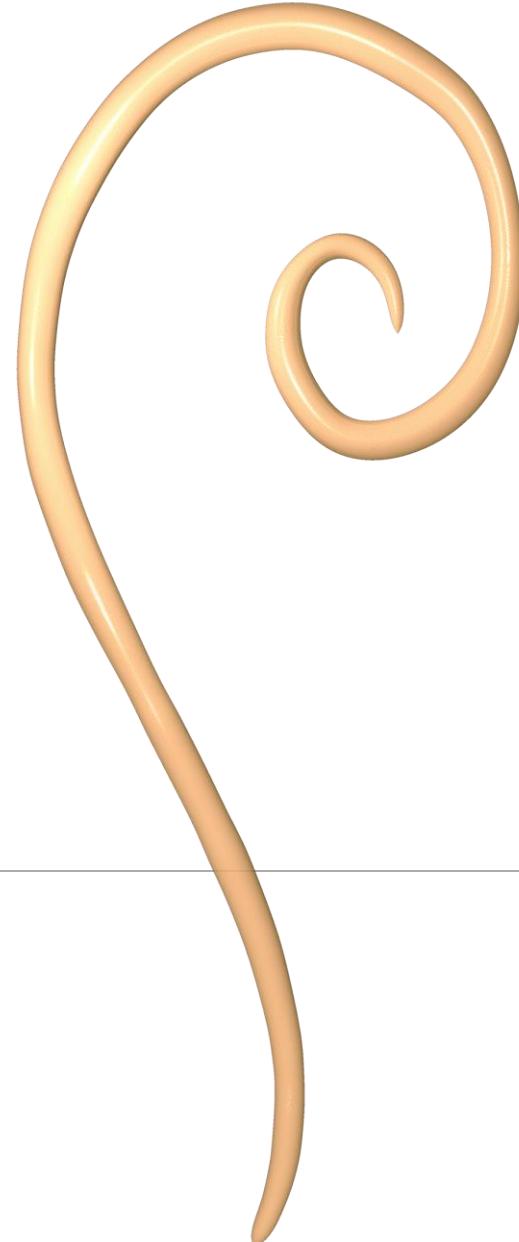


Ascariasis

PROF. ALFONSO J. RODRÍGUEZ-MORALES

PARASITOLOGÍA GRUPOS 4 Y 5

SEMESTRE I-2015



Phylum

Classes

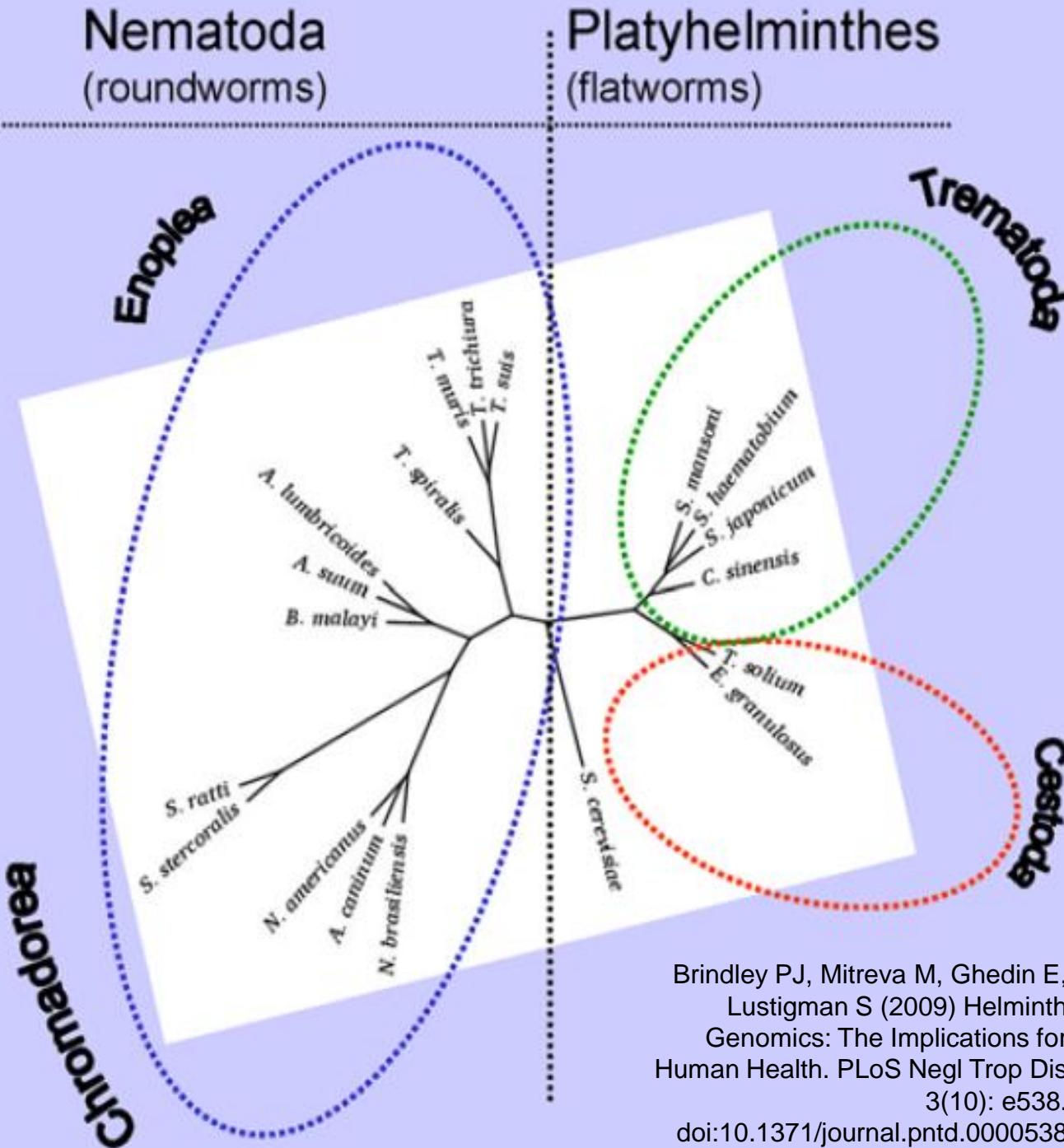


Figure 2. Phylogeny of the major taxa of human helminths—nematodes and platyhelminths—as established by maximum likelihood (ML) analysis of 18S ribosomal RNA from 18 helminth species.

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

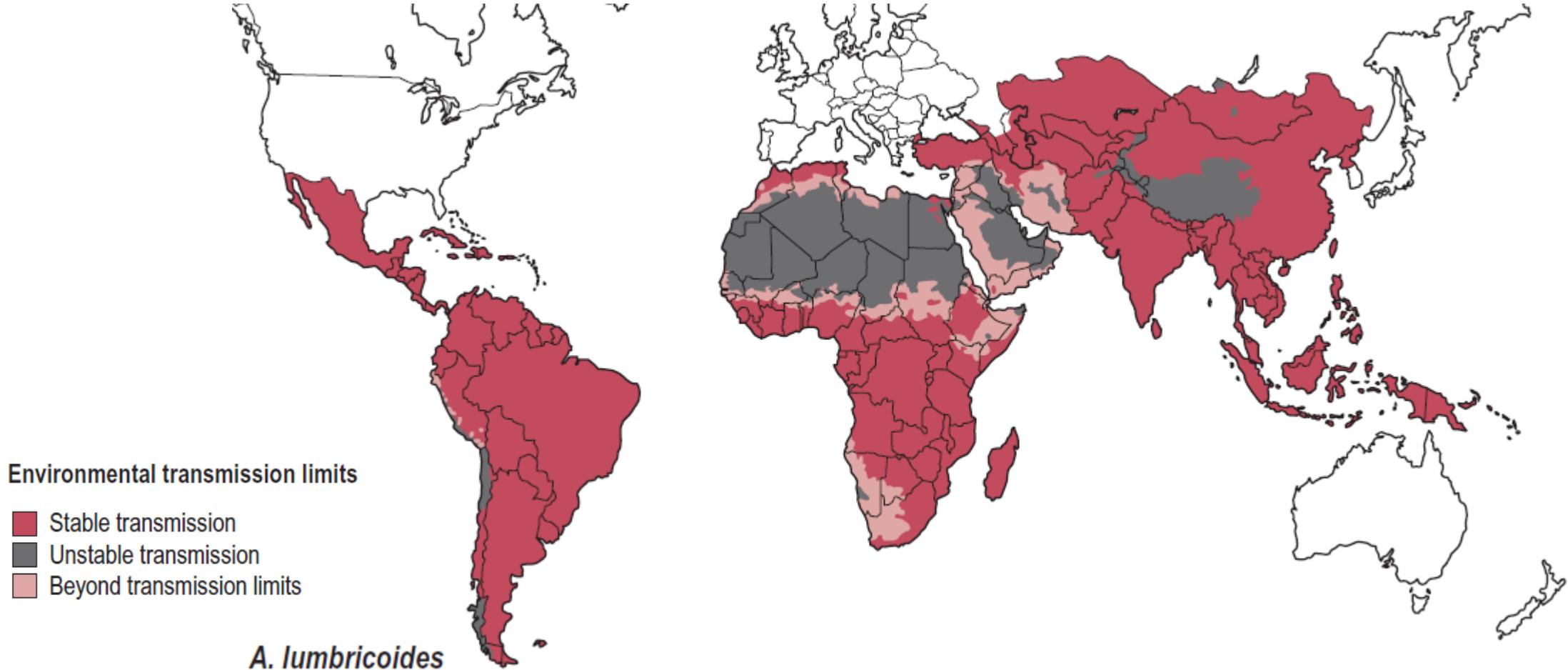
Introducción a las Geohelmintiasis

Helmintiasis como NTDs (Enfermedades Desatendidas u Olvidadas)

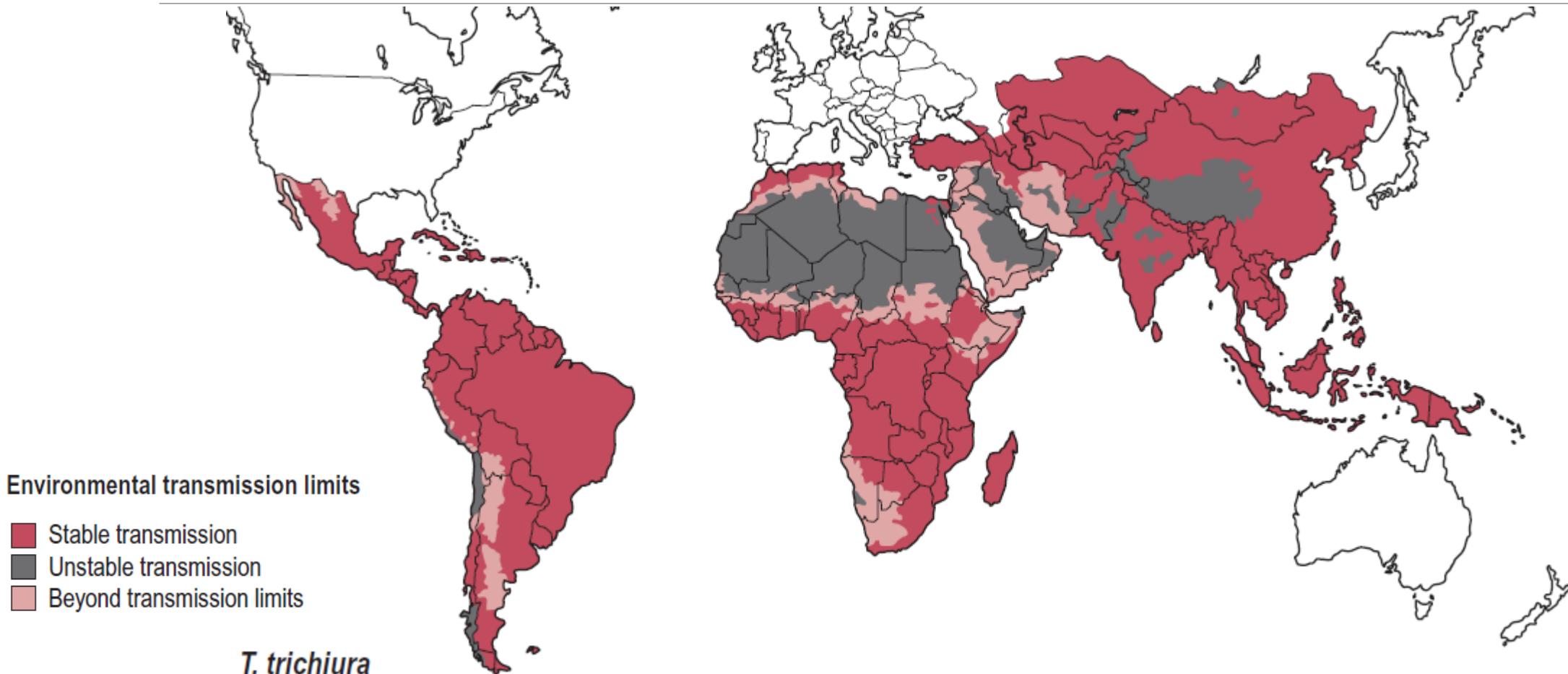
- Enfermedades Olvidadas, Desatendidas, de la Pobreza (*neglected tropical diseases*)
 - 13 infecciones bacterianas y parasitarias:
 - 1. Ascariasis
 - 2. Anquilostomiasis
 - 3. Trichuriasis
 - 4. **Filariasis linfática**
 - 5. **Oncocercosis**
 - 6. **Dracunculiasis**
 - 7. **Esquistosomiasis**
 - 8. Enfermedad de Chagas
 - 9. Tripanosomiasis Africana Humana
 - 10. Leishmaniasis
 - 11. Ulcera de Buruli
 - 12. Lepra (Enf. de Hansen)
 - 13. Tracoma



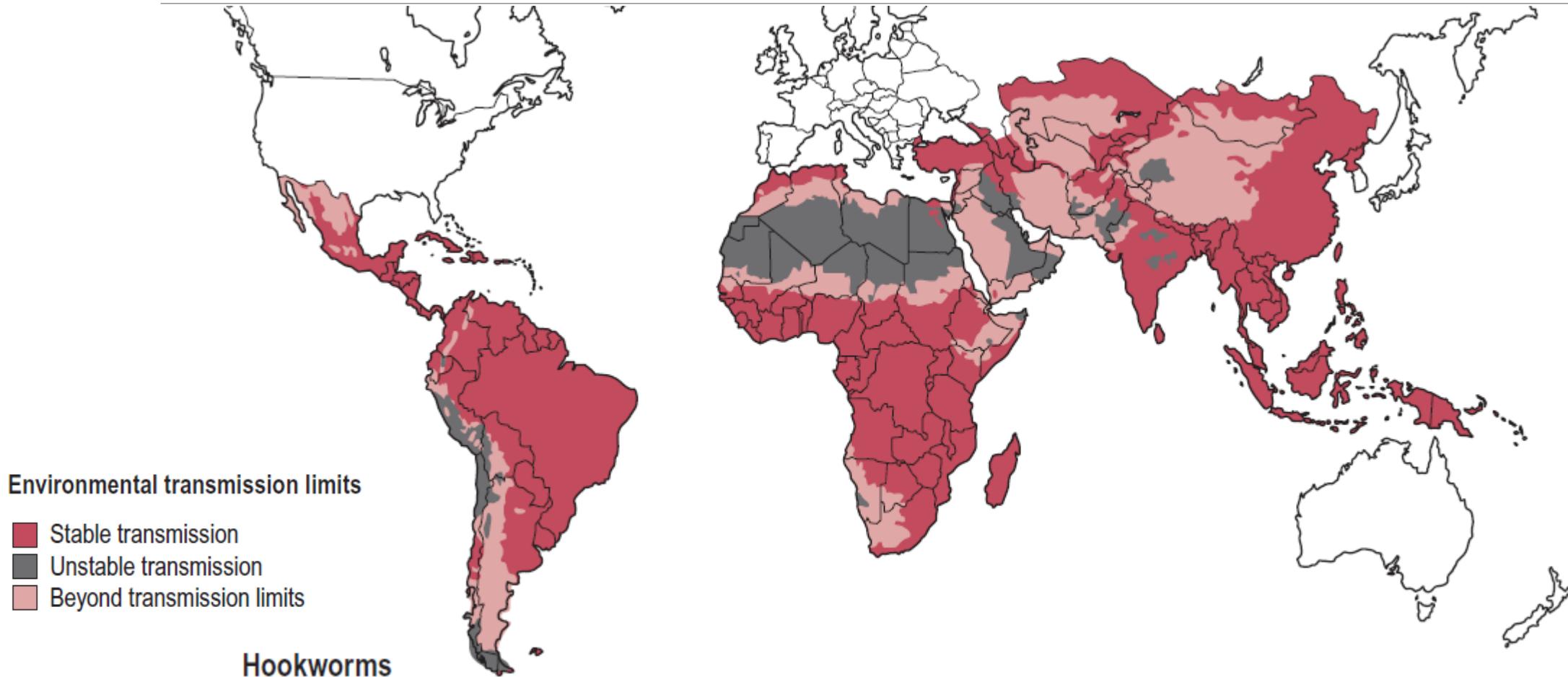
Importancia mundial



Importancia mundial

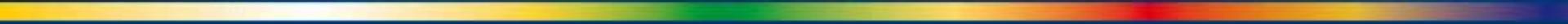


Importancia mundial



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	—
	Amebiasis	Insufficient data	US–Mexico borderlands	—
Bacterial Infections	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	—

¿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.

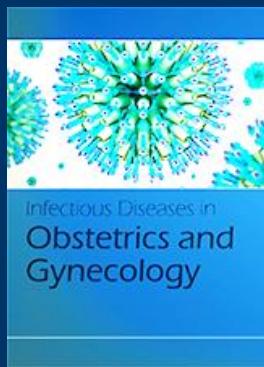


TABLE 1: Parasite positivity in stool specimens examined from pregnant women studied.

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



¿Pobreza y helmintiasis?

Quintero K, Durán C, Duri D, Medina F, García J, Hidalgo G, Nakal S, Echeverría-Ortega M, Albano C, Nino Incani R, Cortez J, Jiménez S, Díaz M, Maldonado C, Matute F, Rodriguez-Morales AJ. Household social determinants of ascariasis and trichuriasis in North Central Venezuela. *International Health* 2012 Jun; 4(2): 103-110.



Table 4

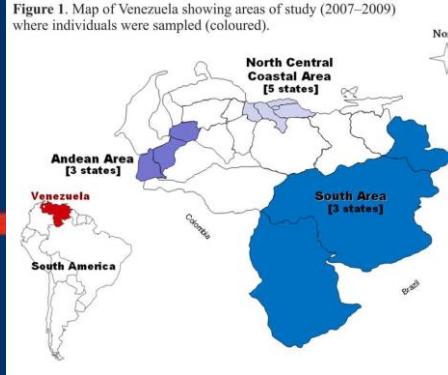
Univariate and multivariate analysis of household risk factors for ascariasis and trichuriasis in individuals from North Central Venezuela (May 2007 to December 2008)

Variable	Ascariasis		Trichuriasis	
	Crude OR (univariate) (95% CI)	Adjusted OR (multivariate) (95% CI)	Crude OR (univariate) (95% CI)	Adjusted OR (multivariate) (95% CI)
Vulnerable house				
Yes	4.242 (4.198–4.287)	1.479 (1.428–1.532)	2.598 (2.547–2.650)	10.519 (9.971–11.097)
No	1.000	1.000	1.000	1.000
In a rural area				
Yes	5.597 (5.543–5.652)	2.067 (2.035–2.101)	2.610 (2.564–2.657)	1.918 (1.868–1.970)
No	1.000	1.000	1.000	1.000
Near to small rivers or wetlands				
Yes	4.928 (4.838–5.020)	NS	NS	NS
No	1.000			
Rudimentary wall materials				
Yes	4.097 (4.055–4.139)	NS	1.598 (1.564–1.634)	NS
No	1.000		1.000	
Soil floor				
Yes	13.283 (13.127–13.440)	5.027 (4.895–5.162)	3.726 (3.630–3.825)	5.190 (4.944–5.448)
No	1.000	1.000	1.000	1.000
Tap water access				
No	8.719 (8.626–8.809)	2.512 (2.465–2.560)	3.014 (2.950–3.080)	NS
Yes	1.000	1.000	1.000	
Collection of water in inappropriate receptacles				
Yes	1.734 (1.708–1.759)	NS	1.453 (1.417–1.490)	1.118 (1.089–1.149)
No	1.000		1.000	1.000
Appropriate disposal of sewage waters				
No	6.728 (6.597–6.862)	2.315 (2.254–2.378)	1.091 (1.023–1.163)	NS
Yes	1.000	1.000	1.000	
Appropriate waste disposal				
No	3.061 (3.031–3.091)	1.798 (1.775–1.820)	1.700 (1.671–1.729)	NS
Yes	1.000	1.000	1.000	

NS: not significant.

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

Especie parasitaria	Nº	%
<i>Entamoeba coli</i>	210	60
<i>Entamoeba histolytica/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

Importancia nacional

Rev. salud pública. 7(3): 327-338, 2005

ARTÍCULOS/INVESTIGACIÓN

Prevalencia de Giardiasis y Parásitos Intestinales en Preescolares de Hogares atendidos en un programa estatal en Armenia, Colombia

Jorge M. Giraldo-Gómez¹, Fabiana Lora², Luz H. Henao³, Shirley Mejía⁴ y Jorge E. Gómez-Marín⁵

Tabla 1. Prevalencia de parásitos intestinales en 328 niños de 1 a 7 años de 35 hogares de ICBF de la ciudad de Armenia. 2003- 2004

Parásito	Frecuencias	%
<i>Levaduras</i>	93	28,9
<i>Entamoeba coli</i>	51	15,5
<i>Endolimax nana</i>	43	13,1
<i>Giardia lamblia*</i>	42	12,8
<i>Comp. E. histolytica/dispar</i>	30	9,1
<i>Blastocystis hominis*</i>	20	6,1
<i>Iodamoeba butschlii</i>	20	6,1
<i>Ascaris lumbricoides*</i>	8	2,4
<i>Trichuris trichura*</i>	7	2,1
<i>Hymenolepis nana*</i>	2	0,6

*= Parásito patógeno

Prevalencia y Factores de Riesgo Asociados a Parasitismo Intestinal en Preescolares de Zona Urbana en Calarcá, Colombia

**Prevalence and risk factors associated with intestinal parasitism in
preschool children from the urban area of Calarcá, Colombia**

Ángela L. Londoño, Shirley Mejía y Jorge E. Gómez-Marín

Facultad de Ciencias de la salud. Universidad del Quindío, Colombia. angelalilianal@uniquindio.edu.co

Tabla 1. Prevalencia de parásitos intestinales en niños preescolares de la zona urbana de Calarcá 2007

Parásitos	Intensidad				Trofozoitos n:	Quistes n :	Total n:	%
	+	++	+++	++++				
<i>Blastocystis</i>	40	25	14	2	1	80	81	36,4
<i>Giardia</i>	10	12	7		2	27	29	13,2
Complejo <i>E. histolytica/dispar</i>	17	7			1	24	25	10,9
<i>Ascaris</i>	1		1				2	0,9
Multiparasitismo (más de dos especies de parásitos)							15	6,8
Total							119	53,8

TABLE 13.2 Estimates of global numbers infected with *Ascaris lumbricoides* infection in 2010, by region

Region	Total population (millions)	Infected population (95% BCI ^a)	Prevalence (95% BCI)	
Asia	3487.0	552.4	(326.2–842.7)	15.9% (9.4–24.2%)
Central Asia	76.8	5.8	(3.1–9.5)	7.5% (4.0–12.4%)
East Asia	1336.9	144.2	(71.1–246.1)	10.8% (5.3–18.5%)
South Asia	1498.6	284.2	(179.8–411.4)	19.0% (12.0–27.5%)
Southeast Asia	574.7	118.2	(72.2–175.7)	20.6% (12.6–30.6%)
Latin America (LA) and the Caribbean	550.5	80.8	(50.0–121.9)	14.7% (9.1–9.1%)
Caribbean	38.0	3.1	(2.2–4.4)	8.2% (5.8–11.6%)
Andean LA	49.5	10.1	5.5–16.1)	20.3% (11.1–32.5%)
Central LA	215.2	38.9	(25.9–55.3)	18.1% (12.1–25.7%)
Southern LA	55.0	5.7	(4.1–7.9)	10.4% (7.4–14.3%)
Tropical LA	192.8	23.0	(12.3–38.2)	11.9% (6.4–19.8%)
Sub-Saharan Africa (SSA)	763.1	104.9	(63.7–159.2)	13.8% (8.4–20.9%)
Central SSA	84.4	18.1	(10.7–27.9)	21.5% (12.7–33.0%)
East SSA	313.4	30.2	(18.1–46.6)	9.6% (5.8–14.9%)
Southern SSA	64.9	8.3	(4.6–13.3)	12.9% (7.1–20.5%)
West SSA	300.4	48.2	(30.2–71.4)	16.1% (10.1–23.8%)
North Africa and Middle East	410.8	23.0	(15.7–32.8)	5.6% (3.8–8.0%)
Oceania	9.7	1.8	(1.0–2.8)	18.2% (10.5–28.4%)
GLOBAL	5221.2	762.9	(456.5–1159.3)	14.6% (8.8–22.3%)

^aBCI = Bayesian credible interval, based on geo-statistical models and logit-normal distributions.

Simon J. Brooker, Rachel L. Pullan. Chapter 13 – *Ascaris lumbricoides* and Ascariasis: Estimating Numbers Infected and Burden of Disease. Holland. Ascaris: the Neglected Parasite, 2013, Pages 343–362

TABLE 13.1 Population at risk of *Ascaris lumbricoides* infection in 2010, by region

Region	Total population (millions)	Population at risk (stable transmission)		Population at risk (unstable transmission)	
		N (million)	(%)	N (million)	(%)
Asia	3487.0	3477.1	(99.7%)	—	—
Central Asia	76.8	76.2	(99.3%)	—	—
East Asia	1336.9	1331.5	(99.6%)	—	—
South Asia	1498.6	1494.7	(99.7%)	—	—
Southeast Asia	574.7	574.7	(100.0%)	—	—
Latin America (LA) and the Caribbean	550.5	539.7	(98.0%)	0.4	(0.1%)
Caribbean	38.0	38.0	(100.0%)	—	—
Andean LA	49.5	39.6	(79.9%)	0.4	(0.8%)
Central LA	215.2	215.2	(100.0%)	—	—
Southern LA	55.0	54.1	(98.3%)	—	—
Tropical LA	192.8	192.8	(100.0%)	—	—
Sub-Saharan Africa (SSA)	763.1	632.2	(82.8%)	87.0	(11.4%)
Central SSA	84.4	84.2	(99.7%)	0.2	(0.3%)
East SSA	313.4	270.3	(86.2%)	23.1	(7.4%)
Southern SSA	64.9	63.6	(97.8%)	1.3	(2.0%)
West SSA	300.4	214.2	(71.3%)	62.2	(20.7%)
North Africa and Middle East	410.8	235.6	(57.3%)	96.7	(23.5%)
Oceania	9.7	9.7	(100.0%)	—	—
GLOBAL	5221.2	4894.3	(94.0%)	184.1	(3.5%)

Simon J. Brooker, Rachel L. Pullan. Chapter 13 – *Ascaris lumbricoides* and Ascariasis: Estimating Numbers Infected and Burden of Disease. Holland. Ascaris: the Neglected Parasite, 2013, Pages 343–362

TABLE 13.4 Estimates of global deaths, cases of childhood wasting and years lived with disability (YLDs) due to ascariasis in 2010, by region

Region	Deaths	Wasting	YLDs
Asia	1829	4,042,671	801,369
Central Asia	21	112,823	5845
East Asia	389	521,579	80,506
South Asia	1028	2,832,863	503,191
Southeast Asia	391	575,406	211,826
Latin America (LA) and the Caribbean	294	342,554	82,619
Caribbean	11	16,833	1819
Andean LA	40	33,293	12,654
Central LA	150	184,563	43,489
Southern LA	18	10,625	2635
Tropical LA	75	97,240	22,022
Sub-Saharan Africa (SSA)	582	101,1854	169,864
Central SSA	118	158,960	27,710
East SSA	165	226,371	38,541
Southern SSA	39	11,630	4035
West SSA	260	614,893	99,579
North Africa and Middle East	112	619,766	54,858
Oceania	8	4020	1889
GLOBAL	2825	6,020,865	1,110,600

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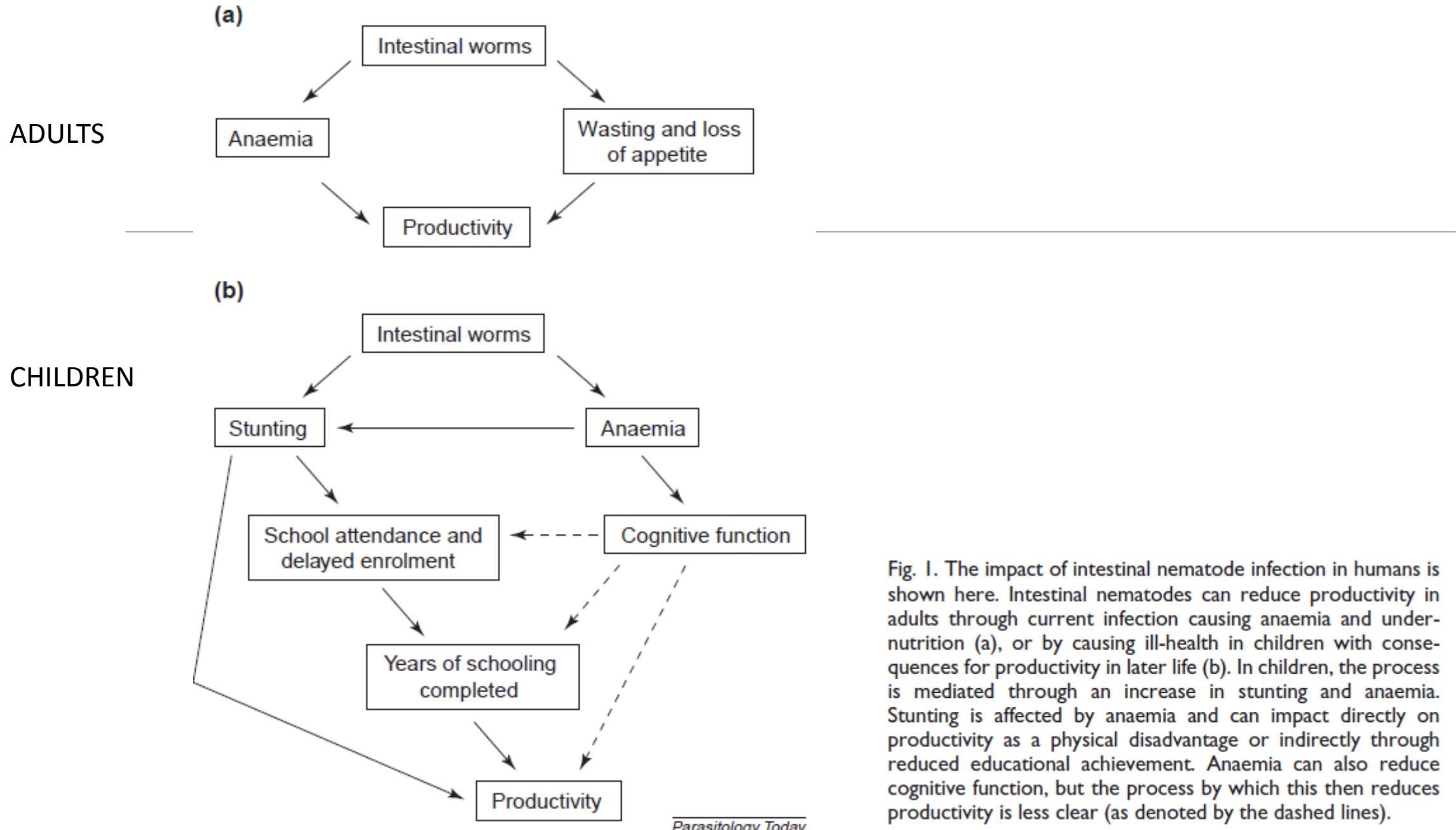
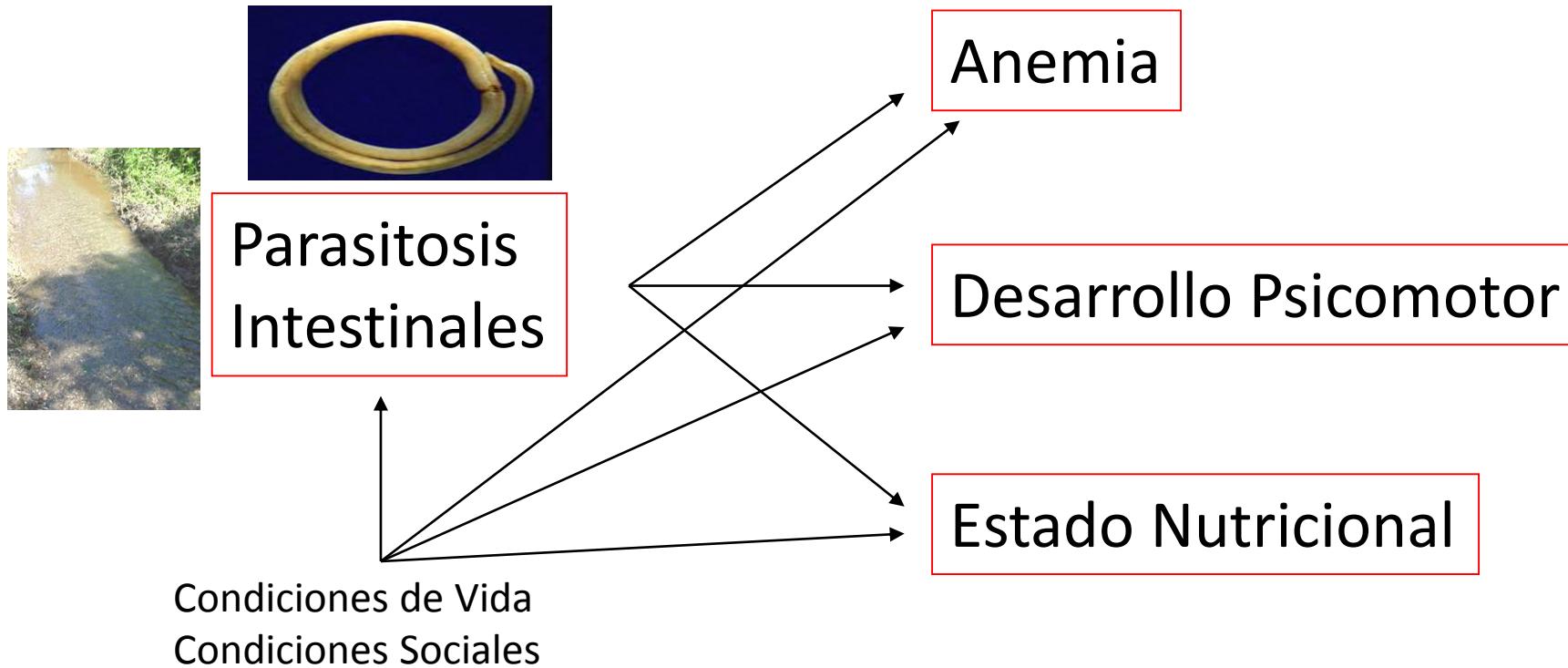


Fig. 1. The impact of intestinal nematode infection in humans is shown here. Intestinal nematodes can reduce productivity in adults through current infection causing anaemia and under-nutrition (a), or by causing ill-health in children with consequences for productivity in later life (b). In children, the process is mediated through an increase in stunting and anaemia. Stunting is affected by anaemia and can impact directly on productivity as a physical disadvantage or indirectly through reduced educational achievement. Anaemia can also reduce cognitive function, but the process by which this then reduces productivity is less clear (as denoted by the dashed lines).



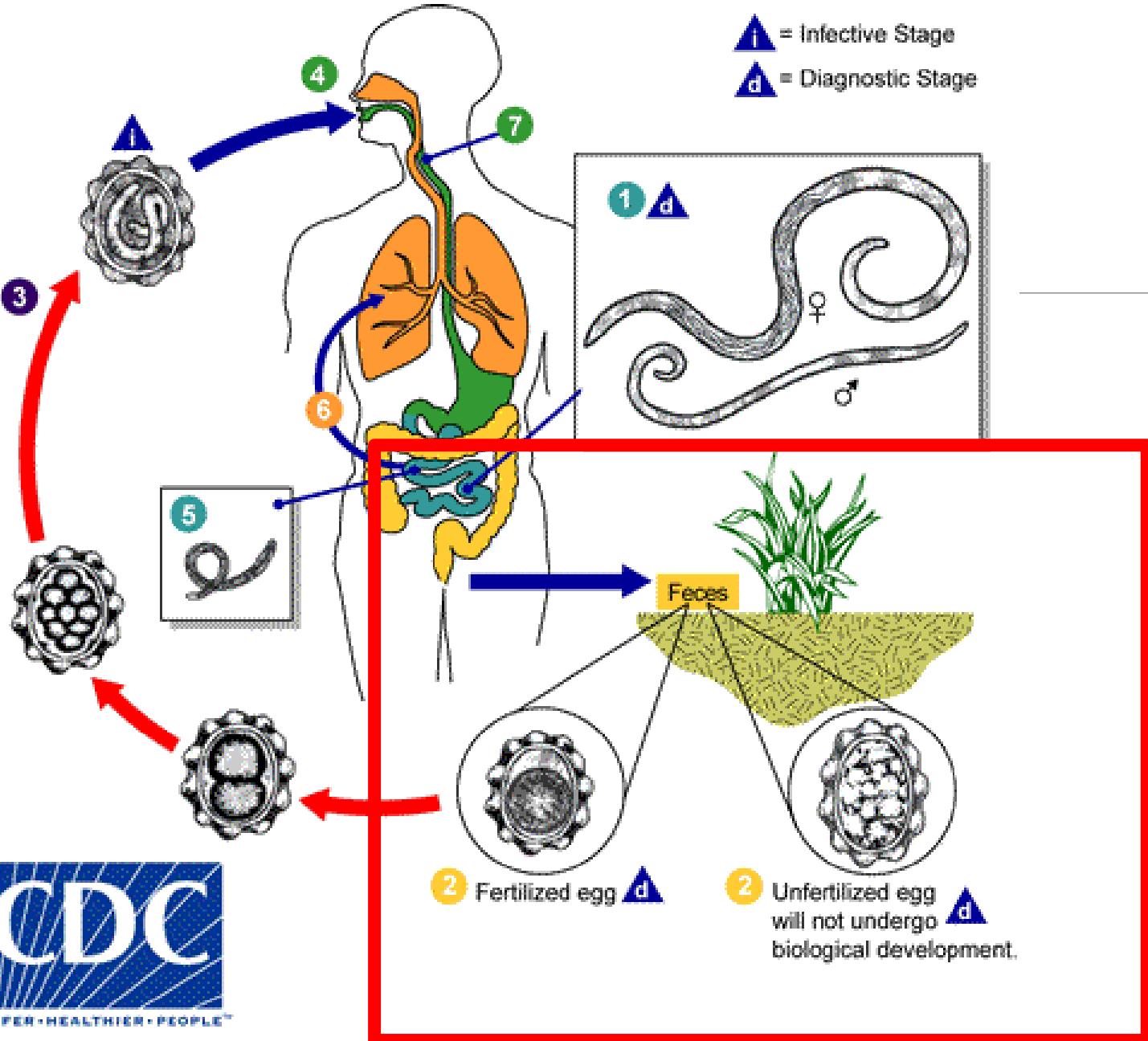




403. Letrina pública en Gedi (Kenya)

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).

Ascaris



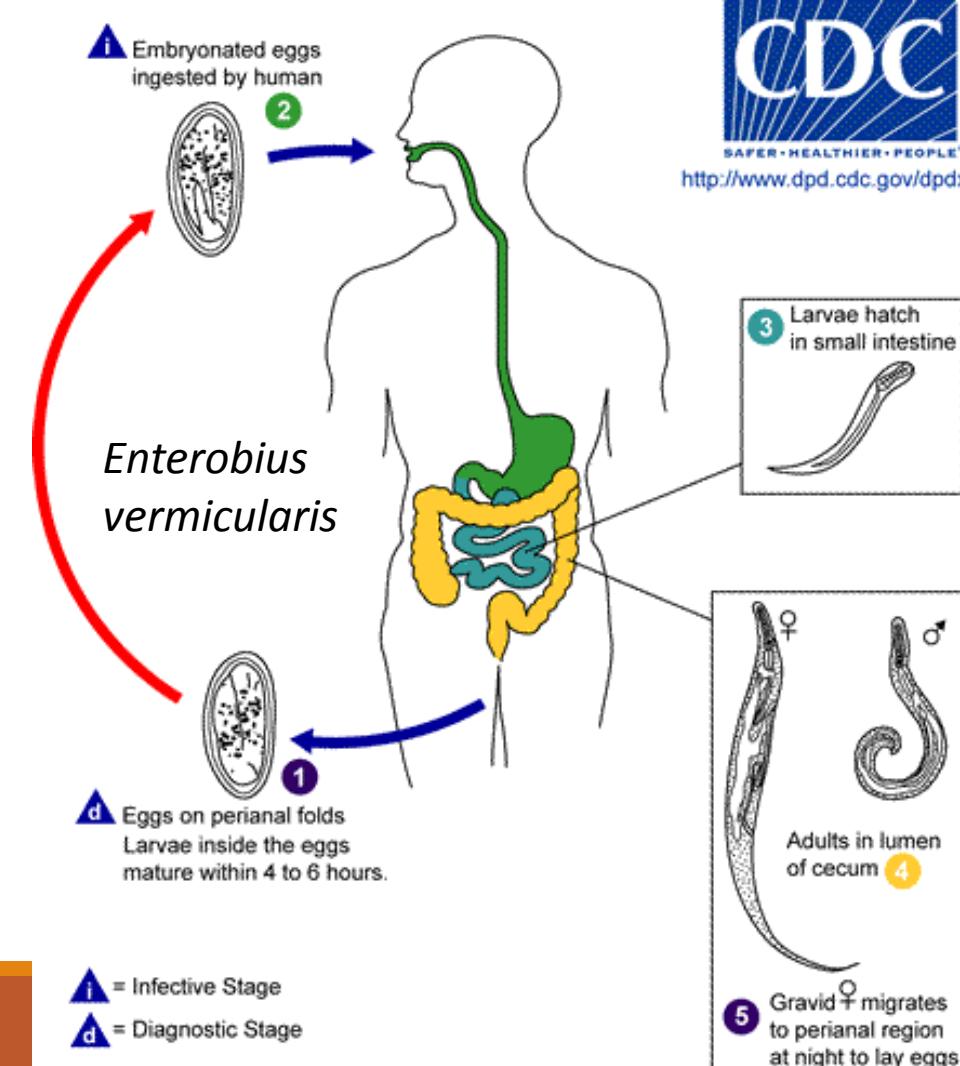
Cycles and transmission

- ❖ 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 1: Direct (*Enterobius vermicularis*, *Trichuris trichiura*)

Embryonated eggs are passed; they hatch and reinfect within 2–3 hours by being carried from the anal margin to the mouth and either do not reach the soil or, if they do, do not require a period of development there.

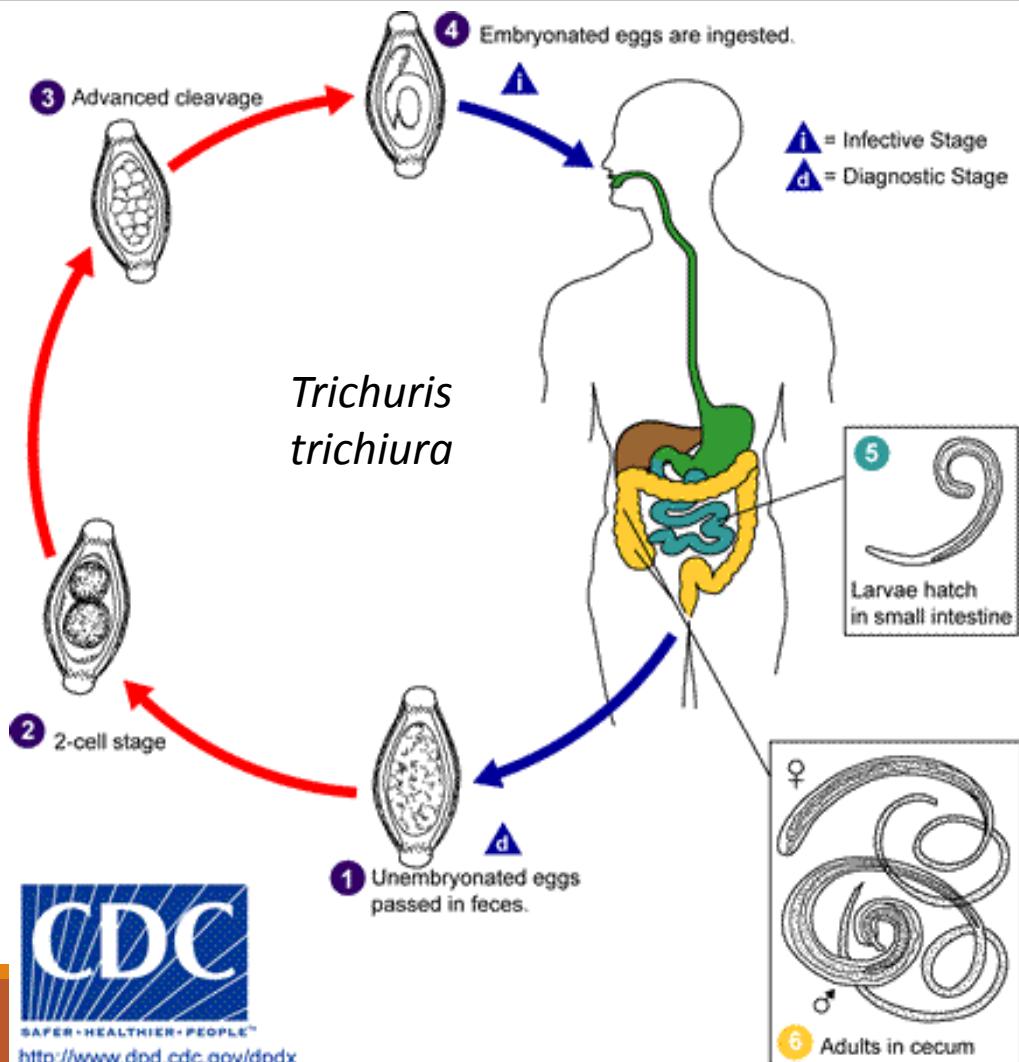
This group includes *Enterobius vermicularis* (pinworm) and *Trichuris trichiura* (whipworm).



Type 1: Direct (*Enterobius vermicularis*, *Trichuris trichiura*)

Embryonated eggs are passed; they hatch and **reinfect** within **2–3 hours** by being carried from the anal margin to the mouth and either do not reach the soil or, if they do, do not require a period of development there.

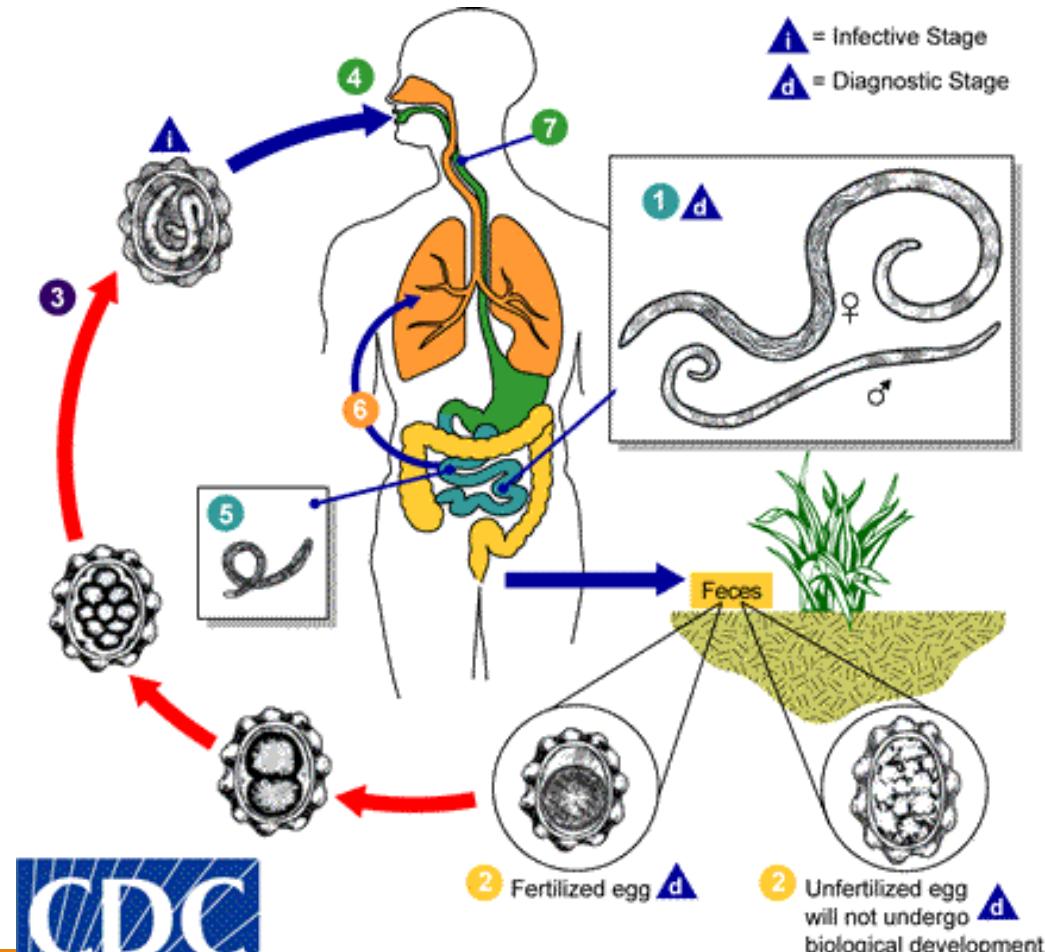
This group includes *Enterobius vermicularis* (pinworm) and *Trichuris trichiura* (whipworm).



Type 2: Modified Direct (*Ascaris lumbricoides*, *Toxocara spp.*)

Eggs are passed out in the stool and undergo a **period of development** in the soil before being ingested, where they hatch, releasing larvae which penetrate the mucous membrane(s) of the stomach and enter the circulation to reach the lungs, passing up the respiratory tract to enter the oesophagus, reaching the intestine where they become adult.

These include *Ascaris lumbricoides* (roundworm) and *Toxocara spp.*

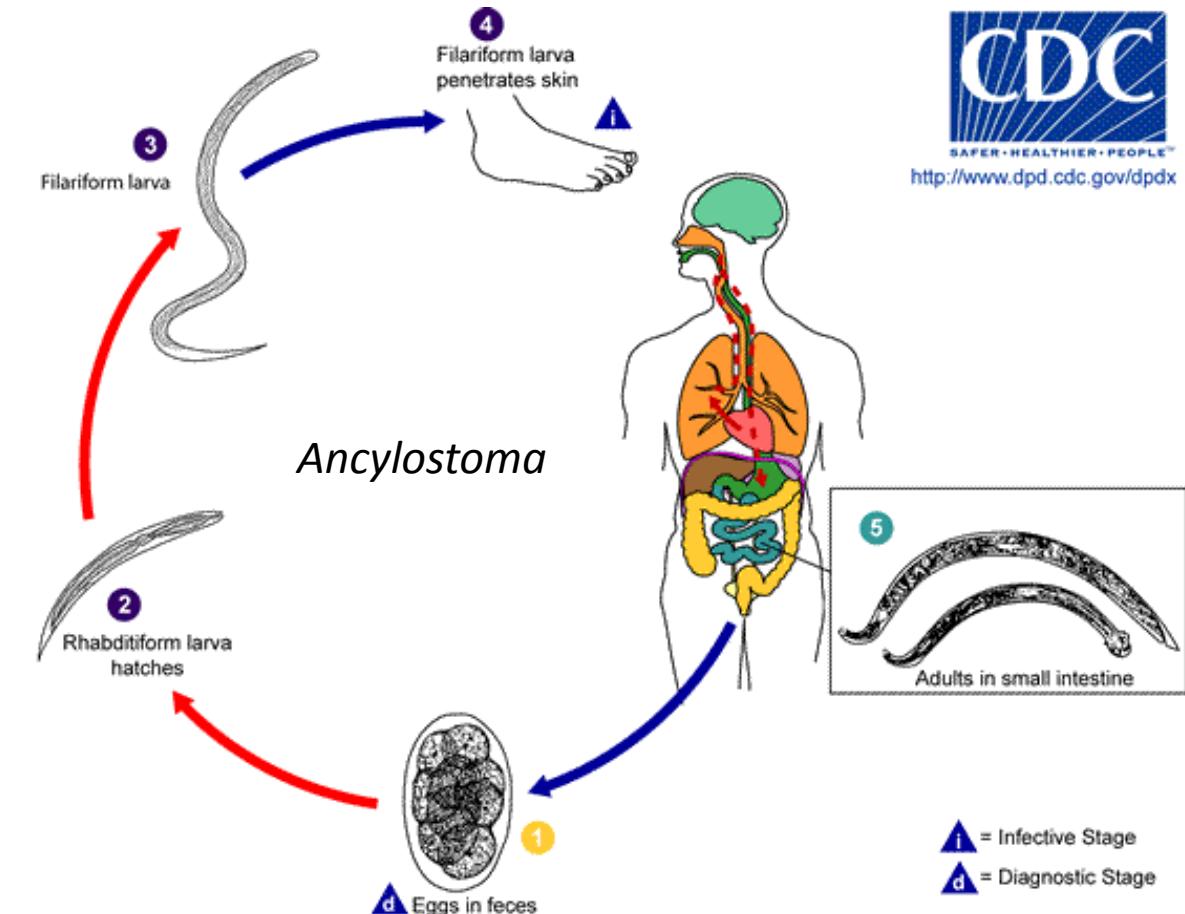


Ascaris lumbricoides

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.

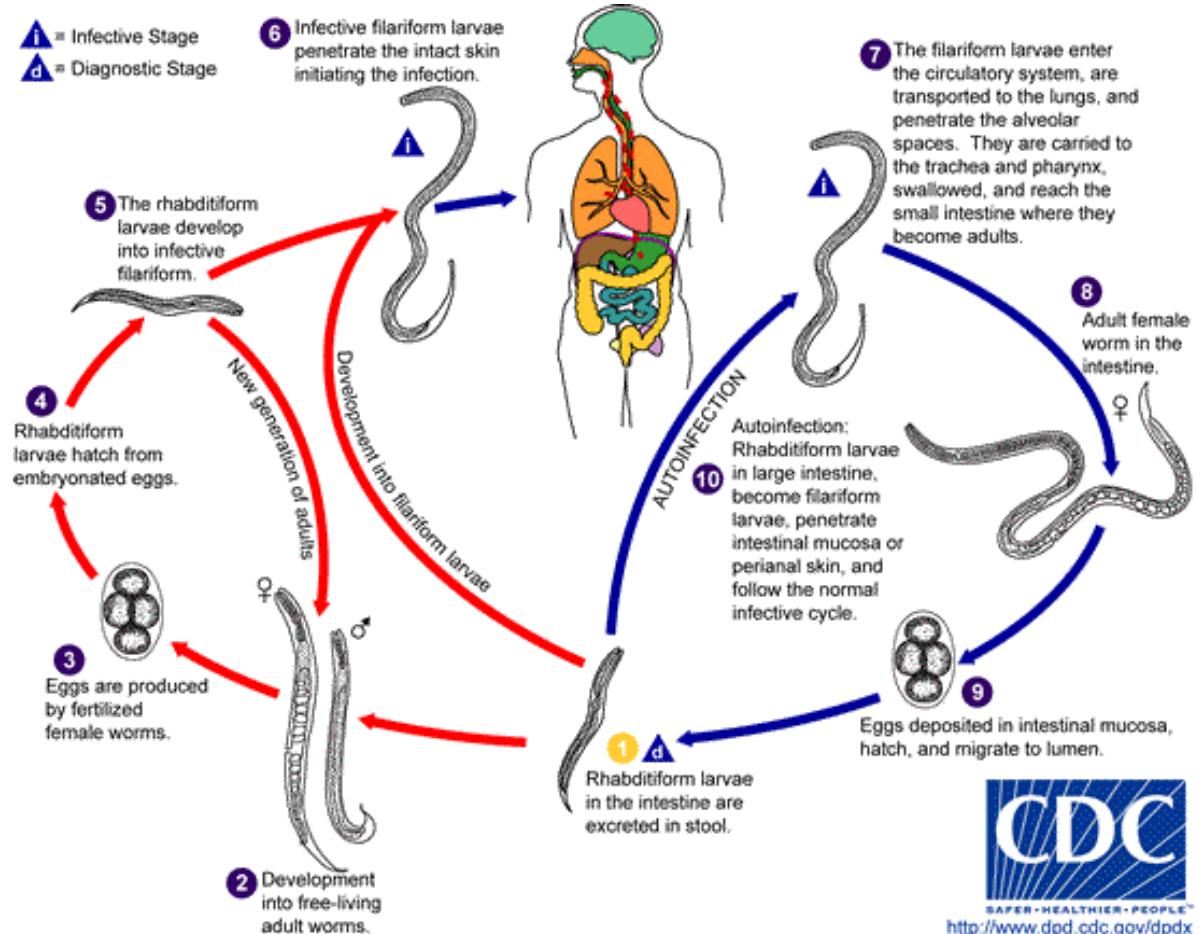
The hookworms, *Ancylostoma duodenale* and *Necator americanus*, and *Strongyloides stercoralis* belong to this group, but differ in that *S. stercoralis* larvae are passed in the stool and autoinfection can occur at the anal margin, or independent development takes place in the soil, where they can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



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

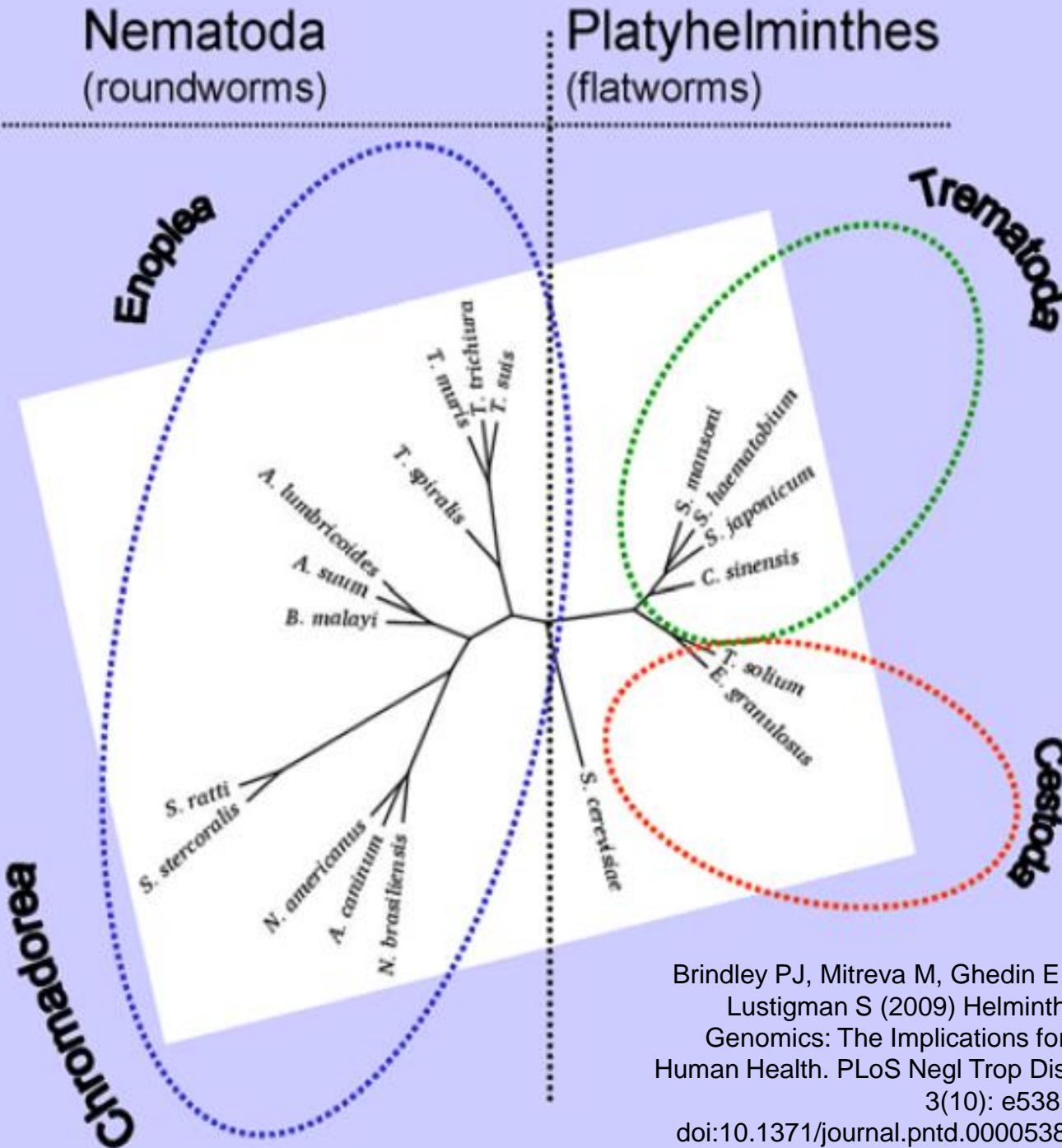


Figure 2. Phylogeny of the major taxa of human helminths—nematodes and platyhelminths—as established by maximum likelihood (ML) analysis of 18S ribosomal RNA from 18 helminth species.

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	Enoplida	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 Ancylostomoidea	<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 Gnathostomoidea Thelazoidea Filarioidea		
	Spirurida (Camallanina)	Dracunculoidea		

Ascaris lumbricoides y géneros relacionados

Ascaridida	Ascaridoidea		
		<i>Ascaris lumbricoides</i>	800-1.000 millones
		<i>Toxocara canis</i>	Miles
		<i>Toxocara cati</i>	Miles
		<i>Lagochilascaris minor</i>	Infrecuente
		<i>Baylisascaris procyonis</i>	Infrecuente
		Género <i>Anisakis</i>	Infrecuente
		<i>Pseudoterranova decipiens</i>	Miles

Ciclo *Ascaris lumbricoides*

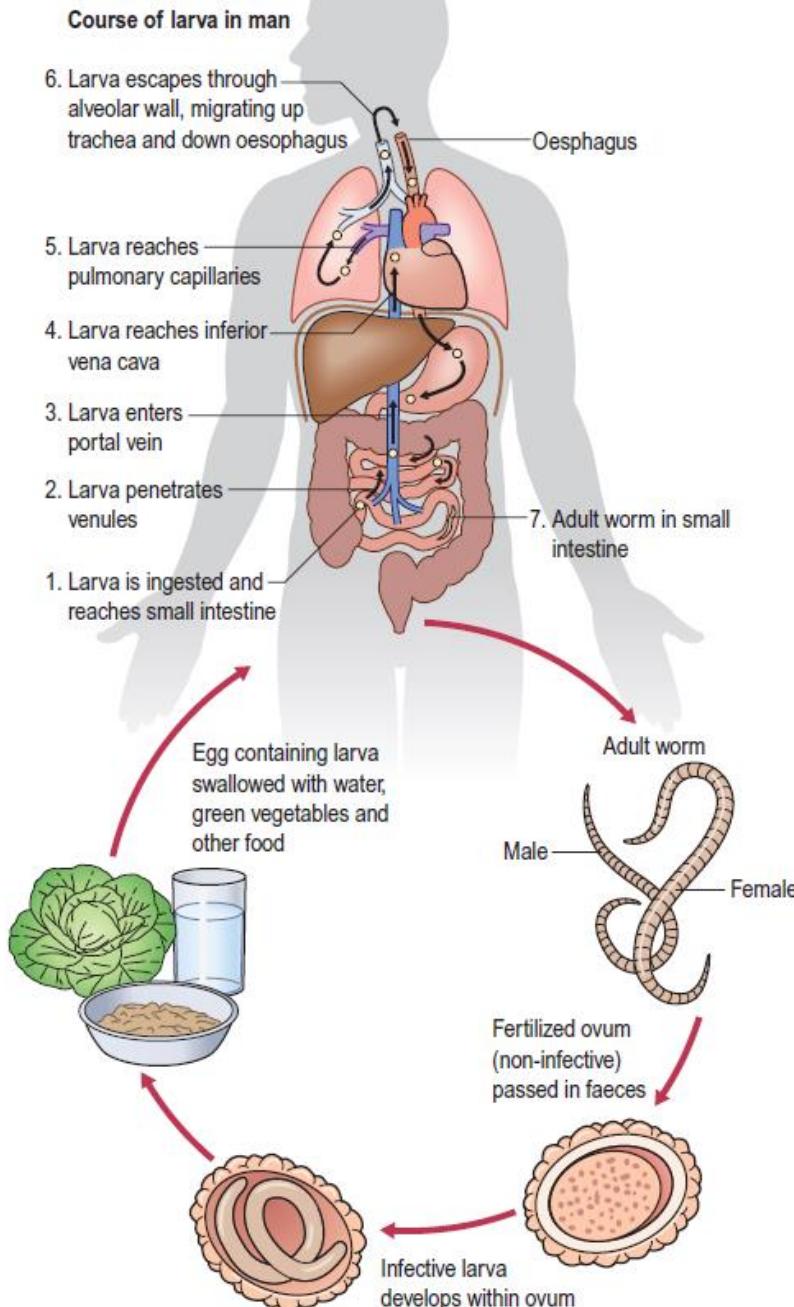
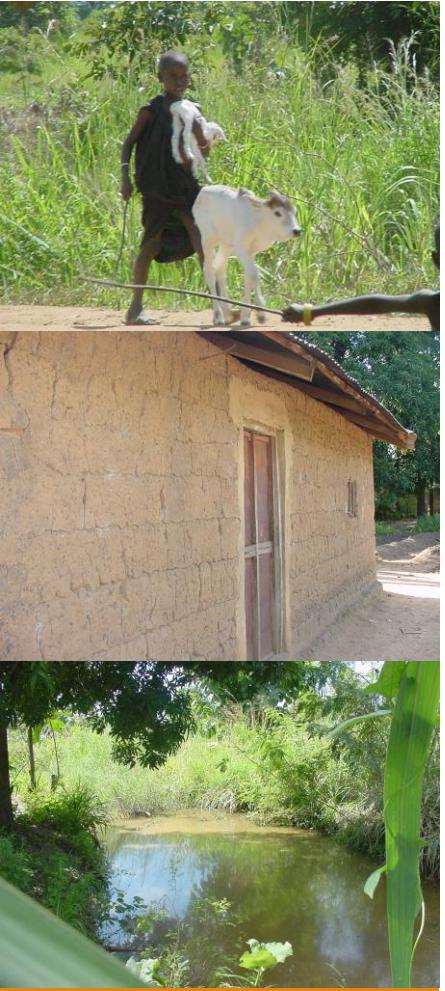


Figure 55.9 Life cycle of *Ascaris lumbricoides* (roundworm). (Courtesy of Tropical Resources Unit.)

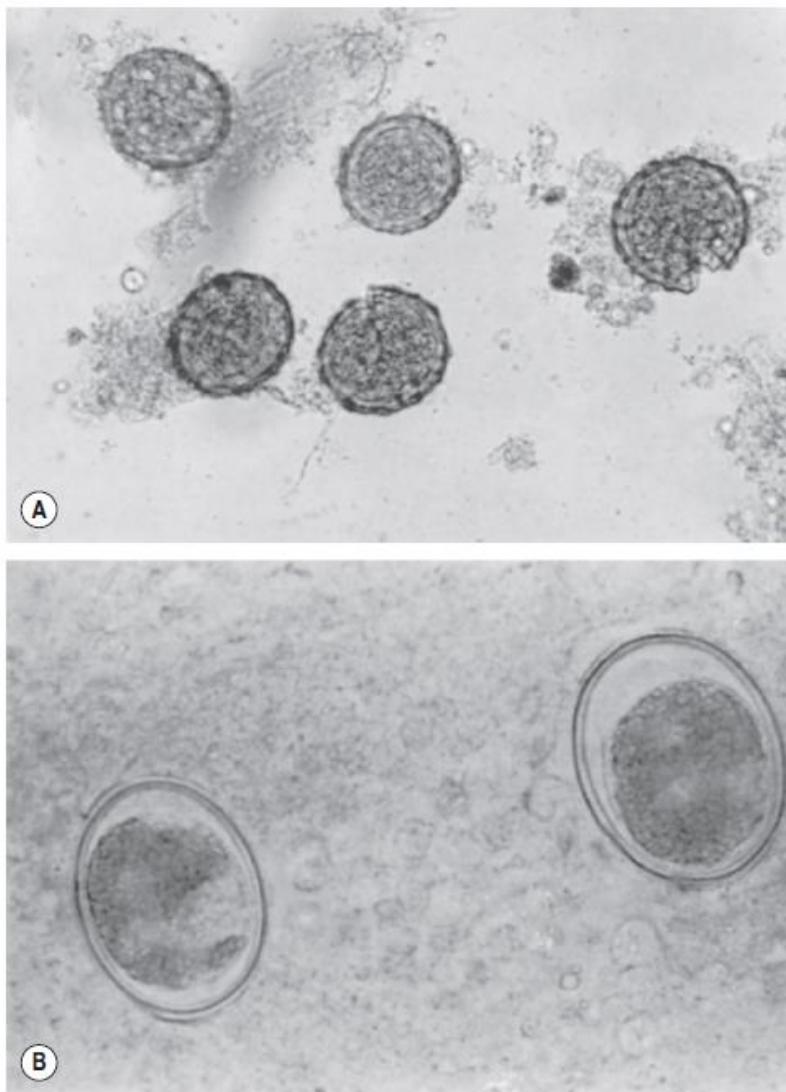
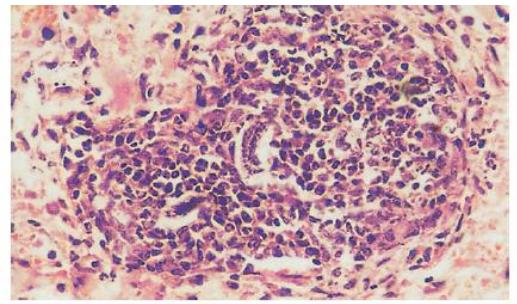


Figure 55.10 Eggs of *Ascaris lumbricoides* (roundworm). (A) Fully formed, fertile, in stool. (B) Decorticated from liver abscess. ((A) Courtesy of Tropical Resources Unit. (B) Courtesy M. L. Chu.)

Ciclo *Ascaris lumbricoides*

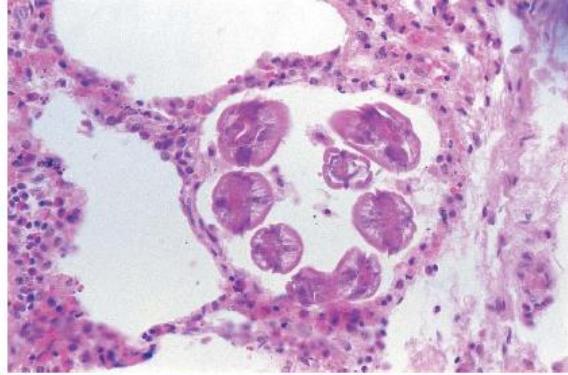
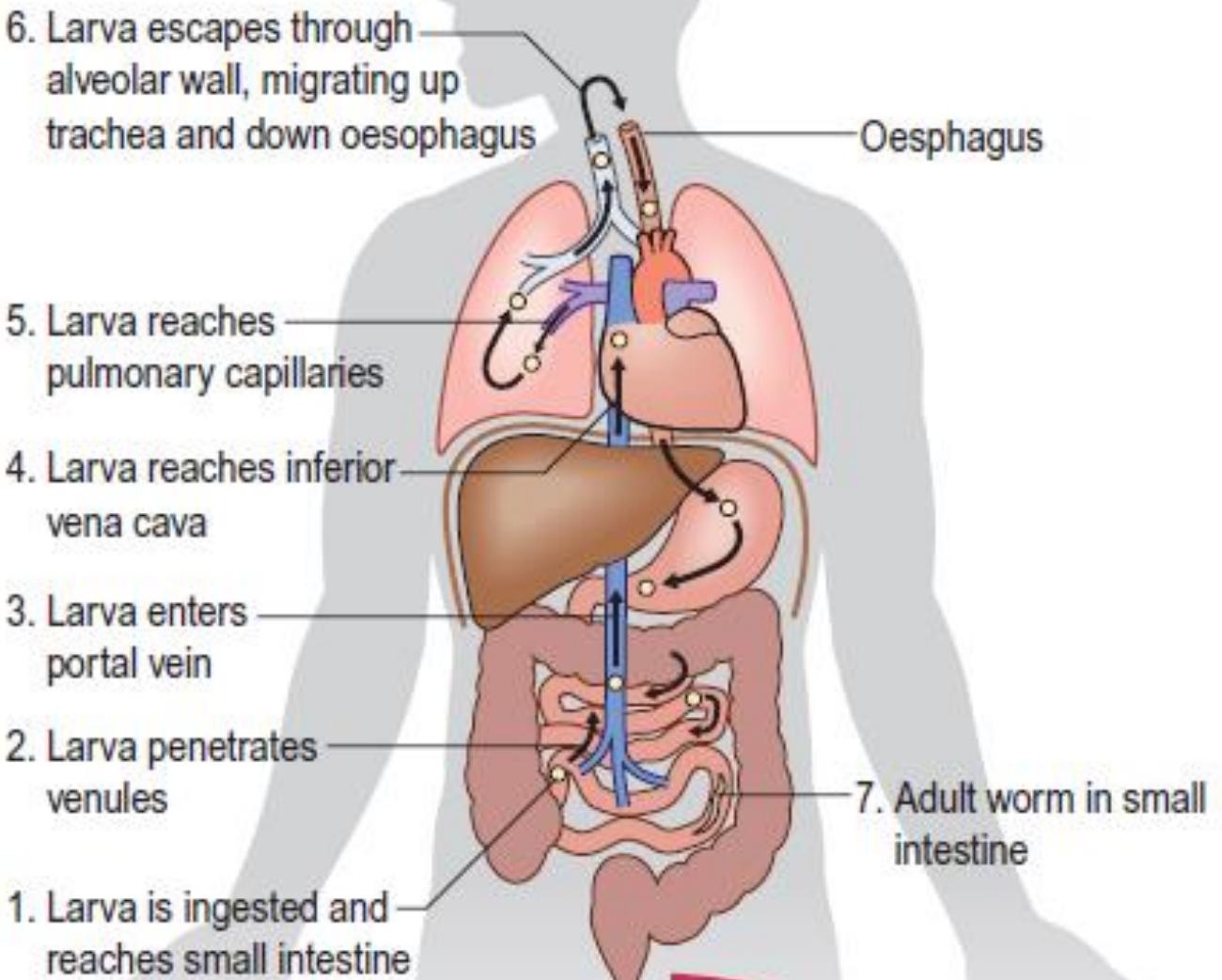


459. Larvas de *Ascaris lumbricoides* en fase de migración hacia el pulmón

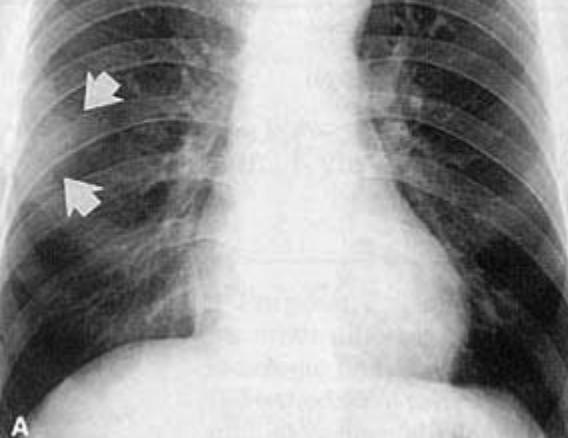


458. Larva de segunda fase de *Ascaris lumbricoides* transformándose en el intestino

Course of larva in man



460. Cortes transversales de larvas de *Ascaris lumbricoides* en los alvéolos pulmonares



<http://emedicine.medscape.com/article/1002606-workup#a0720>



463. *Ascaris lumbricoides* en una radiografía

Las formas adultas aparecen –a menudo de manera incidental– como defectos de relleno en la radiografía con bario.



464. Obstrucción causada por nematodos

Las infestaciones intensas, especialmente en los niños, pueden causar obstrucción intestinal. El volvulo es una complicación adicional en el intestino de la imagen, correspondiente a un niño de 2 años.



465. Nematodos adultos en fase de migración hacia el hígado

Los gusanos adultos tienden a introducirse en cualquier orificio que haya en su vecindad y pueden salir a través de fistulas abdominales tras la intervención quirúrgica. También pueden causar obstrucción biliar y ocupar el apéndice.



466. Infestación masiva por *Ascaris* en un niño

Tras el tratamiento antihelmíntico, el paciente elimina una gran madeja de nematodos.

Surgical Diagnosis and Management of Intestinal Obstruction Due to *Ascaris lumbricoides*

Leticia López,¹ Ruth Cáceres,¹ Jazmin Servin,¹ Jessica Esquivel,¹
Myriam Chirico,¹ and Alfonso J. Rodriguez-Morales^{2,3}

Abstract

Background: Ascariasis continues to be one of the most important parasitic diseases in terms of its burden and complications in children in the developing world.

Methods: Case report and literature review (Medline, SCI, and LILACS).

Results: We report herein a case in which a Paraguayan infant presented with one of these complications: An intestinal obstruction due to *Ascaris lumbricoides* being diagnosed during surgery. The patient was managed with a conservative protocol for the extraction of the parasites using liquid petrolatum administered through a nasogastric tube followed with extensive water irrigation through the tube, in conjunction with the administration of piperazine as antiparasitic treatment.

Conclusions: This case, as with others reported previously, shows that this complication can be managed successfully without major intestinal surgery. Early recognition of this condition, based on local prevalence, can prevent serious surgical complications, morbidity, and mortality associated with intestinal obstruction due to *A. lumbricoides*.

ASCARIASIS CONTINUES to be one of the most important *A*-parasitic diseases in terms of its burden and complications in children in the developing world [1]. In recent years, intestinal obstruction due to *Ascaris lumbricoides* infection has been characterized as one of the most common complications in children, accounted for 38% to 87.5% of all complications, sometimes leading to a fatal evolution, with case fatality rates ranging from 0 to 8.6% [2]. Many of these cases have evolved in this way because of delay or confusion regarding diagnosis. A common misdiagnosis is appendicitis [3]. Intestinal obstruction due to ascariasis can require emergency surgical intervention and supportive and antiparasitic treatments. Although used in surgical and medical pediatric practice in Latin America [4], few reports are found in the international literature about the regional clinical usefulness and experiences of conservative protocols for the extraction of *A. lumbricoides* parasites. Few of those reported describe the use of liquid petrolatum administered through a nasogastric tube followed with extensive water irrigation through the tube in conjunction with the administration of piperazine as

antiparasitic treatment. For these reasons, we report herein a case in which a Paraguayan infant presented with an intestinal obstruction due to *A. lumbricoides* that was diagnosed during surgery and managed with the mentioned extraction protocol [4].

Case Report

A 13-month-old male infant born in Paraguarí (rural Paraguay) presented with complaints of 11-day evolution of fever (39°C), acute abdominal pain, non-bloody, non-mucoid diarrhea; and vomiting. On admission, he was found to have signs of mild dehydration, diffuse abdominal pain without peritoneal irritation, anemia (hemoglobin, 8.5 g/dL), and leukocytosis (12.0×10^3 cells/mm 3 , 60% lymphocytes). His anthropometric evaluation revealed short stature (-2 SD) and weight (-1 SD) for his age according to the national growth charts. Abdominal sonogram revealed an intestinal invagination at the ileal region. Abdominal radiography also showed signs of intestinal obstruction (Fig. 1). Surgical exploration via

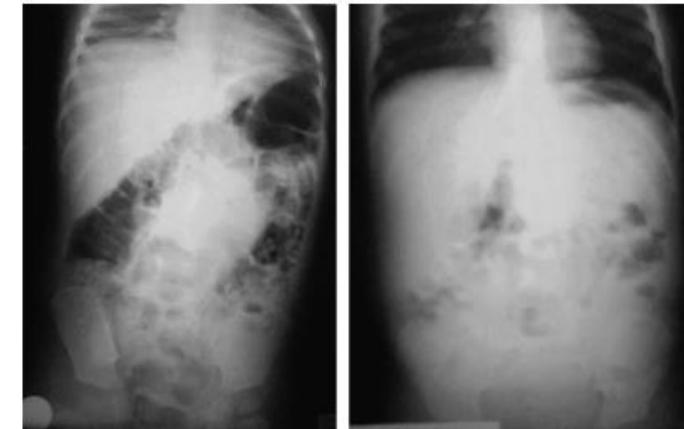


FIG. 1. Abdominal radiography images showing signs of intestinal obstruction (left) and after surgical and medical treatment (right).

open right transverse infraumbilical laparotomy found a parasite bolus (suggestive of *A. lumbricoides*) located 1.5 m from the ileocecal valve. The surgical diagnosis was intestinal obstruction due to *A. lumbricoides*. During abdominal surgery, the parasite bolus was manually displaced to the large intestine (ascending colon). Liquid petrolatum (20 mL) was administered through a nasogastric tube followed with extensive water irrigation in conjunction with the nasogastric administration of piperazine (50 mg/kg per day divided into three doses) as antiparasitic treatment. Adult forms of *A. lumbricoides* began extensive expulsion through the anus (up to 50 adult parasites in each evacuation) (Fig. 2). Ampicillin-sulbactam was used as antimicrobial prophylaxis for the surgical procedure. Patient evolution was successful, presenting one day later with a systemic allergic reaction (nasal pruritus, cough, cutaneous rash, and pruritus) treated with chlorphenhydramine (0.3 mg/kg per day by mouth). One day later, the patient was discharged.

Discussion

Ascariasis is one of the most cosmopolitan intestinal parasite infections but with higher burdens in developing countries in tropical and subtropical areas, sometimes carrying major and even fatal complications such as intestinal obstruction [5]. With variable incidence, intestinal obstruction has been managed effectively conservatively using intravenous fluid, antibiotics, piperazine salt through nasogastric tube, and glycerin plus liquid paraffin emulsion enemas, among other measures, especially in patients who do not have peritonitis [5,6]. More studies in settings with a higher prevalence of ascariasis should be done, considering there are no randomized clinical trials for the management of intestinal obstruction due to *A. lumbricoides* infection [5,6]. This complication could be managed successfully without major intestinal surgery, especially if early recognition of this condition is achieved. Appropriate epidemiologic evaluation



FIG. 2. Moment of one feces evacuation after the protocol using piperazine in which the parasites (adult forms of *A. lumbricoides*) began to be expelled extensively through the anus (up to 50 adult parasites in each evacuation).

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³Instituto Experimental Jose Wittemundo Torrealba, Universidad de Los Andes, Trujillo, Venezuela.



López L, Cáceres R, Servin J, Esquivel J, Chirico M, Rodriguez-Morales AJ. Surg Infect (Larchmt). 2010 Apr;11(2):183-5.

Ciclo

Ascaris lumbricoides

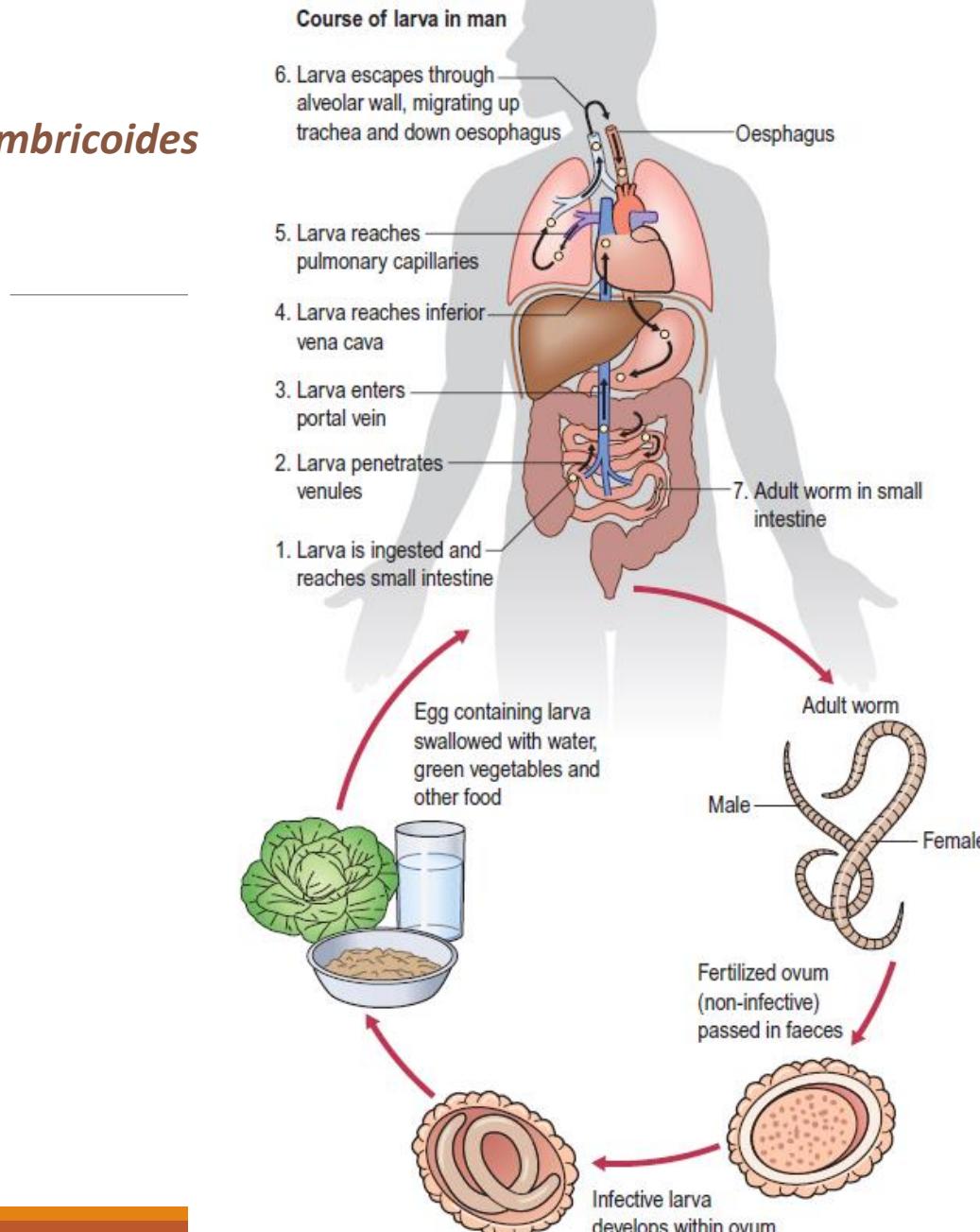


Figure 55.9 Life cycle of *Ascaris lumbricoides* (roundworm). (Courtesy of Tropical Resources Unit.)

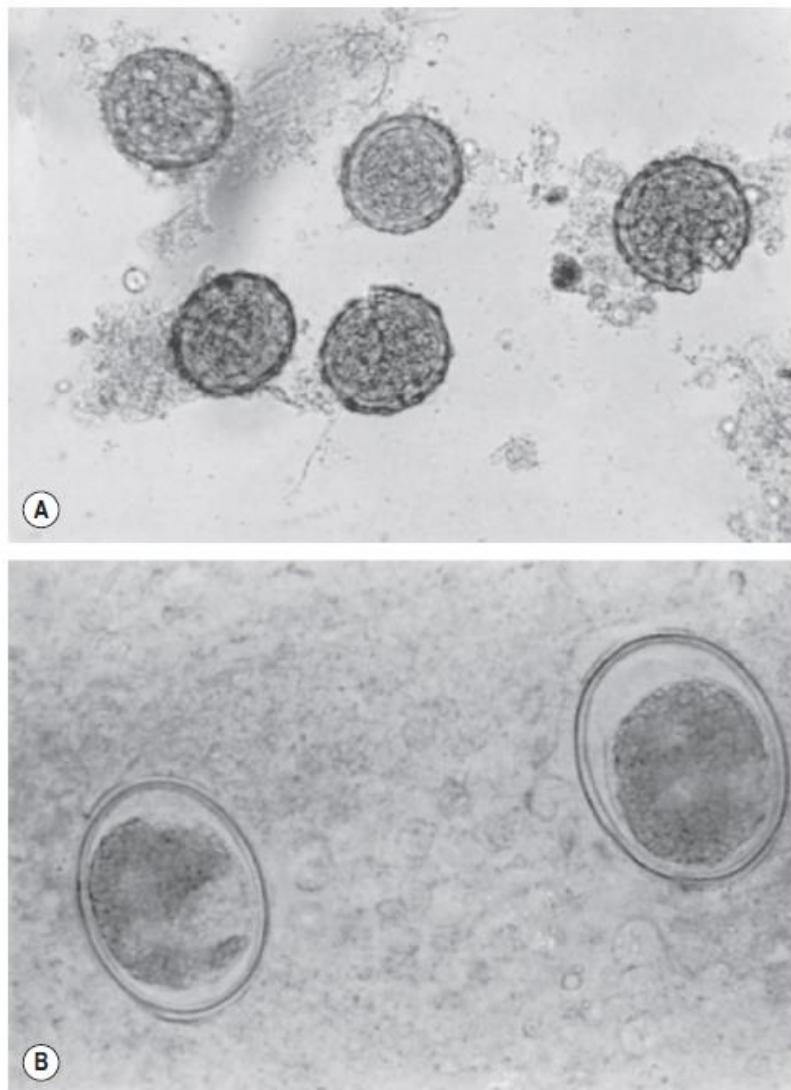
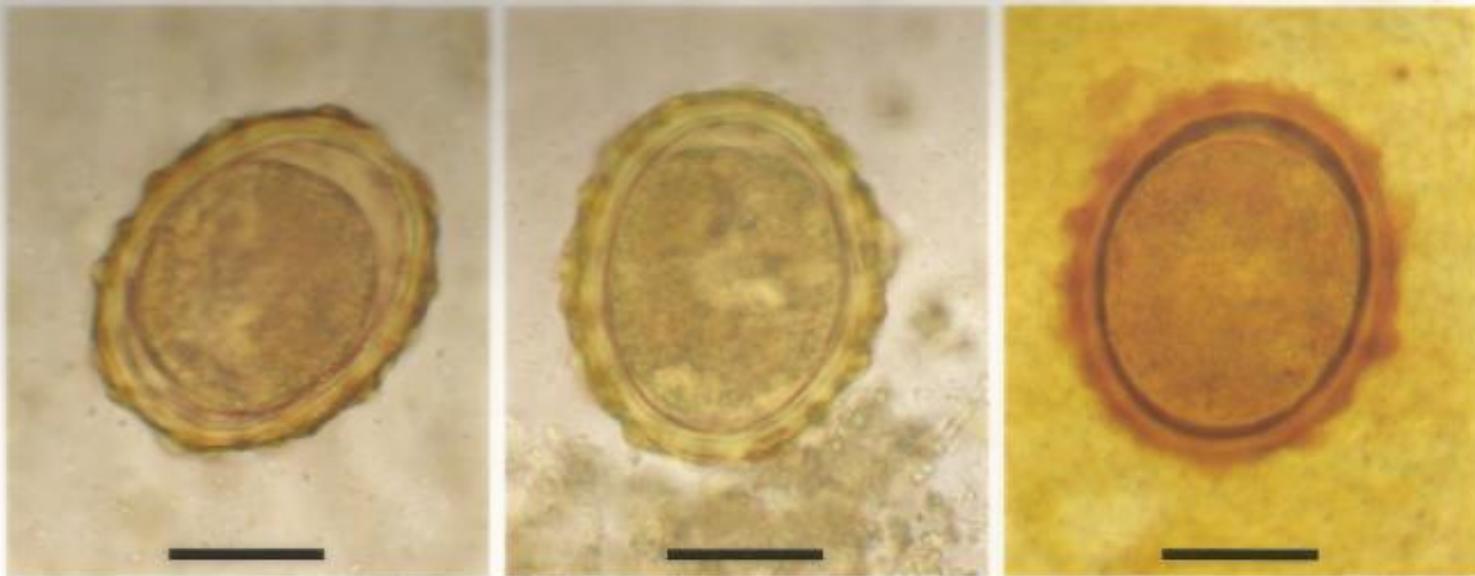


Figure 55.10 Eggs of *Ascaris lumbricoides* (roundworm). (A) Fully formed, fertile, in stool. (B) Decorticated from liver abscess. ((A) Courtesy of Tropical Resources Unit. (B) Courtesy M. L. Chu.)



Los huevos fértiles normales de *Ascaris lumbricoides* miden 55-75 μm por 35-50 μm , son de color entre amarillo dorado y pardo y se pasan a las heces en la fase monocelular. El huevo presenta mamelones bien visibles en la superficie.

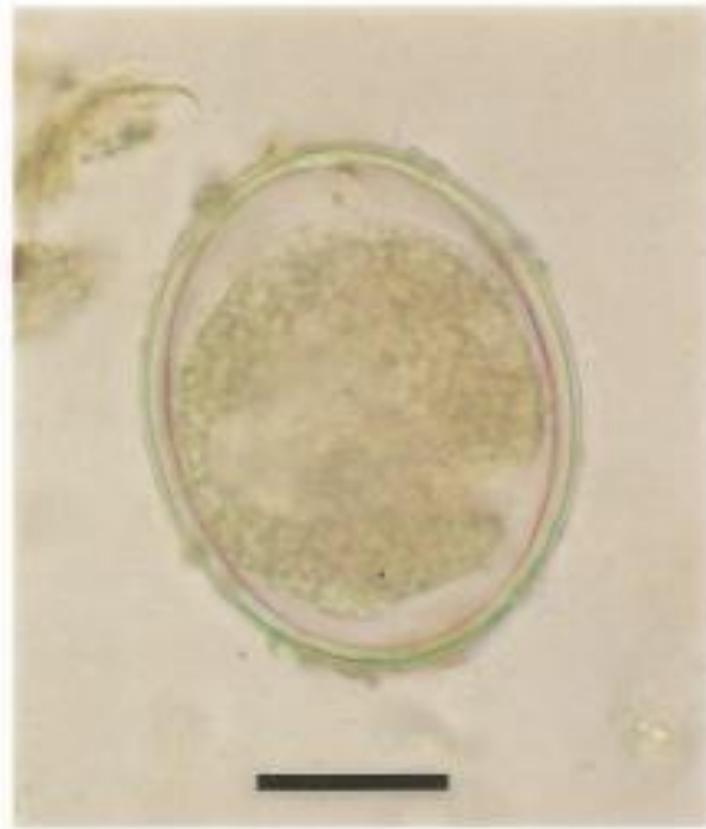
Típico huevo fértil de *Ascaris* en una preparación de Kato-Katz.



Típicos huevos infériles de *Ascaris* en las heces. Son alargados y mucho mayores (85-95 μm por 43-47 μm) y tienen una fina cubierta y una capa mammelona muy irregular. El contenido del huevo suele ser granuloso y no está nada organizado.

Huevos fértiles (abajo a la izquierda) e infériles de *Ascaris* en una preparación de Kato-Katz.

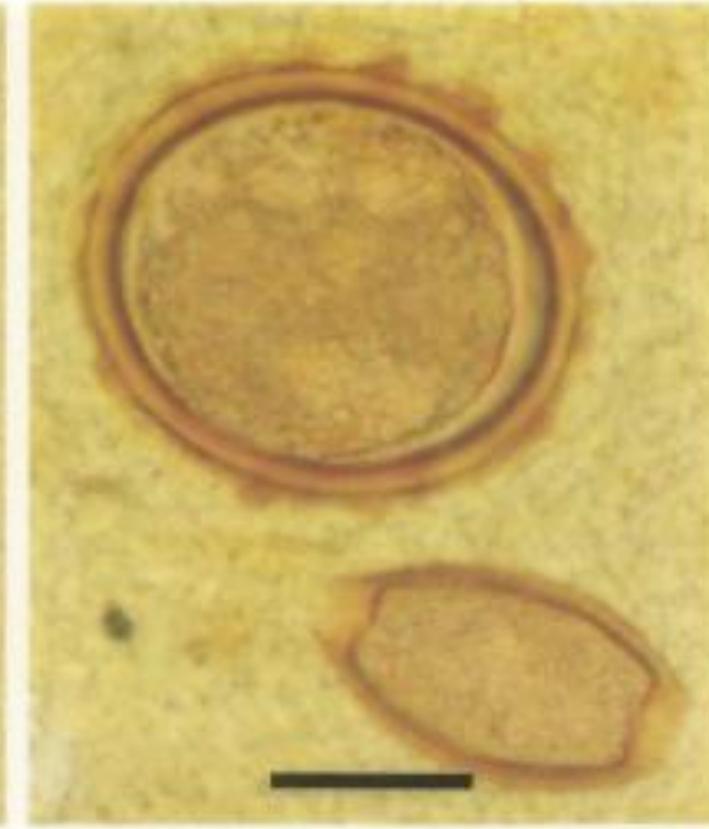




Ascaris. A veces, los huevos fértiles normales carecen de capa mamelonada, en cuyo caso se les denomina «decorticados».



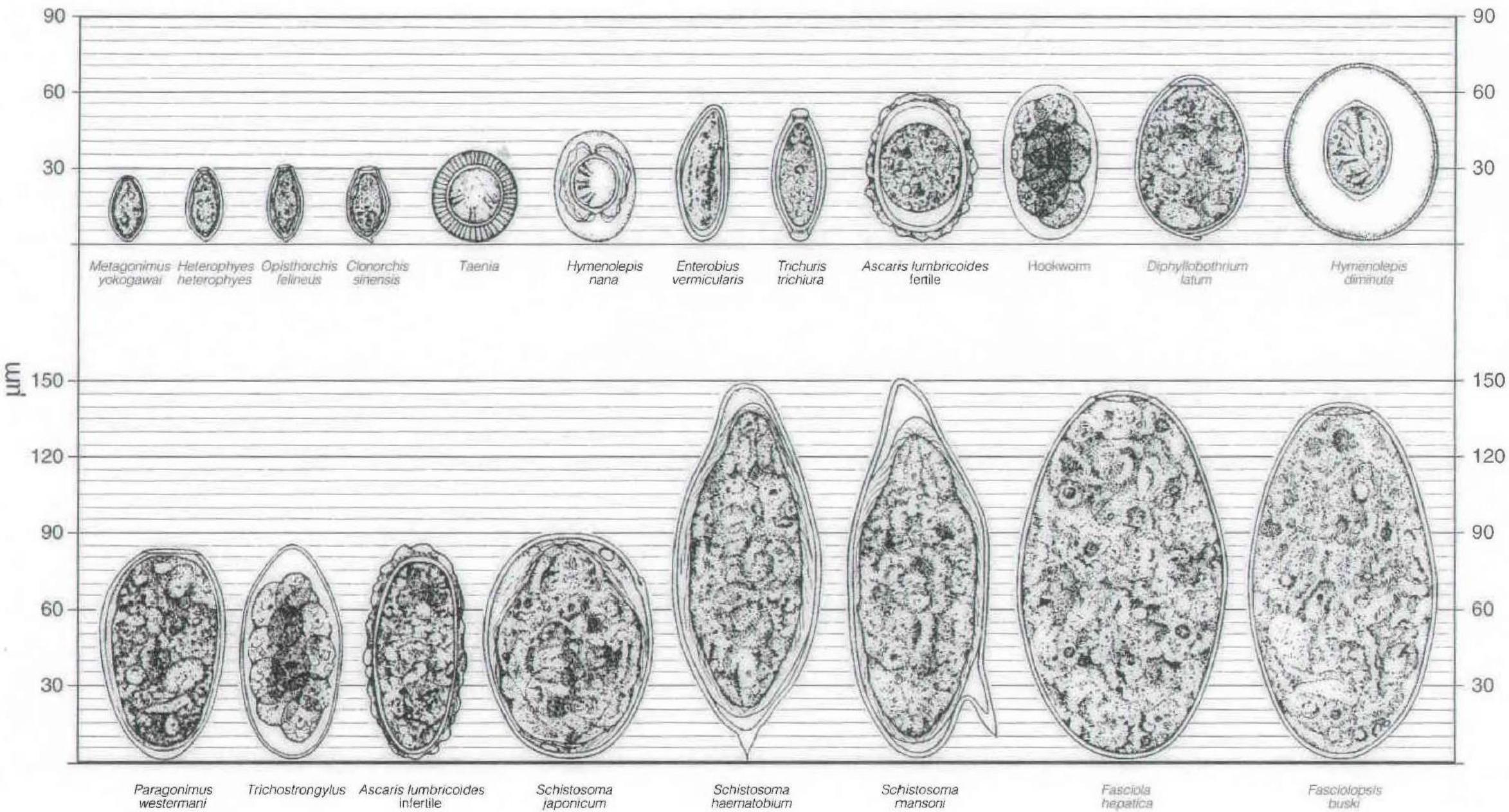
Ascaris. Huevo normal y decorticado (arriba a la izquierda) en una preparación de Kato-Katz.



Huevos de ***Ascaris*** (arriba) y ***Trichuris*** (abajo) en una preparación de Kato-Katz.

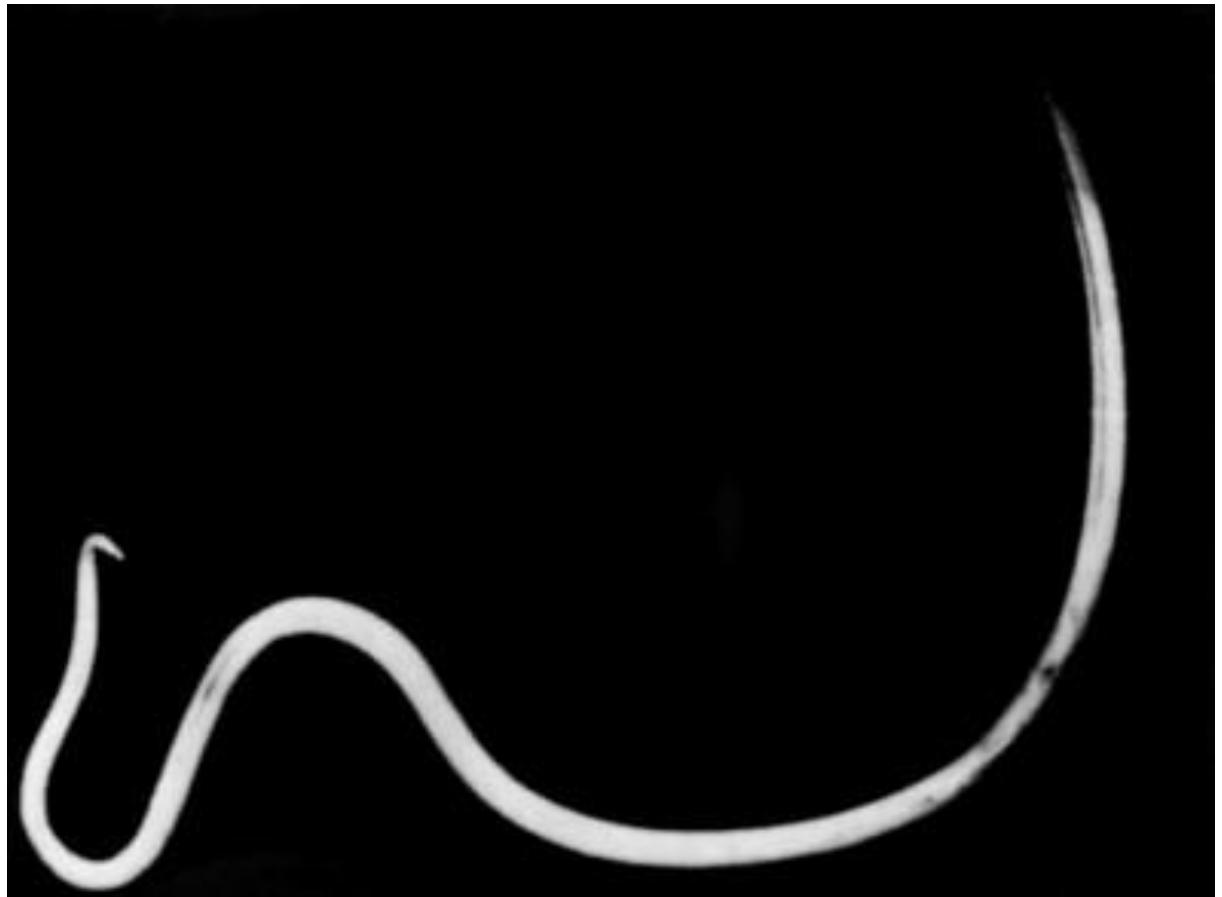


Tamaño relativo de los huevos de helmintos*



Adults

A. lumbricoides is a comparatively large worm (female 20–25 cm × 3–6 mm; male **15–31 cm × 2–4 mm**)



▼ Ascaris lumbricoides unfertilized eggs.

Fertilized and unfertilized *Ascaris lumbricoides* eggs are passed in the stool of the infected host. Fertilized eggs are rounded and have a thick shell with an external mammillated layer that is often stained brown by bile. In some cases, the outer layer is absent (known as decorticated eggs). Fertile eggs range from 45 to 75 µm in length. Unfertilized eggs are elongated and larger than fertile eggs (up to 90 µm in length). Their shell is thinner and their mammillated layer is more variable, either with large protuberances or practically none. Unfertile eggs contain mainly a mass of refractile granules.



Figure A: Unfertilized egg of *A. lumbricoides*. Note the prominent mammillations on the outer layer.



Figure B: Unfertilized egg of *A. lumbricoides* in an unstained wet mount, 200x magnification.



Figure C: Unfertilized egg of *A. lumbricoides* in an unstained wet mount of stool.



Figure D: Unfertilized egg of *A. lumbricoides* in a wet mount of stool. Note this specimen lacks the mammillated layer (decorticated).

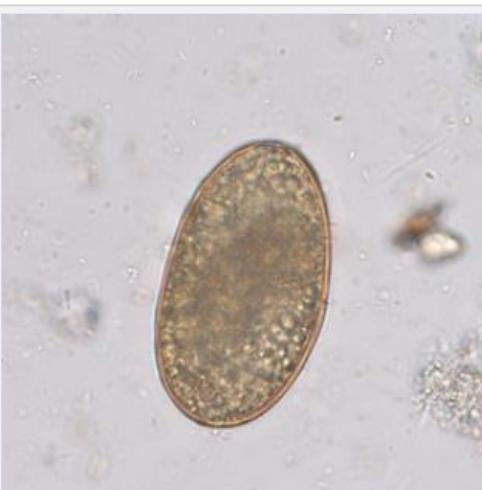


Figure E: Infertile, decorticated egg of *Ascaris lumbricoides*. Image courtesy of The Leiden University Medical Center, The Netherlands.



Figure F: Infertile, decorticated egg of *Ascaris lumbricoides*. Image courtesy of The Leiden University Medical Center, The Netherlands.

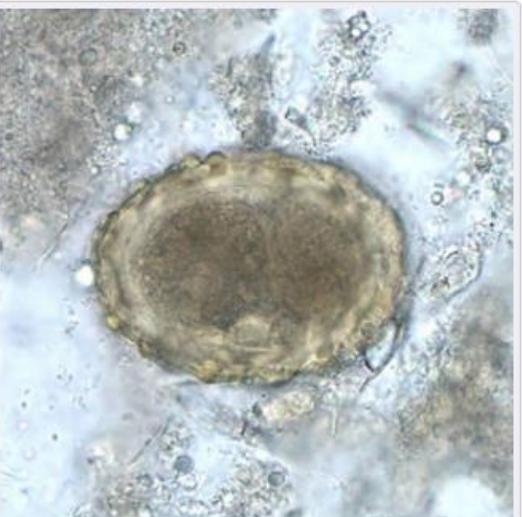
▼ *A. lumbricoides* fertilized eggs.

Figure A: Fertilized egg of *A. lumbricoides* in unstained wet mounts of stool, with embryos in the early stage of development.



Figure B: Fertilized egg of *A. lumbricoides* in unstained wet mounts of stool, with embryos in the early stage of development.

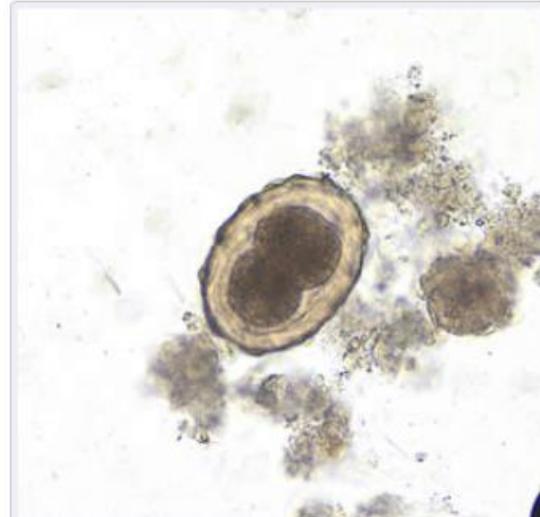


Figure C: Fertilized egg of *A. lumbricoides* in an unstained wet mount of stool, undergoing early stages of cleavage. Image taken at 200x magnification.



Figure D: Fertilized egg of *A. lumbricoides* in an unstained wet mount of stool.

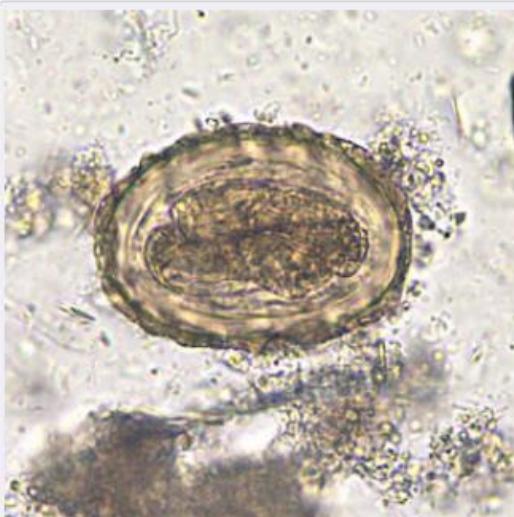


Figure E: Fertilized egg of *A. lumbricoides* in an unstained wet mount of stool, 200x magnification. A larva is visible in the egg.



Figure F: Fertilized egg of *A. lumbricoides* in an unstained wet mount of stool.

▼ *A. lumbricoides* fertilized, decorticated eggs.

Figure A: *A. lumbricoides* decorticated, fertile egg in wet mounts, 200x magnification.

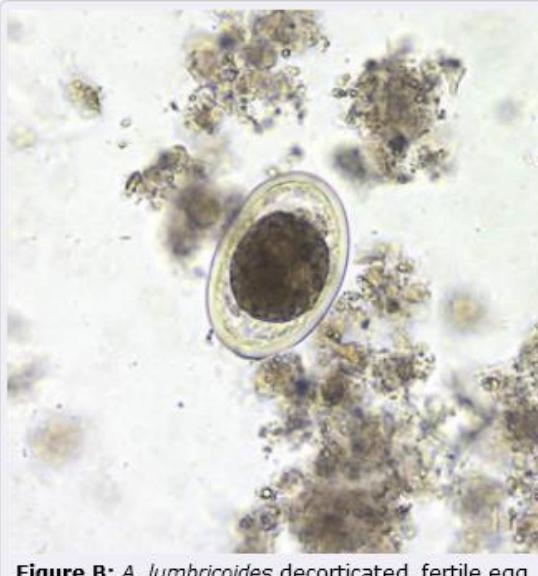


Figure B: *A. lumbricoides* decorticated, fertile egg in wet mounts, 200x magnification.

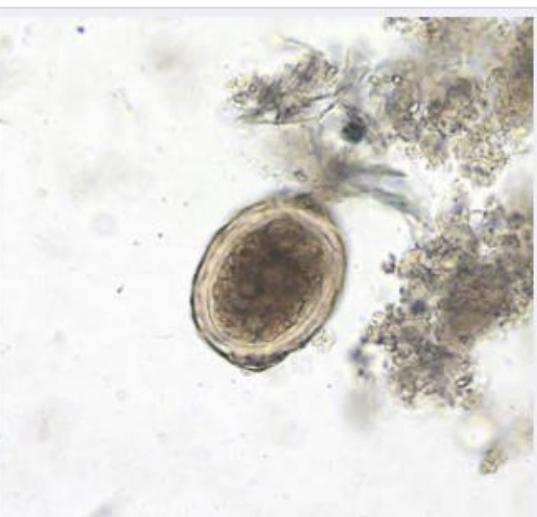


Figure C: *A. lumbricoides* decorticated, fertile egg in a wet mount, 200x magnification. The embryo has advanced cleavage.



Figure D: The same egg as in **Figure C**, but at 400x magnification.

TABLE
55.2

Classification of Intensity of Infection for STH Species Based on WHO Guidelines

	Light	Moderate	Heavy
<i>Trichuris trichiura</i>	1–999	1 000–9 999	≥10 000
<i>Ascaris lumbricoides</i>	1–4 999	5 000–49 999	≥50 000
Hookworm	1–1 999	2 000–3 999	≥4 000

Manson's Tropical Infectious Diseases (Twenty-third Edition)
Editor: Jeremy Farrar ISBN: 978-0-7020-5101-2, 2014.

▼ **Larvae of *A. lumbricoides* hatching from eggs.**

Larvae of *Ascaris lumbricoides* hatching from eggs.



Figure A: Larva of *A. lumbricoides* hatching from an egg.



Figure B: Larva of *A. lumbricoides* hatching from an egg.

▼ Adults of *A. lumbricoides*.

Adults of *Ascaris lumbricoides* are large roundworms. Females measure 20-35 cm long with a straightened tail; males are smaller at 15-31 cm and tend to have a curved tail. Adults of both sexes possess three 'lips' at the anterior end of the body.



Figure A: Adult female *A. lumbricoides*.

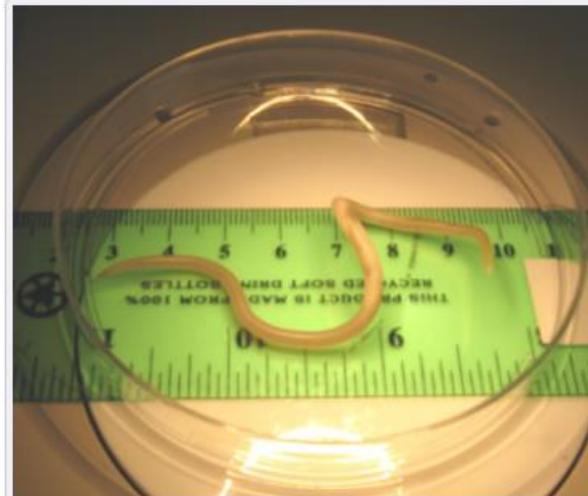


Figure B: Adult female *A. lumbricoides*. Image courtesy of the Orange County Public Health Laboratory, Santa Ana, CA.

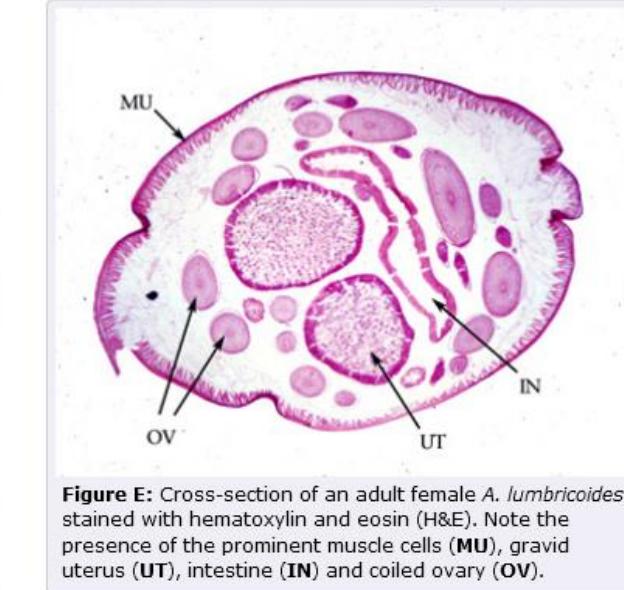


Figure E: Cross-section of an adult female *A. lumbricoides*, stained with hematoxylin and eosin (H&E). Note the presence of the prominent muscle cells (**MU**), gravid uterus (**UT**), intestine (**IN**) and coiled ovary (**OV**).



Figure C: Close-up of the anterior end of an adult *A. lumbricoides*. Note the three 'lips.' Image courtesy of the Orange County Public Health Laboratory, Santa Ana, CA.

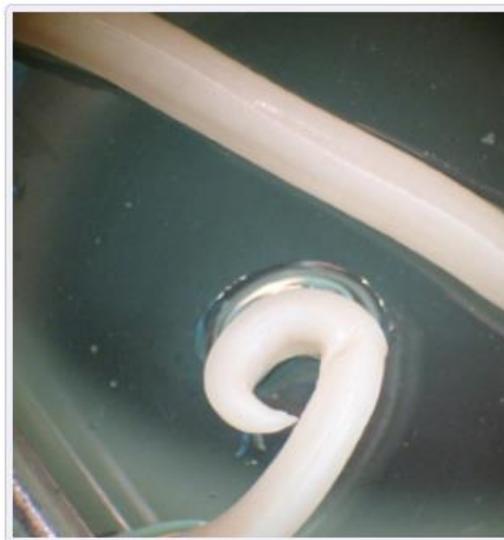


Figure D: Posterior end of a male *A. lumbricoides*, showing the curled tail.

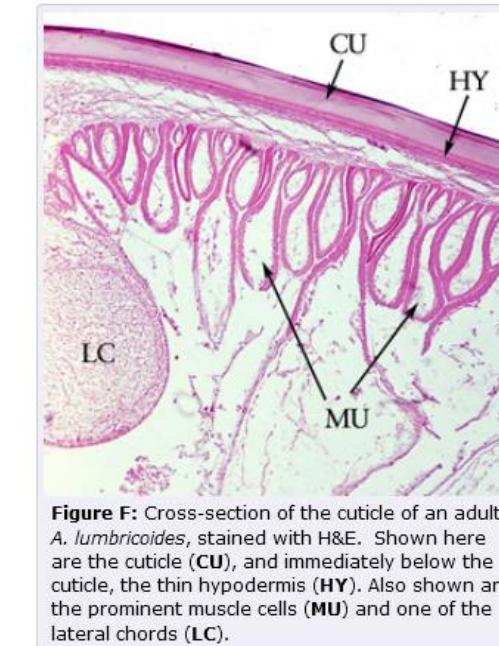


Figure F: Cross-section of the cuticle of an adult *A. lumbricoides*, stained with H&E. Shown here are the cuticle (**CU**), and immediately below the cuticle, the thin hypodermis (**HY**). Also shown are the prominent muscle cells (**MU**) and one of the lateral chords (**LC**).

▼ *A. lumbricoides* in tissue specimens.

Ascaris lumbricoides in tissue specimens, stained with hematoxylin and eosin (H&E).

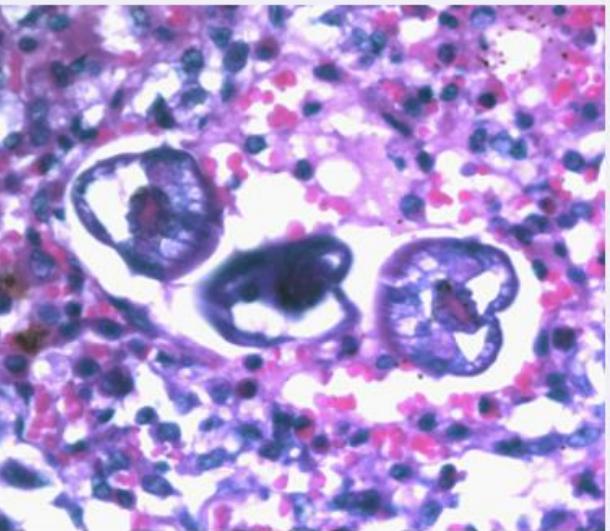


Figure A: L3 larvae of *A. lumbricoides* in lung tissue, stained with H&E. Image taken at 400x magnification.

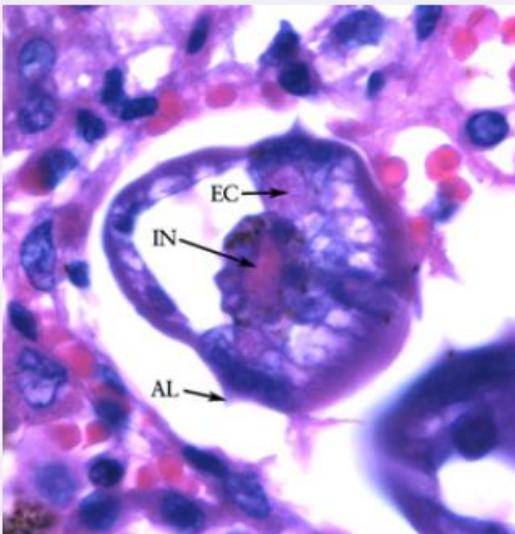


Figure B: Higher magnification (1000x) of the specimen in **Figure A**. Note the prominent alae (AL), intestine (IN) and excretory ducts (EC).

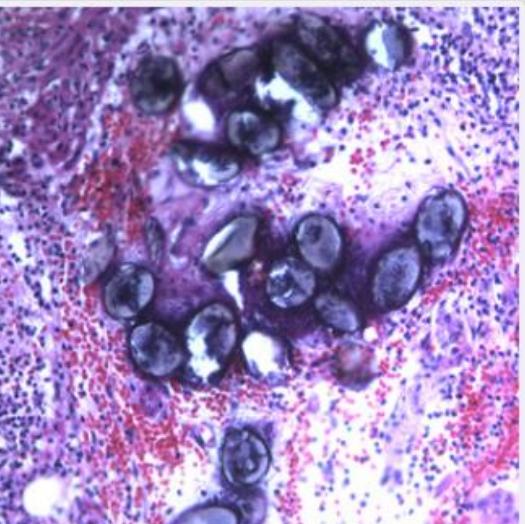


Figure C: Eggs of *A. lumbricoides* in an appendix biopsy, stained with H&E. This image was taken at 200x magnification.

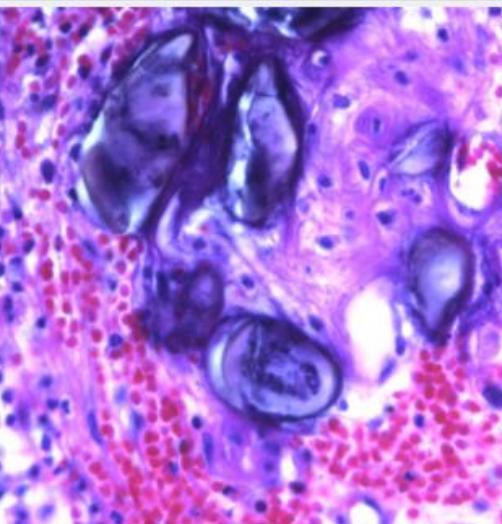


Figure D: Eggs of *A. lumbricoides* in an appendix biopsy, stained with H&E. This image was taken at 400x magnification.

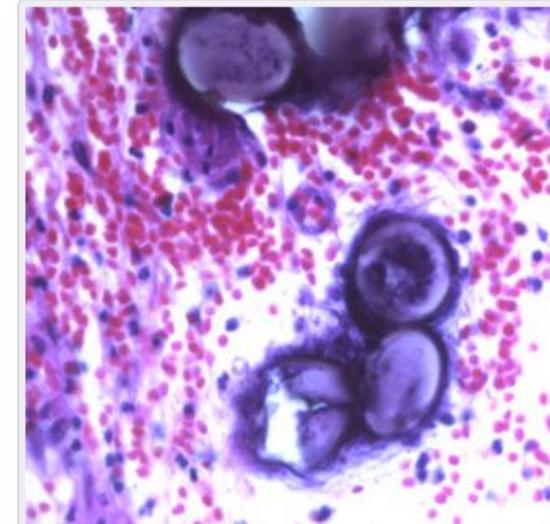


Figure E: Eggs of *A. lumbricoides* in an appendix biopsy, stained with H&E. Image taken at 400x magnification.

Pathology and Migrating Larvae

Pathology may be caused by larvae migrating through the liver and lungs or adults residing in the intestinal tract and migrating to abnormal situations. As with other geohelminths, the severity of pathology is related to the intensity of infection.

Migrating Larvae (Larval Ascariasis).

Migrating larvae cause symptoms from their actual physical presence and the eosinophilic inflammatory responses they elicit.

Damage to the lungs occurs during the migration of larvae on their way to the intestine. '**Löffler's syndrome**', which can be potentially fatal, may be produced with **fever, cough, sputum, asthma, skin rash, eosinophilia and radiological pulmonary infiltration**.

Segments of fourth-stage larvae (L4) can be seen in the bronchioles associated with infiltration with polymorphonuclear and eosinophilic leucocytes with scattered Charcot–Leyden crystals usually associated with lysed eosinophils.

Small areas of necrosis with eosinophils may be found in the liver.

Migrating larvae have been recovered from aspirated gastric juice and sputum. If the larvae reach the general circulation they may cause localized symptoms resembling those of visceral larva migrans caused by *Toxocara spp.*

Larvae may wander into the brain, eye or retina, causing granulomas simulating *Toxocara* spp. In small children, ascariasis is frequently associated with toxocariasis. Hundreds of larvae have been removed from a swelling in the neck.

Clinical Features

Natural History.

Most *A. lumbricoides* infections are symptomless but heavy infections in childhood give rise to symptoms. These heavy infections may be controlled by immunity, or by diminished exposure, so that adults have much lighter infections, although reinfection can occur throughout life.

Incubation Period.

The incubation period from infection after swallowing eggs to the first appearance of eggs in the stools is 60–70 days. In larval ascariasis pulmonary symptoms occur 4–6 days after infection.

Symptoms and Signs

Light infections do not usually cause symptoms, though a single adult worm can cause a liver abscess or block the common bile duct. Acute manifestations are roughly proportional to the number of worms harboured and serious disease may be caused when the burden amounts to 100 worms or more.

During the migratory stages the larvae cause a pneumonitis 4–16 days after infection, with fever, cough, sputum and radiological infiltration of the lungs. There is a high eosinophilia and larvae can be found in the sputum or gastric juice, especially if a quantity is collected, digested with trypsin and centrifuged. It seems that Löffler's syndrome occurs more with seasonal ascariasis, rather than with continued transmission throughout the year.

The pneumonitis is of short duration – about 3 weeks (in contrast to tropical pulmonary eosinophilia (TPE), which lasts for many months). There may be asthma, which can be so intense as to cause status asthmaticus, and the liver may be affected, becoming enlarged and tender.

Symptoms and Signs

On reaching the general circulation larvae may cause symptoms similar to those of *Toxocara* spp. Neurological disorders including convulsions, meningism and epilepsy, palpebral oedema, insomnia and tooth grinding during the night may occur. When the larvae wander into the brain they cause granulomas, presenting as small tumours in the eye, retina or brain.

The commonest complication of ascariasis is small bowel obstruction. The incidence of *Ascaris*-induced intestinal obstruction (AI-IO) is non-linearly related to the prevalence of infection and estimated to be in the range of 0–0.25 cases per year per 1000 in endemic areas. The case fatality rate is up to 5%. AI-IO is most common among children below the age of 10 years, possibly because of their narrower intestinal lumen diameter and high worm burden, and as many as 1000 worms have been removed from one patient. Gastrointestinal discomfort, colic and vomiting are quite common. Plain abdominal radiography and abdominal ultrasonography featuring the characteristic 'railway track' sign and 'bull's eye' appearance help to confirm the diagnosis.



Figure 55.11 Impacted mass of adult *Ascaris* worms in the small intestine causing fatal intestinal obstruction.



López L, Cáceres R, Servin J, Esquivel J, Chirico M, Rodriguez-Morales AJ. Surg Infect (Larchmt). 2010 Apr;11(2):183-5.

Symptoms and Signs

The second most common complication is biliary ascariasis, especially among adults in the Indian subcontinent.

The symptoms are acute onset of right upper abdominal pain, sometimes with fever and jaundice from recurrent cholangitis.



Fig.-2: Dead round worm impacted into the papilla.



Fig.-4: Dormia basket in situ during removal of round worm from the common bile duct

J MEDICINE 2011; 12 : 170-173



Fig. 1 - Abdominal CT scan revealed in the left lobe of the liver a heterogeneous alteration but no clear image of mass or liquid collection.

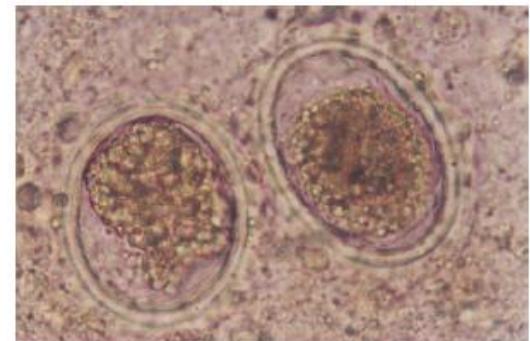


Fig. 2 - Eggs of *Ascaris lumbricoides* of liquid obtained from the hepatic abscess.



Fig. 3 - Charcot Leyden Crystals of liquid obtained from the hepatic abscess.

Rev. Inst. Med. trop. S. Paulo, 43(6):343-346, 2001.

Ascaris y alergias

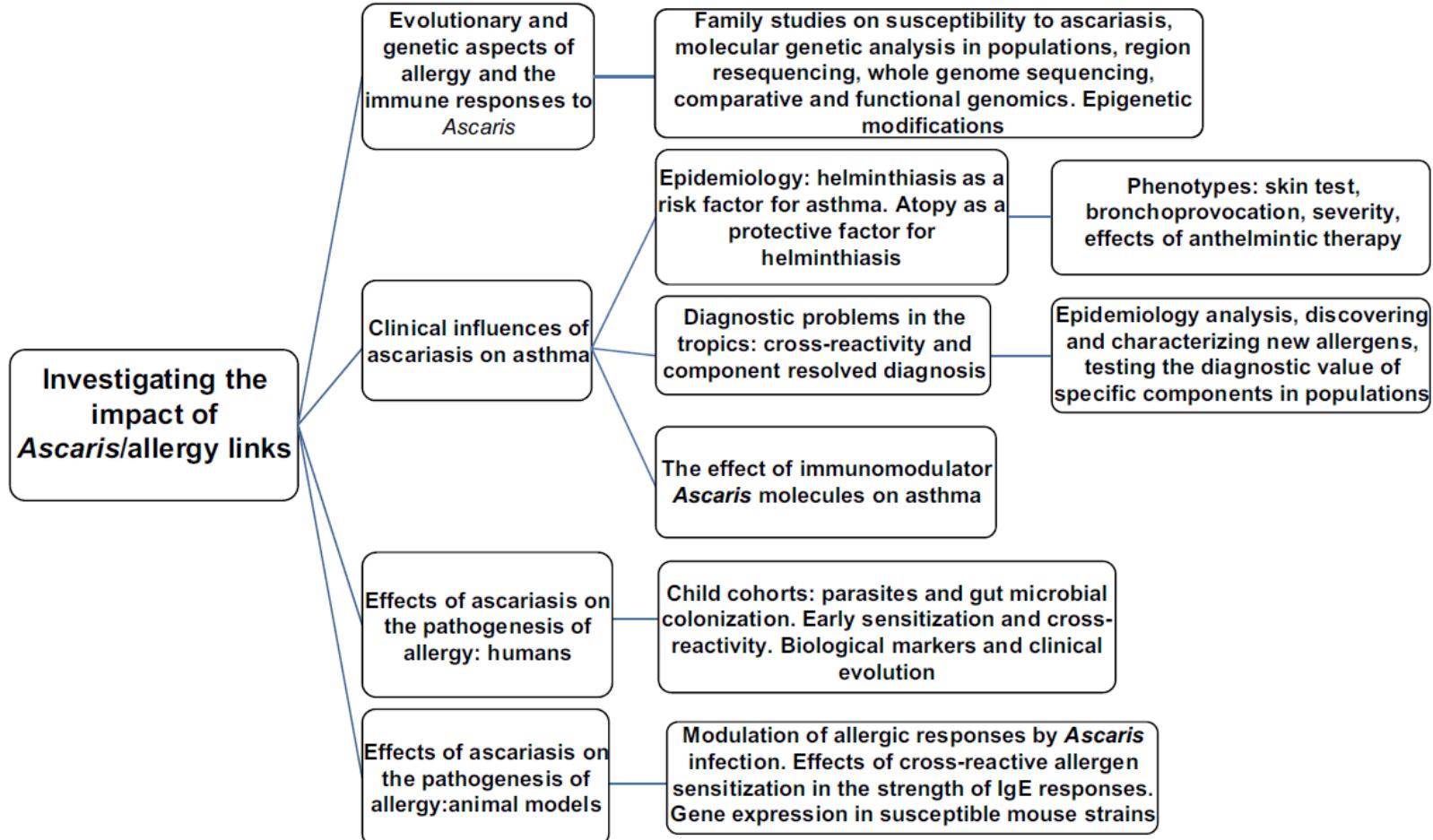


FIGURE 2.1 Several aspects of the *Ascaris*-allergy association are currently under investigation. Results from most of these studies are discussed in this chapter. Component resolved diagnosis employs purified allergens instead of the whole extracts for determining the immune reactivity (mainly specific IgE) of patients.

Ascaris y coinfecciones

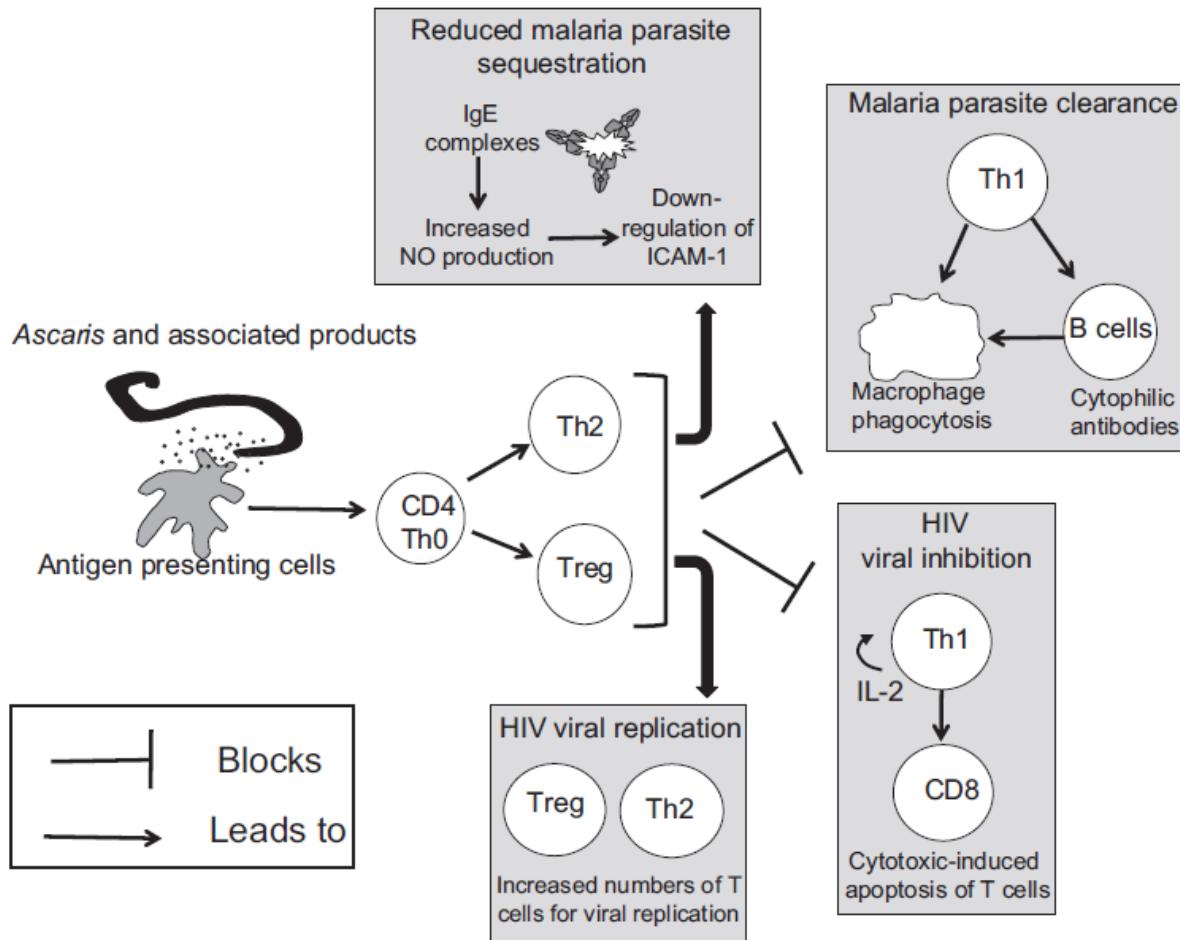


FIGURE 4.2. Possible effects of *Ascaris*-induced immune responses on HIV and malaria infection.

Diagnóstico

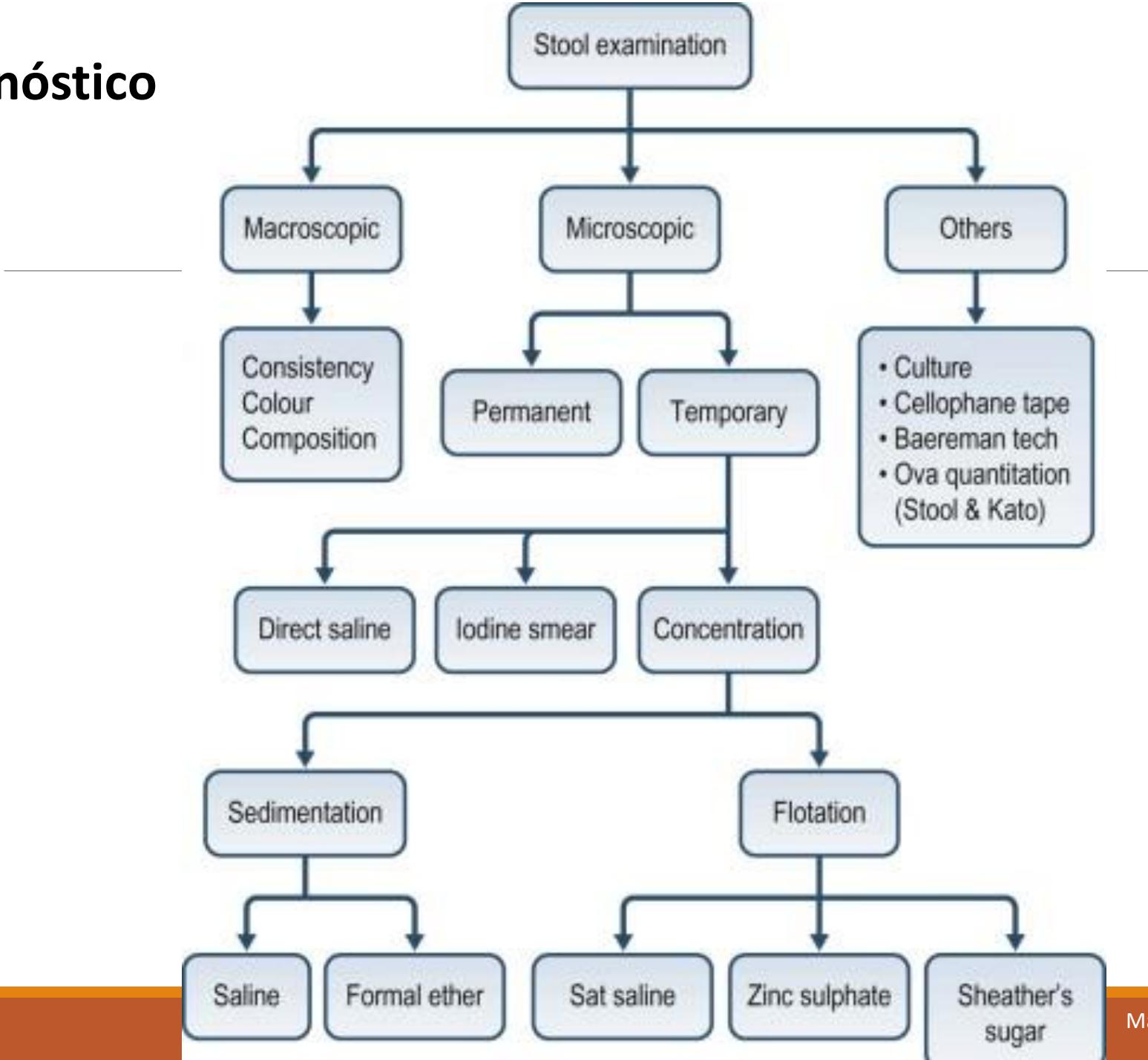
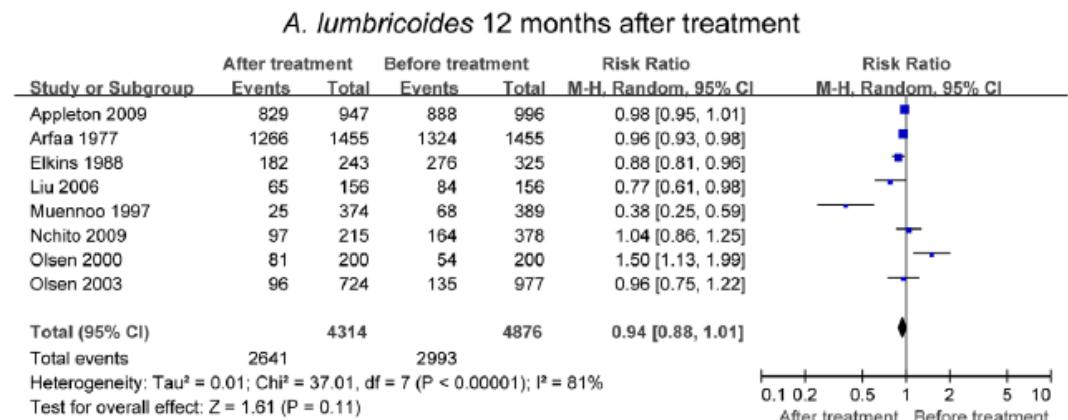
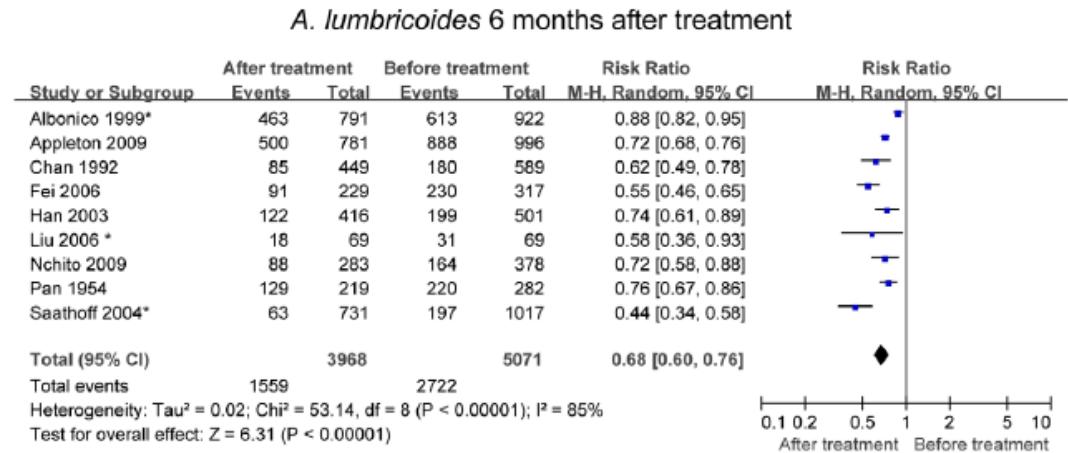
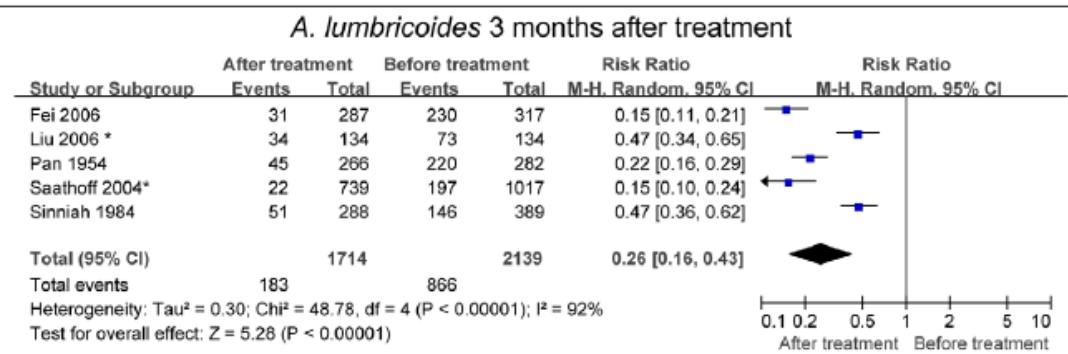


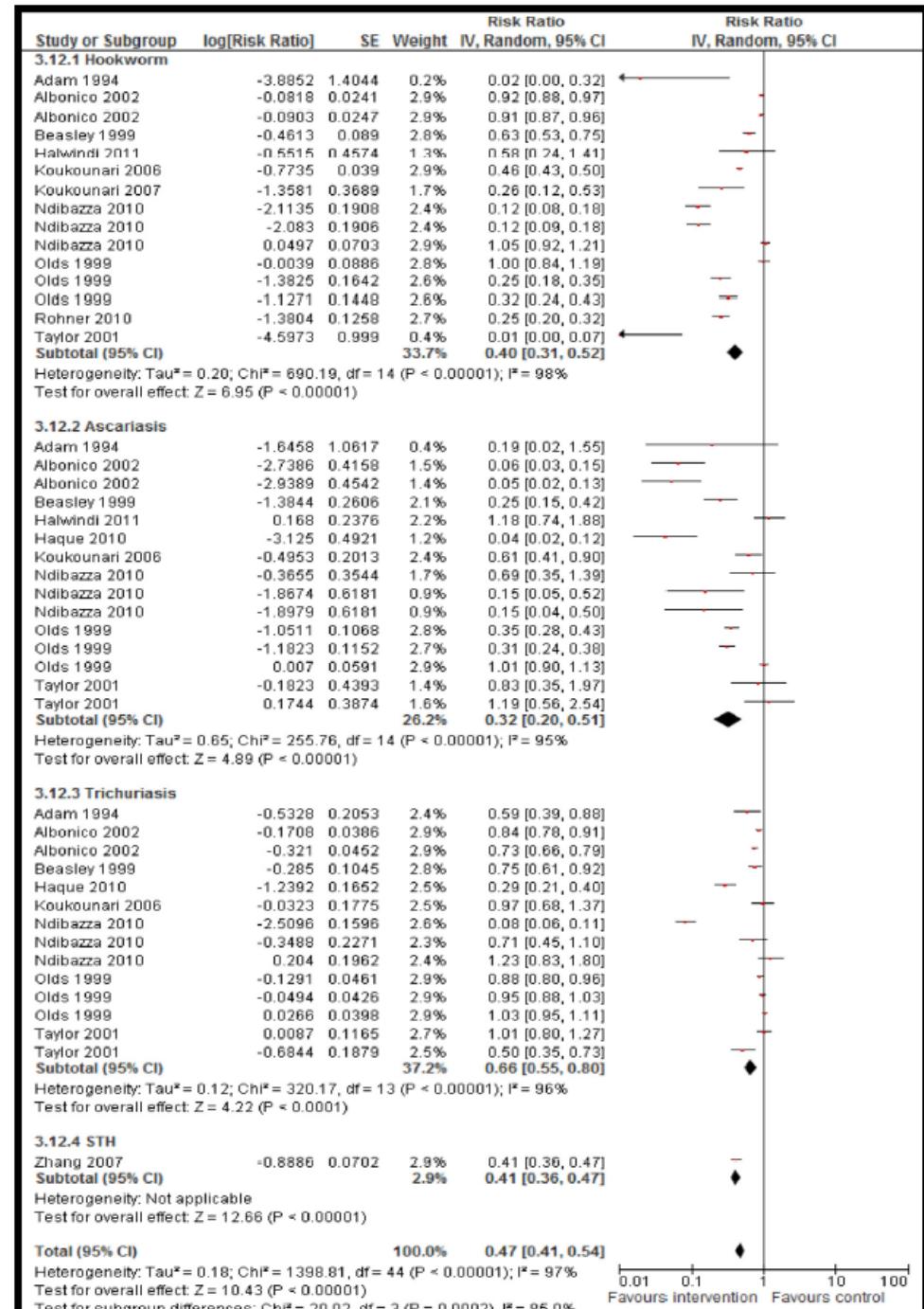
TABLE 55.1 Recommended Treatments for Soil-Transmitted Helminths. Note All Treatment are Administered Orally

Infection	Drugs	Dose	Duration
<i>ENTEROBIUS</i>			
Drugs of choice	Albendazole Mebendazole Pyrantel pamoate	400 mg 100 mg 10 mg/kg	Single dose ^a Single dose ^a Single dose ^a
<i>TRICHURIS</i>			
Drugs of choice	Albendazole Mebendazole	400 mg 500 mg	Single dose ^b Single dose ^b
Alternatives	Nitazoxanide	500 mg or 200 mg for children 4–11 years or 100 mg for children 1–3 years	Daily for 3 days
<i>ASCARIS</i>			
Drugs of choice	Albendazole	400 mg or 200 mg for children 2–5 years	Single dose
	Mebendazole	500 mg	Single dose
	Levamisole	2.5 mg/kg	Single dose
	Pyrantel pamoate	10 mg/kg	Single dose
Alternatives	Nitazoxanide	500 mg or 200 mg for children 4–11 years or 100 mg for children 1–3 years	Daily for 3 days



Jia T-W, Melville S, Utzinger J, King CH,
Zhou X-N (2012) Soil-Transmitted
Helminth Reinfection after Drug Treatment:
A Systematic Review and Meta-
Analysis. PLoS Negl Trop Dis 6(5): e1621.
doi:10.1371/journal.pntd.0001621

Figure 2. Forest plot of prevalence of *Ascaris lumbricoides* 3, 6, and 12 months posttreatment. A random relative risk (RR) value of less than 1 indicates a lower infection rate after treatment compared to the initial level. Diamonds represent the pooled estimate across studies. See Table S1 for full references. *The infection rate 3 or 6 months after the last round of treatment was abstracted (Table S3).
doi:10.1371/journal.pntd.0001621.g002

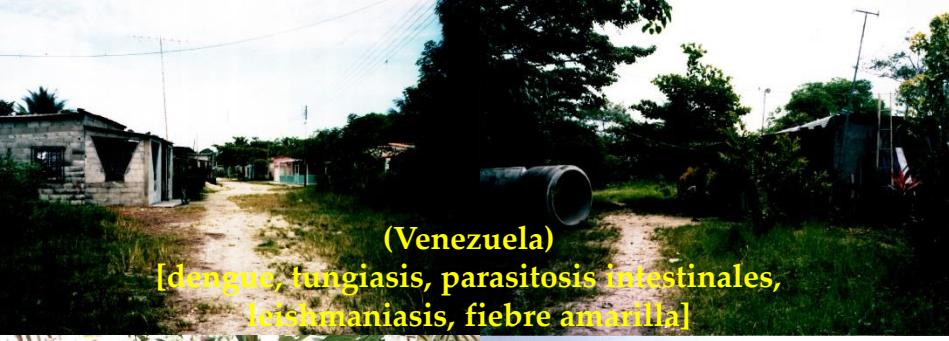


Infect Dis Poverty. 2014 Jul 31;3:23. doi: 10.1186/2049-9957-3-23. eCollection 2014.

Community-based interventions for the prevention and control of helminthic neglected tropical diseases.

Salam RA1, Maredia H2, Das JK1, Lassi ZS1, Bhutta ZA3.

Figure 2 Forest plot for the impact of CBIs on STH prevalence.



Prevención y Control

- Supongamos que deseamos ver la asociación entre la presencia de piso de tierra en las casas de niños familias de Caimalito y la ocurrencia de ascariasis
 - Se encontró que:
 - De 107 niños con ascariasis: **89 vivían en casas con piso de tierra** y 18 no.
 - De 113 niños sin ascariasis: 15 vivían en casas con piso de tierra y **98 no.**
 - ¿Cuál es la razón de chances (OR) de encontrar un niño con ascariasis que viva en una casa con piso de tierra en comparación con aquellos que viven en casas con otros materiales de piso?



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.



¿Pobreza y helmintiasis?

Quintero K, Durán C, Duri D, Medina F, García J, Hidalgo G, Nakal S, Echeverría-Ortega M, Albano C, Nino Incani R, Cortez J, Jiménez S, Díaz M, Maldonado C, Matute F, Rodriguez-Morales AJ. Household social determinants of ascariasis and trichuriasis in North Central Venezuela. *International Health* 2012 Jun; 4(2): 103-110.



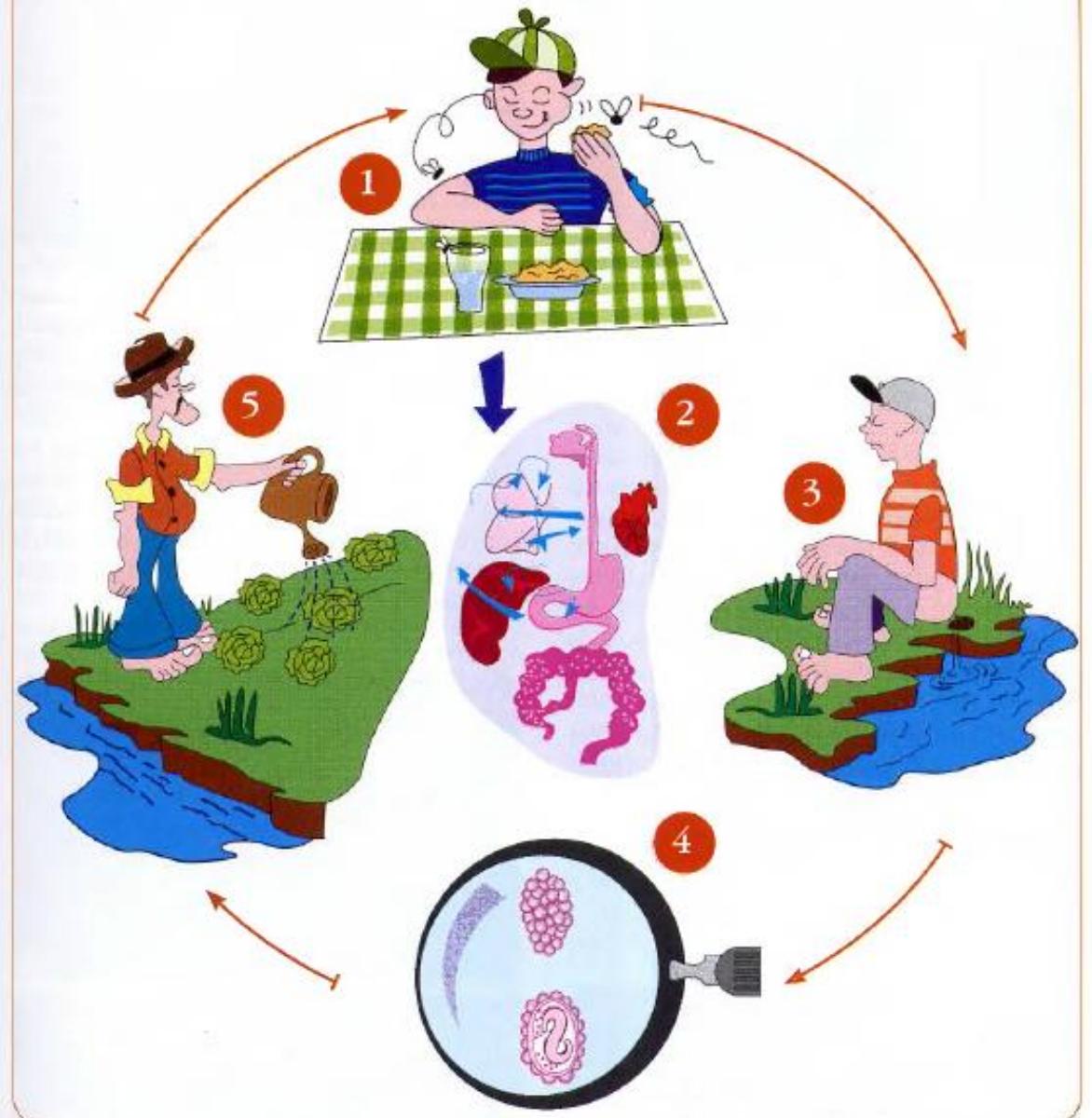
Table 4

Univariate and multivariate analysis of household risk factors for ascariasis and trichuriasis in individuals from North Central Venezuela (May 2007 to December 2008)

Variable	Ascariasis		Trichuriasis	
	Crude OR (univariate) (95% CI)	Adjusted OR (multivariate) (95% CI)	Crude OR (univariate) (95% CI)	Adjusted OR (multivariate) (95% CI)
Vulnerable house				
Yes	4.242 (4.198–4.287)	1.479 (1.428–1.532)	2.598 (2.547–2.650)	10.519 (9.971–11.097)
No	1.000	1.000	1.000	1.000
In a rural area				
Yes	5.597 (5.543–5.652)	2.067 (2.035–2.101)	2.610 (2.564–2.657)	1.918 (1.868–1.970)
No	1.000	1.000	1.000	1.000
Near to small rivers or wetlands				
Yes	4.928 (4.838–5.020)	NS	NS	NS
No	1.000			
Rudimentary wall materials				
Yes	4.097 (4.055–4.139)	NS	1.598 (1.564–1.634)	NS
No	1.000		1.000	
Soil floor				
Yes	13.283 (13.127–13.440)	5.027 (4.895–5.162)	3.726 (3.630–3.825)	5.190 (4.944–5.448)
No	1.000	1.000	1.000	1.000
Tap water access				
No	8.719 (8.626–8.809)	2.512 (2.465–2.560)	3.014 (2.950–3.080)	NS
Yes	1.000	1.000	1.000	
Collection of water in inappropriate receptacles				
Yes	1.734 (1.708–1.759)	NS	1.453 (1.417–1.490)	1.118 (1.089–1.149)
No	1.000		1.000	1.000
Appropriate disposal of sewage waters				
No	6.728 (6.597–6.862)	2.315 (2.254–2.378)	1.091 (1.023–1.163)	NS
Yes	1.000	1.000	1.000	
Appropriate waste disposal				
No	3.061 (3.031–3.091)	1.798 (1.775–1.820)	1.700 (1.671–1.729)	NS
Yes	1.000	1.000	1.000	

NS: not significant.

Ascaris lumbricoides



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

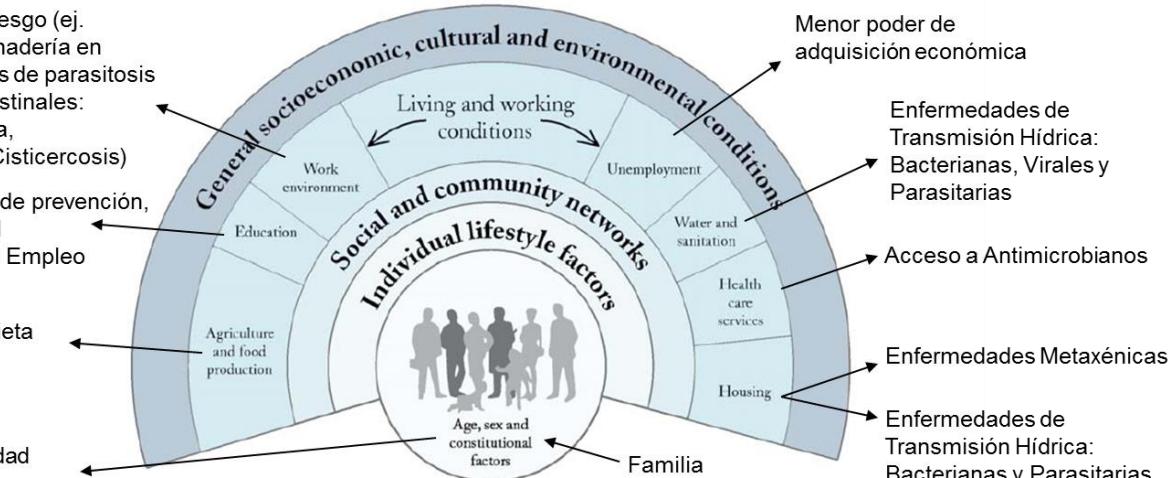
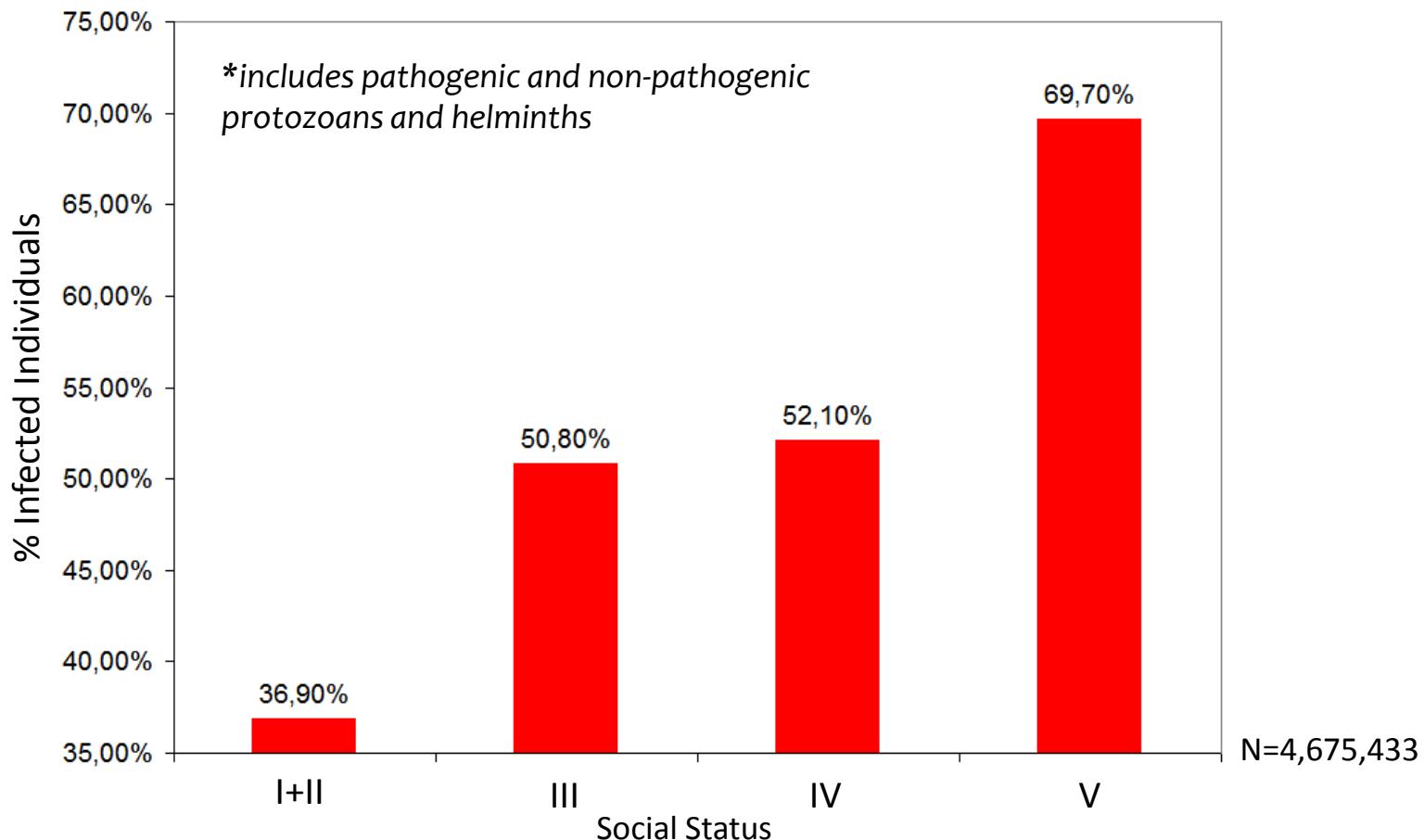


Figure shows one influential model of the determinants of health that illustrates how various health-influencing factors are embedded within broader aspects of society.

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

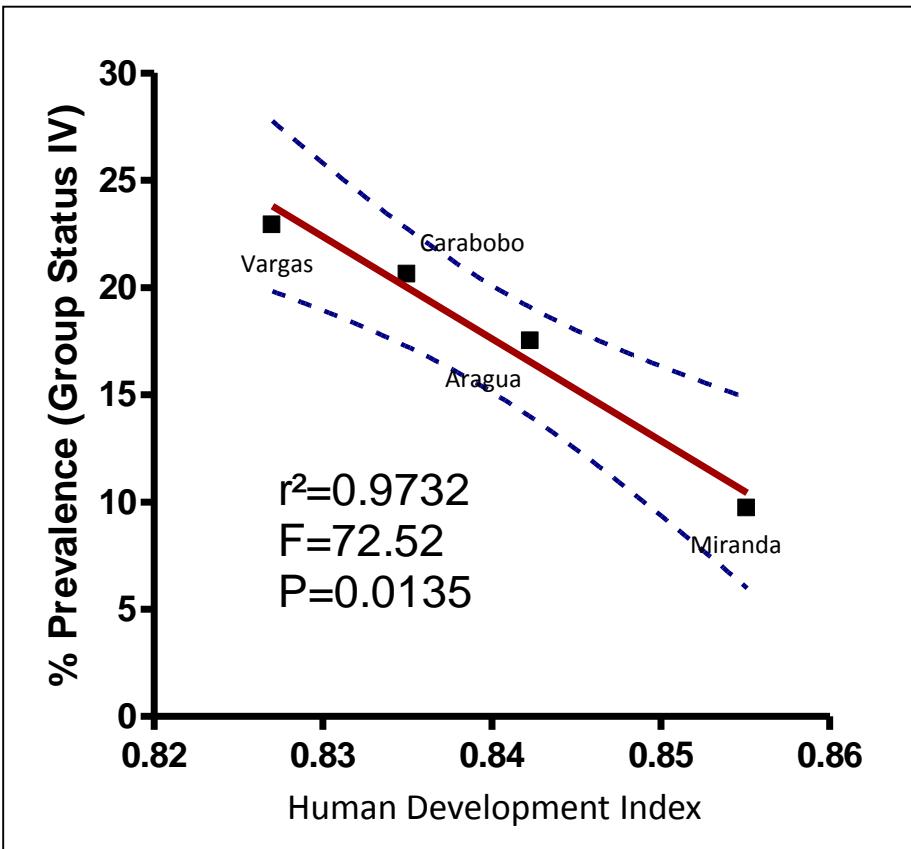
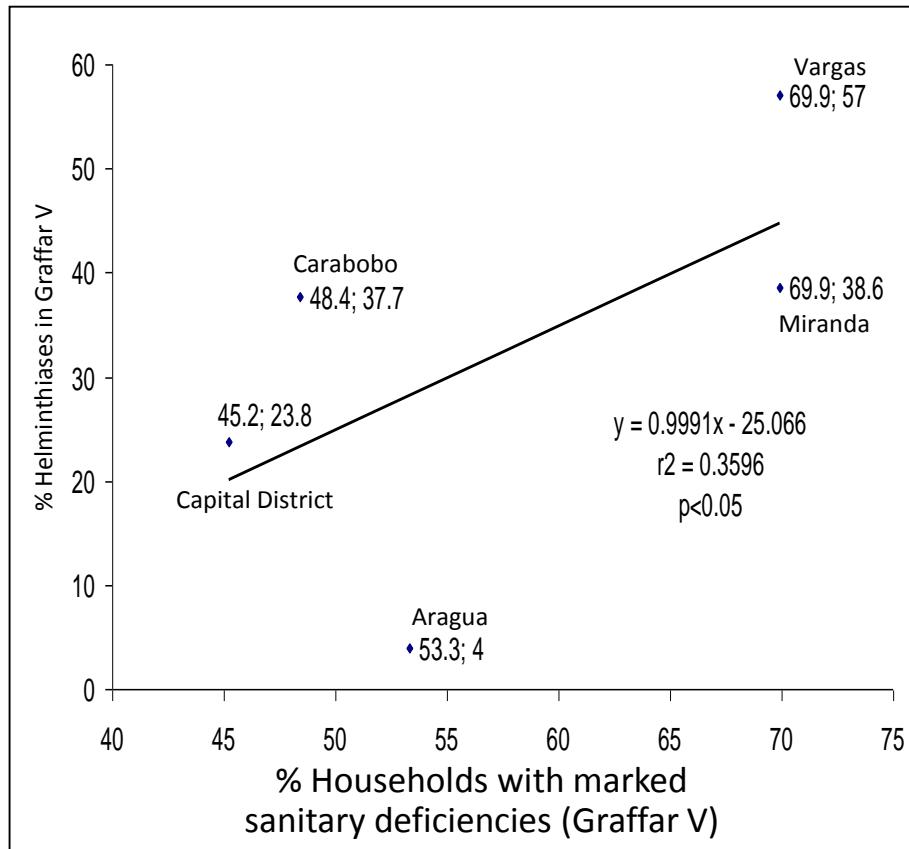
Prevalence of intestinal parasitosis according to social status



Household social conditions and ascariasis

Discussion

Ecological approaches





Ascaris suum enolase is a potential vaccine candidate against ascariasis

Ning Chen^{a, b, c, 1}, Zi-Guo Yuan^{a, b, 1}, , Min-Jun Xu^a, Dong-Hui Zhou^a, Xiu-Xiang Zhang^c, Yan-Zhong Zhang^d, Xiao-Wei Wang^b, Chao Yan^e, Rui-Qing Lin^c, Xing-Quan Zhu^{a, f, g},

^a State Key Laboratory of Veterinary Etiological Biology, Key Laboratory of Veterinary Parasitology of Gansu Province, Lanzhou Veterinary Research Institute, Chinese Academy of Agricultural Sciences, Lanzhou, Gansu Province 730046, PR China

^b College of Veterinary Medicine, South China Agricultural University, Guangzhou, Guangdong Province 510642, PR China

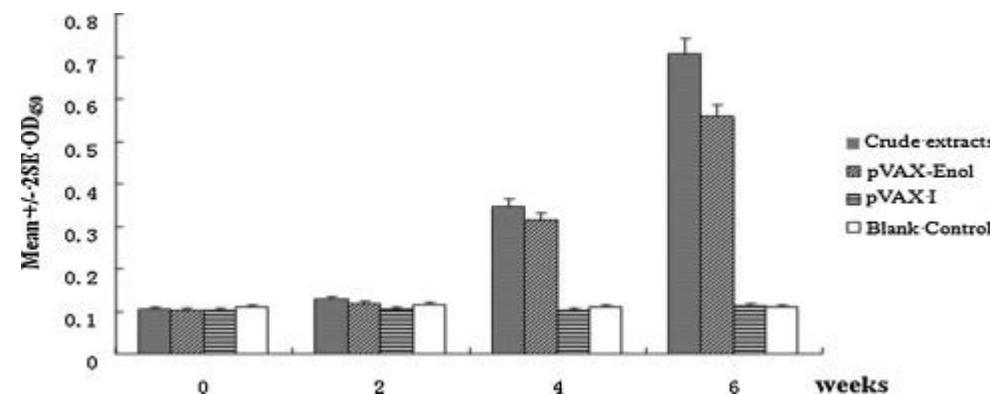
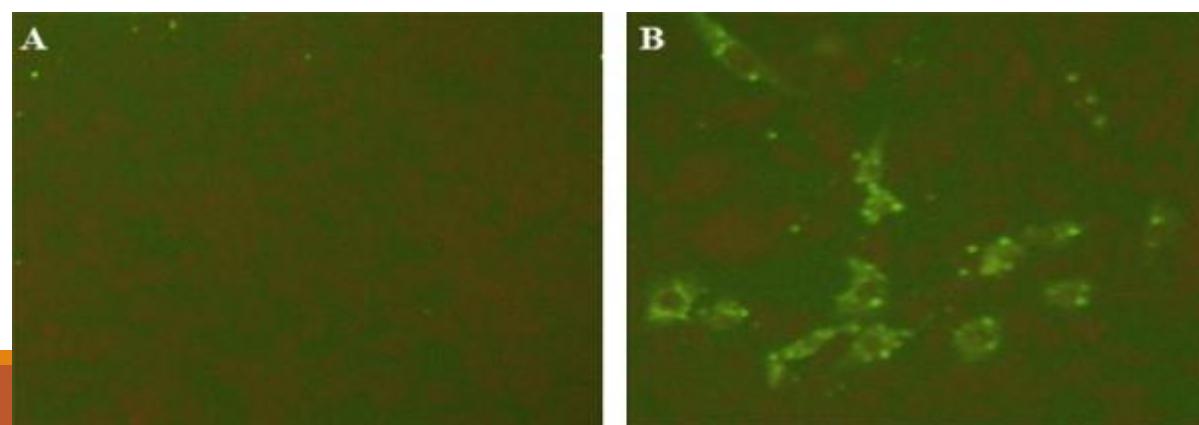
^c Shenzhen Institute for Drug Control, Shenzhen, Guangdong Province 518057, PR China

^d Shenzhen Rui-Peng Pet Hospital, Shenzhen, Guangdong Province 518001, PR China

^e Department of Pathogen Biology and Immunology, Xuzhou Medical College, Xuzhou, Jiangsu Province 221004, PR China

^f College of Animal Science and Technology, Yunnan Agricultural University, Kunming, Yunnan Province 650201, PR China

^g College of Animal Science and Veterinary Medicine, Heilongjiang Bayi Agricultural University, Daqing, Heilongjiang Province 163319, PR China



Cytokine production in splenocytes of immunized Kunming mice after stimulating with crude extracts of *Ascaris suum* larvae (AsCE).

Group	Cytokine production (pg/ml)				Proliferation SI
	IFN- γ	IL-2	IL-4	IL-10	
AsCE	791.33 ± 9.07 ^a	166.33 ± 8.02 ^a	230.00 ± 11.53 ^a	328.00 ± 7.55 ^a	1.40 ± 0.03 ^a
pVAX-Enol	658.67 ± 26.65 ^b	143.33 ± 13.43 ^a	213.33 ± 15.57 ^a	315.67 ± 8.50 ^a	1.36 ± 0.06 ^a
pVAX I	193.33 ± 9.61 ^c	53.67 ± 9.50 ^b	100.67 ± 8.08 ^b	164.67 ± 7.02 ^b	0.18 ± 0.03 ^b
Blank control	190.67 ± 11.01 ^c	48.67 ± 9.29 ^b	97.67 ± 8.96 ^b	172.33 ± 13.32 ^b	0.19 ± 0.05 ^b

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 infantil, especialmente rural y asociado con pobreza y condiciones medioambientales
- ❖ Fácil tratamiento, de importancia prevención y educación, tratamiento colectivo más que individual
- ❖ Clínicamente, pensar en los diagnósticos diferenciales, pero también en presentaciones atípicas que pueden complicarse, e incluso ser fatales
- ❖ Poliparasitismo
- ❖ Relación con desnutrición y alteraciones del crecimiento
- ❖ Necesidad de incrementar la investigación epidemiológica en la región y el país



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