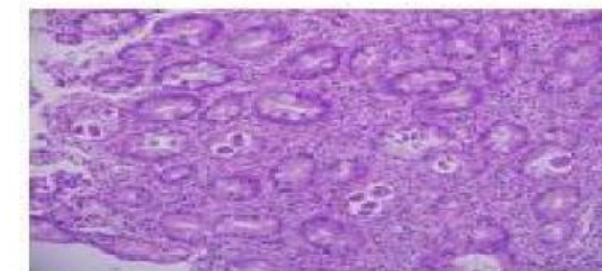
Department of Pathology and Laboratory Medicine, Multi-Organ Transplant Center, Department
of Internal Medicine, King Fahad Specialist Hospital, Dammam, Saudi Arabia



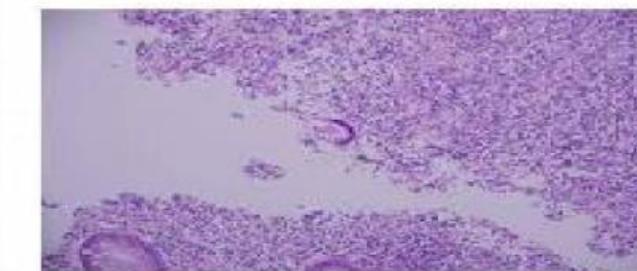
A



B



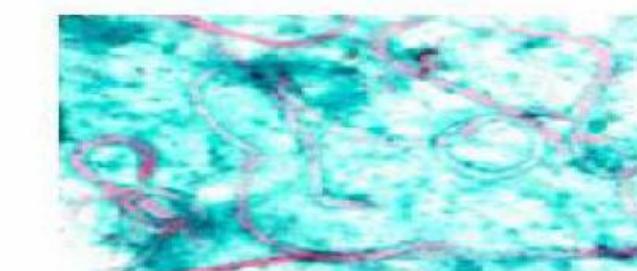
C



D



E



F



Review

Transplantation and tropical infectious diseases

Carlos Franco-Paredes ^{a,b,*}, Jesse T. Jacob ^a, Alicia Hidron ^a, Alfonso J. Rodriguez-Morales ^c, David Kuhar ^a, Angela M. Caliendo ^a

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Table 1

Overall screening recommendations for tropical infections in transplant donors/recipients

Comprehensive medical history, history of travel, residence, occupation, animal exposure is critical to have a suspicion of latent or active tropical infectious diseases^a. Laboratory values (eosinophilia, elevated liver enzymes, and other parameters) can help to assess the risk for latent or active tropical parasitic, viral, bacterial, or fungal infections.

Indications of screening for strongyloidiasis and schistosomiasis in donors and recipients should be based on having a history of travel or residence in an endemic area; having a history of eosinophilia or a history of unexplained gastrointestinal symptoms.

Screening for *Trypanosoma cruzi* infection should be based on having a history of travel or residence in an endemic area, or having cardiac or gastrointestinal symptoms that may suggest Chagas disease.

Serologic testing for viral infections, particularly HTLV-1 and dengue, should be considered when there is a clinical suspicion or if the patient has resided in a highly endemic area.

Blood cultures, peripheral blood smears (*T. cruzi* infection, malaria), cultures of respiratory specimens (penicilliosis), serologic testing (strongyloidiasis or schistosomiasis), and biopsies of lymph nodes (paracoccidioidomycosis) or affected tissues (free-living pathogenic amoebas) may be useful for diagnosis of tropical infections in transplant recipients depending on clinical history and previous epidemiologic exposures.

^a Some of these are for screening for elective organ transplantation and some should be considered as diagnostic testing for those who have received transplantation and who may be suffering from a tropical infectious disease.

RESEARCH ARTICLE

Open Access

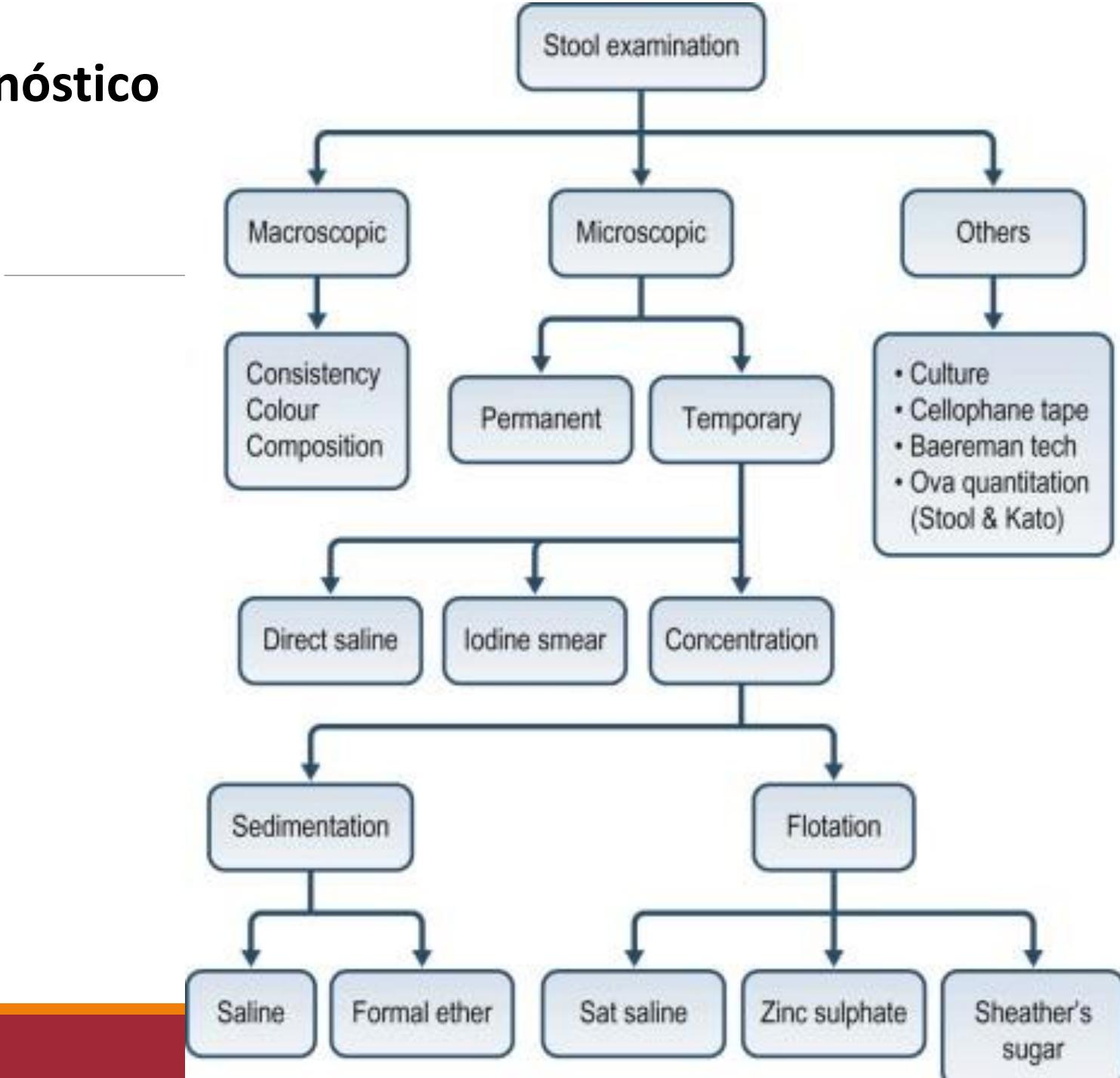
Severe strongyloidiasis: a systematic review of case reports

Dora Buonfrate^{1*}, Ana Requena-Mendez², Andrea Angheben¹, Jose Muñoz², Federico Gobbi¹, Jef Van Den Ende³ and Zeno Bisoffi¹

Table 1 Patients under steroid treatment: reasons for prescription

Condition	N (%)	References
COPD/asthma/lung fibrosis	30 (18.3)	[48,49,52,57-59,68,99,101,118,121,123,128,137,146,153,180-183,185,187,188,192-196]
Leukemia/lymphoma	13 (7.9)	[9,17,23,25,37,47,56,98,111,126,162,186]
SLE	9 (5.5)	[41,64,66,86,151,176,197,198]
Rheumatoid arthritis	4 (2.4)	[83,103,199,200]
IBD	6 (3.6)	[59,147,148,164,177,201]
Sarcoidosis	2 (1.2)	[65,132]
Cancer	8 (4.8)	[30,54,93,97,112,160,169,202]
Organ/bone marrow transplant	25 (15.2)	[21,25,29,31,39,48,51,54,60,70,71,74,76,81,87,88,90,92,94,142,145,150,184]
Glomerulonephritis/CRI	6 (3.6)	[16,18,20,129,130,154]
"Idiopathic" eosinophilia	3 (1.8)	[7]
Multiple myeloma/myelodisplasia	6 (3.6)	[72,185,203-206]
Aspecific symptoms	2 (1.2)	[85,166]
Other clinical conditions	46 (28)	[17,22,34,36,54,59,66,84,89,100,102,110,113,124,125,127,133-135,140,155,159,171-174,207-213]
HIV-related opportunistic infections/IRIS	4 (2.4)	[24,26,36,105]

Diagnóstico





440. Larvas rabditiformes de *Strongyloides stercoralis* en las heces

La figura muestra larvas rabditiformes que generalmente constituyen la única fase que se observa en las heces. Los huevos, que no se suelen detectar, son similares a los de los anquilostomas, aunque contienen larvas en fase de maduración. Las larvas de *Strongyloides stercoralis* se pueden diferenciar fácilmente (por sus movimientos activos y de tipo serpenteante) de las larvas de los anquilostomas, que en ocasiones son incubadas en heces que se han mantenido durante un cierto tiempo. ($\times 60$) (V. también 452.)

Strongyloides stercoralis infection complicating the central nervous system

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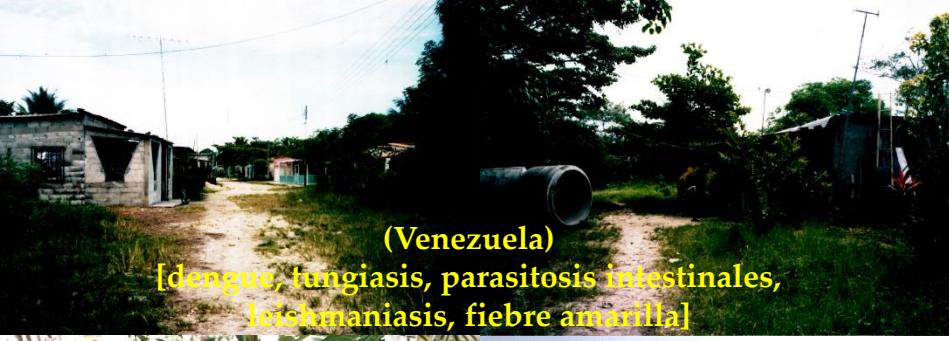
²Infectious Disease Division, Department of Internal Medicine, University of Texas Medical Branch, Galveston, TX, USA

Diagnosis of *Strongyloides stercoralis*

Diagnostic method	Sensitivity	Specificity	Price	Comments
Stool examination	+	+++++	+	Repeated samples for higher sensitivity
Modified Baermann	++	+++++	++	Rarely available
Stool culture	+++	+++	+++	Time consuming.
ELISA	++++	++++	++++	Past and current infections are not differentiated
PCR	+++++	+++++	+++++	Not available in all settings

TABLE
55.1**Recommended Treatments for Soil-Transmitted Helminths. Note All Treatment are Administered Orally**

Infection	Drugs	Dose	Duration
HOOKWORM			
Drugs of choice	Albendazole Mebendazole	400 mg 500 mg	Single dose Single dose ^b
Alternatives	Pyrantel pamoate Levamisole	10 mg/kg 150 mg or 2.5 mg/kg	Daily for 3 days Single dose
HOOKWORM-RELATED CUTANEOUS LARVA MIGRANS			
Drugs of choice	Albendazole	400 mg	Daily over 3–7 days to reduce recurrence
	Ivermectin Thiabendazole	200 µg/kg Topical application	Single dose Daily over 5–7 days
STRONGYLOIDES			
Drug of choice	Ivermectin	200 µg/kg	Single dose repeated after 1 week or daily for 3 days
Alternatives	Albendazole Mebendazole	400 mg 500 mg	Daily for 3 days repeated 2 weeks later Single dose



Prevención y Control

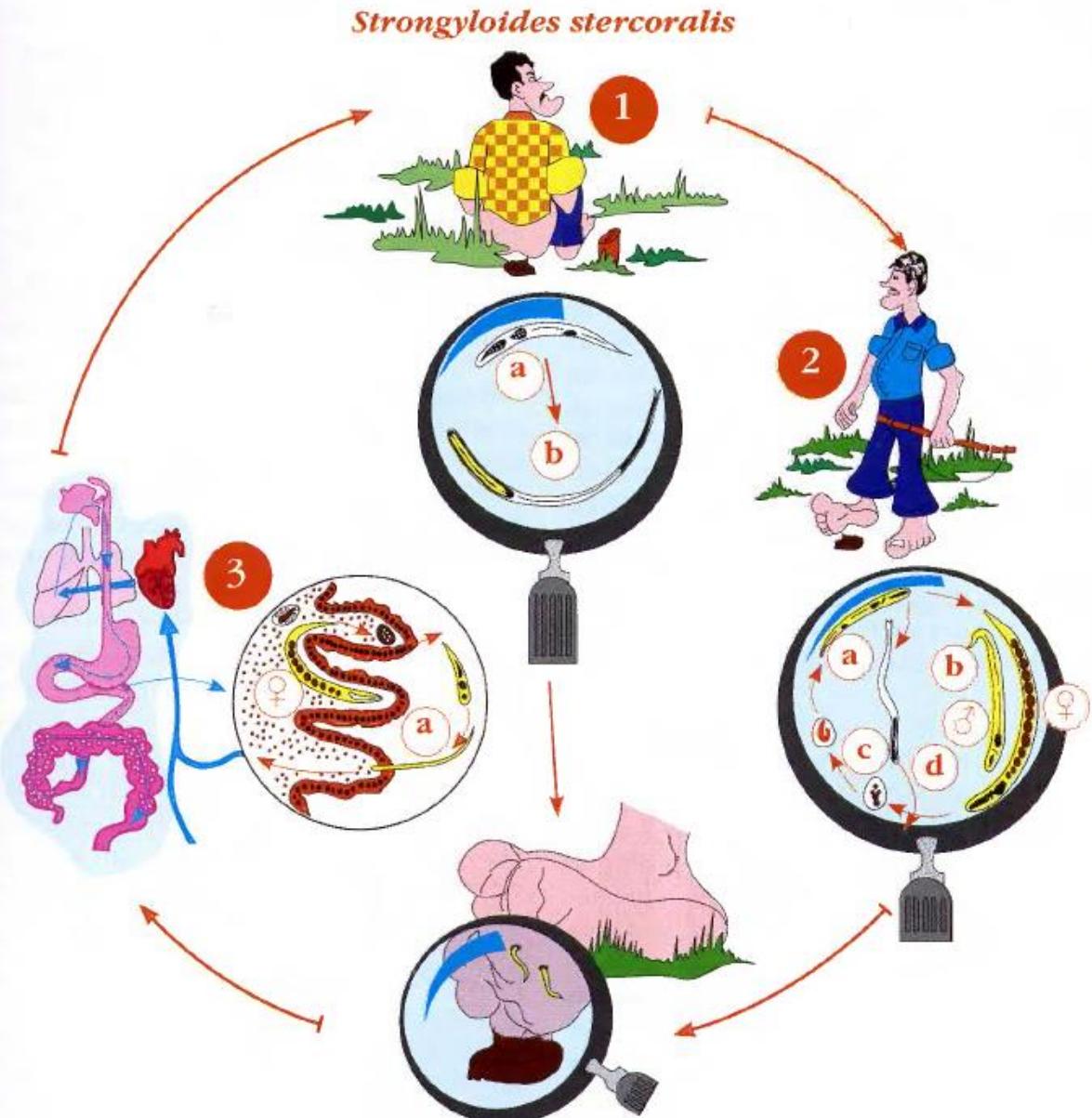


Figure 1.1 A Model of the Determinants of Health

Ambientes de Riesgo (ej. Agricultura y Ganadería en zonas endémicas de parasitosis sistémicas o intestinales: Chagas, Fasciola, Equinococosis, Cisticercosis)

Menor capacidad de prevención, Higiene y sanidad
Oportunidades de Empleo

Calidad de la Dieta
Nutrición
Inmunidad

Susceptibilidad
Genética
+ Endemicidad

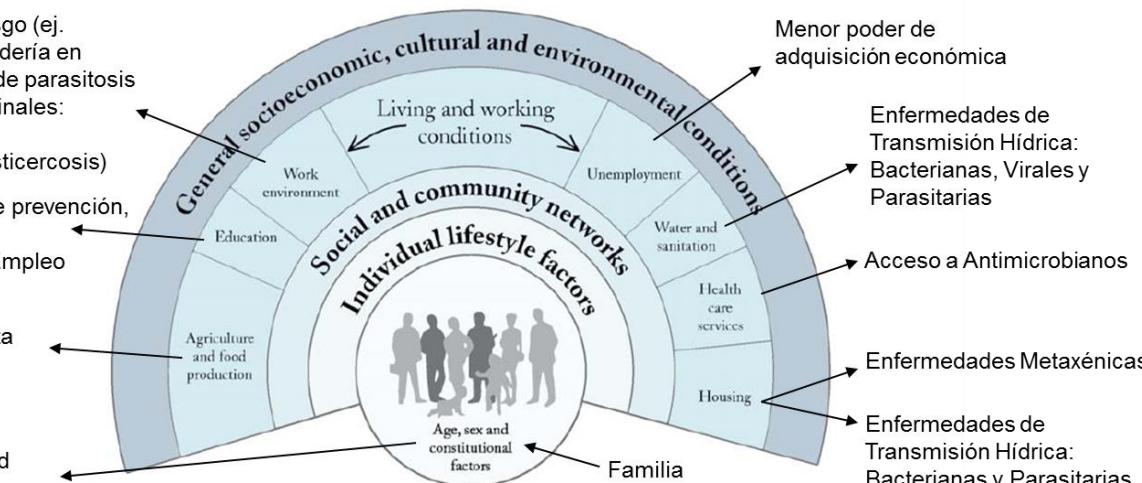


Figure shows one influential model of the determinants of health that illustrates how various health-influencing factors are embedded within broader aspects of society.

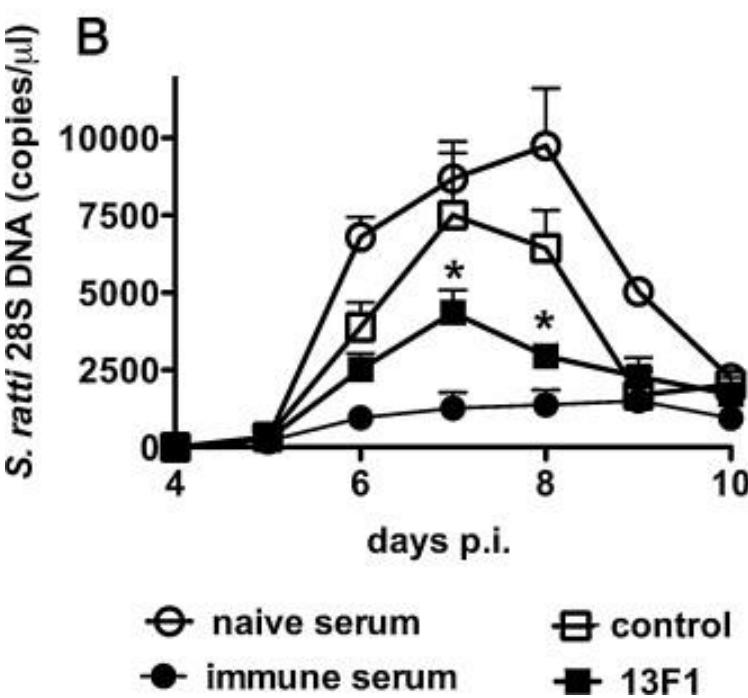
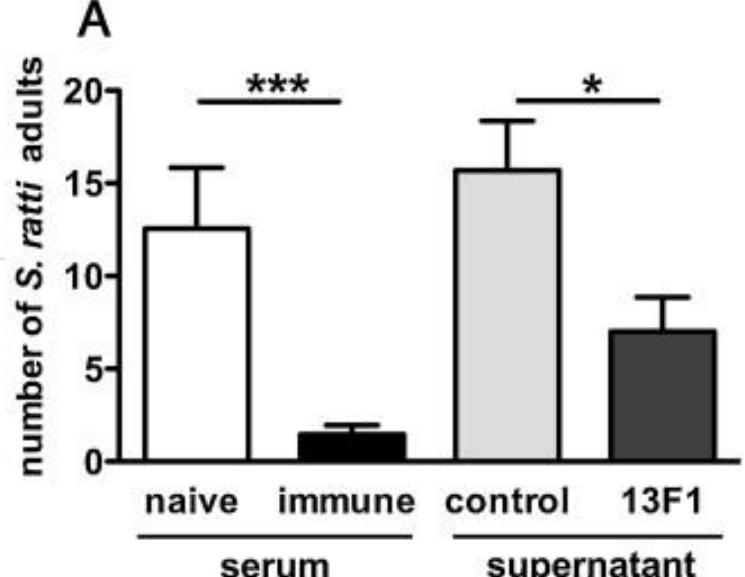
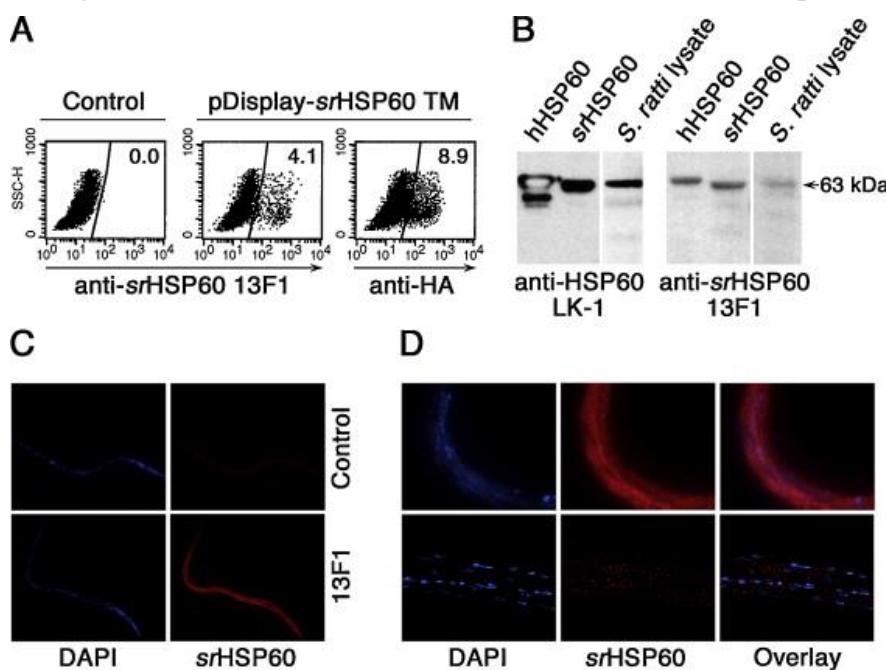
Source: Dahlgren, G. and Whitehead, M. (1991). Policies and Strategies to Promote Social Equity in Health. Stockholm: Institute for Futures Studies.



Passive immunization with a monoclonal IgM antibody specific for *Strongyloides ratti* HSP60 protects mice against challenge infection

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Conclusiones

- ❖ Patología de gran importancia, la cual a pesar de su frecuencia, no es objeto de vigilancia epidemiológica en Colombia y en otros países
- ❖ Alta frecuencia en población inmunosuprimida
- ❖ Clínicamente, pensar en los diagnósticos diferenciales, pero también en presentaciones atípicas que pueden complicarse, e incluso ser fatales
- ❖ Necesidad de incrementar la investigación epidemiológica en la región y el país

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