

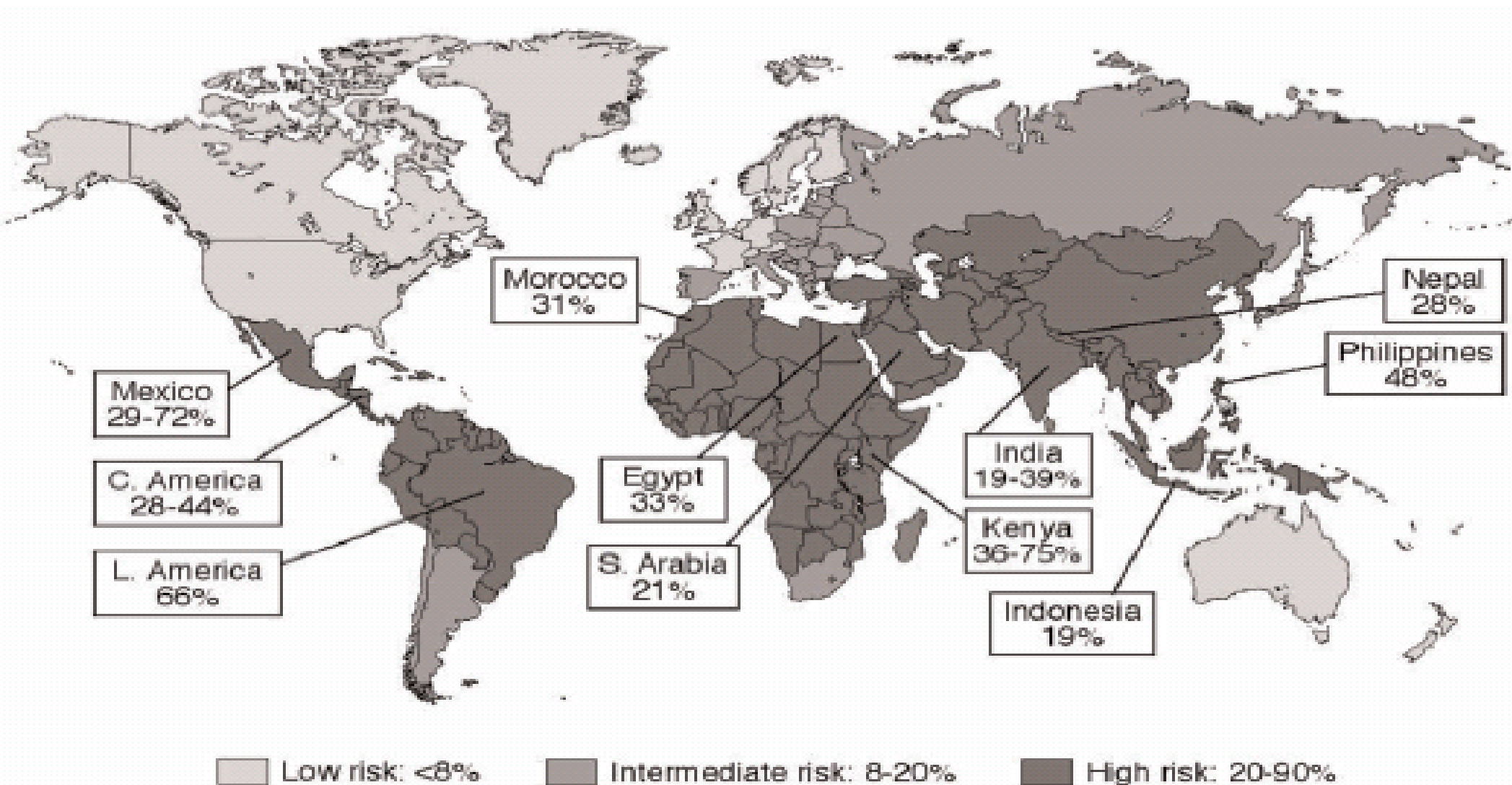
# **Travellers' Diarrhea....or, a backpassage from India**

**Jay Keystone, MD**

**Tropical Disease Unit, TGH**

**“number two is our number one business”**

**University of Toronto**



incidence of travelers' diarrhea caused by enterotoxigenic *Escherichia coli*.

## **TD: Clinical**

- **onset: 1/3 in 1st 2 wks.**
- **4-5 loose stools over 4-5 days (85%)**
- **fever 10%, bloody stool 15%**
- **sequelae:**
  - 40% modify activities**
  - 20% confined to bed**
  - 1% hospitalized**
  - 8-15% diarrhea > 1 wk**
  - 2% chronic diarrhea > 1 mo.**

# Etiology of Travellers' Diarrhea

| Agent                          | Percent |
|--------------------------------|---------|
| EAEC + ETEC                    | 50-70   |
| Salmonella, shigella, campy.   | 0-20    |
| Protozoa (giardia, crypto. Eh) | 0-5     |
| Viruses (rotavirus)            | 0-20    |
| Unknown                        | 10-40   |

# **TD: High risk/increased susceptibility**

- small children, young adults
- hypochlorhydria (esp. PPIs.)  
(Sucralfate - antibacterial properties)
- immunodeficiency (IgA, AIDS etc.)
- blood group O (*V. cholera*, *S. sonnei*)
- Private homes > hotels > street vendors

**“Travellers’ Diarrhea will always be a problem as long as travellers are in a position to eat other people’s stool”**



**David Hamlet Shlim 1995**

**Do travellers adhere to food  
and water precautions?**

**NOT a Chance!**

**97% of travellers make a  
food and water 'faux pas'  
within 72 hours of arrival**

**Kozicki, Int. J. Eide. 1985;14:169-72**

# Looking for Evidence that Personal Hygiene Precautions Prevent Traveler's Diarrhea

David R. Shlim

Jackson Hole Travel and Tropical Medicine, Jackson, Wyoming

**Clinical Infectious Diseases** 2005; 41:531-5

In the 50 years during which traveler's diarrhea has been studied, it has always been assumed that personal hygiene precautions can prevent or reduce the likelihood of developing traveler's diarrhea. However, 7 of 8 studies that specifically addressed this issue showed no correlation between the types of food selected and the risk of acquiring traveler's diarrhea. The eighth study showed a correlation between a few dietary mistakes and a decreased risk of acquiring traveler's diarrhea. A further increase in the number of dietary mistakes, however, did not continue to increase the risk of acquiring traveler's diarrhea. Personal hygiene precautions, when performed under the direct supervision of an expatriate operating his or her own kitchen, can prevent traveler's diarrhea, but poor restaurant hygiene in most developing countries continues to create an insurmountable risk of acquiring traveler's diarrhea.

The adage "Boil it, cook it, peel it, or forget it" has been asserted so often as an effective method to prevent traveler's diarrhea that it seems almost sacrilegious to question it. A search for this phrase on the Internet via Google yielded 4230 references. At the time of this writing, no one seems to be certain of the origin of the phrase, which entered the travel medicine literature as a quotation in a key article published in 1983 [1]. That article is often cited as proof that how and what one chooses to eat can

dietary advice, it would be worthwhile to review in detail the available literature.

## **METHODS**

A search of the literature was performed by searching PubMed for the key words "traveler's diarrhea," "hygiene," and "prevention." In addition, articles that I already had in my files were used. Eight key articles were identified that made specific reference to studies



**Table 1. Food precautions taken by travelers versus the risk of acquiring traveler's diarrhea, compared with the average risk of acquiring traveler's diarrhea. N=10,000**

**JAMA 1983;249:1176-80**

**“No correlation between the types of food selected and the risk of acquiring TD”...Shlim**

|                                   |      |      |       |
|-----------------------------------|------|------|-------|
| Followed 1 recommended precaution | 2530 | 1.08 | <.01  |
| Any no. and type of precaution    | 5966 | 1.09 | <.001 |
| Took $\geq 3$ precautions         | 1041 | 1.13 | <.001 |

# Drug Prophylaxis for Travelers' Diarrhea

Pamela Rendi-Wagner and Herwig Kollaritsch

**Clinical Infectious Diseases** 2002; 34:628–33

Department of Specific Prophylaxis and Tropical Medicine, Institute of Pathophysiology, University of Vienna, Vienna, Austria

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Travelers' diarrhea is the most common health impairment in persons visiting developing countries, affecting 20% to >50% of tourists. Although it is usually benign, travelers' diarrhea represents a considerable socioeconomic burden for both the traveler and the host country. The most common enteropathogens are enterotoxigenic and enteroaggregative *Escherichia coli*. Travelers' compliance with dietary precautionary measures is poor. Despite the excellent protection rates provided by antibiotics, routine administration of prophylaxis is currently not recommended because of potential adverse reactions. Of the various antibiotics that have been tested, quinolones are considered to be the first choice worldwide; however, quinolone-resistant pathogens are increasingly being isolated. Because it is frequently administered and provides only moderate protection, bismuth subsalicylate is not considered a recommendable option for prophylaxis in Europe, where it is rarely available anyhow. To date, no probiotic has been able to demonstrate clinically relevant protection worldwide. In conclusion, there is no satisfactory prophylactic option, and worldwide monitoring of antimicrobial susceptibility patterns and the search for novel antimicrobial agents, such as nonabsorbed antibiotics, and nonantibiotic medications should continue.

# Agents for prevention of TD

## Agent

## Efficacy

---

Activated charcoal

none

Probiotics:

*Lactobacillus* gg

39-47%

*Saccharomyces boulardii*

0-60%

BSS

65%

Antibiotics

≥ 90%

Ansdell, MCNA 1999;83:945-73 CID 2002; 34:628-33 CID 2008 46 suppl 2:S96

# Antibiotics for Prevention of TD (< 1 mo.)

| Drug          | Dose/d (+2 d) |
|---------------|---------------|
| ciprofloxacin | 500 mg        |
| levofloxacin  | 500 mg        |
| ofloxacin     | 300 mg        |
| moxifloxacin  | 400 mg        |
| azithromycin  | 250 mg        |
| rifaximin     | 200 mg        |

# Rifaximin (Xifaxan)

- rifampicin relative
- inhibition of RNA synthesis
- broad spectrum gm +/-, aerobes, anaerobes
- < 1% oral dose absorbed
- high MIC<sub>90</sub> 16 - 64 µg/ml
- stool concentration ~ 250 x MIC's

# A Randomized, Double-Blind, Placebo-Controlled Trial of Rifaximin To Prevent Travelers' Diarrhea

Herbert L. DuPont, MD; Zhi-Dong Jiang, PhD; Pablo C. Olshayen, MD; Charles D. Erickson, MD; Francisco Javier de la Cabada, MD; Shi Ka, MD; Margaret W. DuPont, MSc; and Francisco Martinez-Sandoval, MD, PhD

**Background:** Travelers' diarrhea causes substantial morbidity and postinfectious irritable bowel syndrome.

**Objective:** To evaluate nonabsorbable rifaximin for prevention of travelers' diarrhea.

**Design:** Randomized, double-blind, placebo-controlled trial. **Setting:** Guadalajara, Mexico. **Patients:** 210 U.S. adults. **Intervention:** Rifaximin (200 mg/d, 200 mg twice daily, or 200 mg 3 times daily) or placebo for 2 weeks. **Measurements and Main Results:** Travelers' diarrhea developed in 14.74% of participants taking rifaximin and 53.70% of those taking placebo (rate ratio, 0.27 [95% CI, 0.17 to 0.43]). Rifaximin provided 72% and 77% protection against travelers' diarrhea and antibiotic-treated travel-

## 200 mg daily: 75% protection

**Participants:** U.S. adults.

**Intervention:** On arrival in Guadalajara, Mexico, 210 U.S. adults received rifaximin (200 mg/d, 200 mg twice daily, or 200 mg 3 times daily) or placebo for 2 weeks.

**Measurements:** Participants were followed daily for 3 weeks for enteric disease and symptoms and daily for 5 weeks for drug side effects. Changes in intestinal coliform flora were studied.

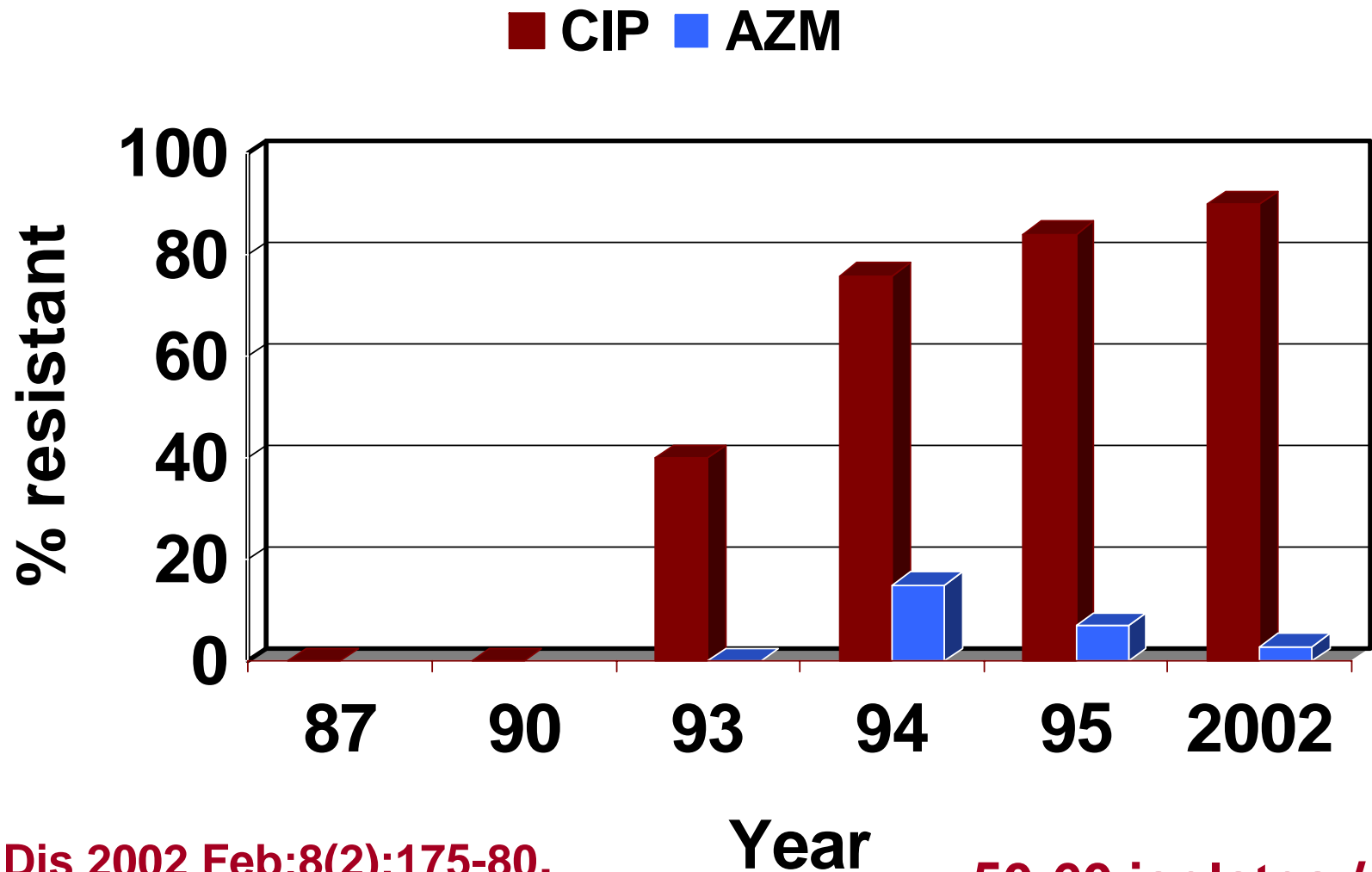
**Results:** Travelers' diarrhea developed in 14.74% of participants taking rifaximin and 53.70% of those taking placebo (rate ratio, 0.27 [95% CI, 0.17 to 0.43]). Rifaximin provided 72% and 77% protection against travelers' diarrhea and antibiotic-treated travel-

**Limitations:** Rifaximin rarely prevented travelers' diarrhea in Mexico, where most cases are caused by diarrhea-producing *Escherichia coli*. A study is needed in Asia to determine whether rifaximin can prevent diarrhea caused by invasive bacterial pathogens.

**Conclusions:** Rifaximin prevents travelers' diarrhea with minimal changes in fecal flora, and more liberal chemoprophylaxis against this disease should be considered. Future studies should evaluate whether rifaximin is effective in preventing postinfectious irritable bowel syndrome.

**Ann Int Med.**2005;142:805

# Campylobacter - Percent resistance to Cipro and azithromycin in Thailand



Emerg Infect Dis 2002 Feb;8(2):175-80,  
CID 1998;26:341-5

50-60 isolates /year

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*Letter*

**Emerg Infect Dis. 2003 9:404-5.**

## **Multidrug-Resistant *Shigella dysenteriae* Type 1: Forerunners of a New Epidemic Strain in Eastern India?**

**Dipika Sur,\* Swapan K. Niyogi,\* Shravani Sur,† Kamal K. Datta,\* Yoshifumi Takeda,‡ Gopinath Balakrish Nair,§ and Sujit K. Bhattacharya\***

\*National Institute of Cholera and Enteric Diseases, Kolkata, India; †Burdwan Medical College, Burdwan, West Bengal; ‡Jissen Women's University, Tokyo, Japan; and §International Centre for Diarrhoeal Diseases Research, Dhaka, Bangladesh

*Suggested citation for this article:* Sur D, Niyogi SK, Sur S, Datta KK, Takeda Y, Nair GB, et al. Multidrug-resistant *Shigella dysenteriae* type 1: forerunners of a new epidemic strain in eastern India? Emerg Infect Dis [serial online] 2003 Mar [date cited].

Available from: URL: <http://www.cdc.gov/ncidod/EID/vol9no3/02-0352.htm>



# Priorities for antibiotic prophylaxis?

- The risk averse traveller
- Underlying disease: IDDM, CRF, IBD
- Antacid use (H2 blockers, PPI)
- Repeatedly ill traveller
- Athletes
- Your bank manager

# TD: Symptomatic Rx

**Oral rehydration:** WHO, gastrolyte, pedialyte

**BSS:** (Pepto-Bismol) 1 oz. (30 cc) or 2 tabs q  
1/2 hr x 8 doses

**loperamide:** (imodium) 4 mg; 2 mg after each  
BM → 16 mg/d (8 tabs)

**opiate:** (lomotil) 2 tabs tid

# Effect of Adjunctive Loperamide in Combination with Antibiotics on Treatment Outcomes in Traveler's Diarrhea: A Systematic Review and Meta-Analysis

Mark S. Riddle,<sup>1</sup> Sarah Arnold,<sup>2</sup> and David R. <sup>1</sup> **Clinical Infectious Diseases 2008; 47:1007–14**

<sup>1</sup>Naval Medical Research Center, Silver Spring, and <sup>2</sup>Uniformed Services University of the Health Sciences, Bethesda, Maryland

(See the editorial commentary by Butler on pages 1015–6)

**Background.** A previous Cochrane Collaboration review established an effective advantage of antibiotic therapy, compared with placebo, for treatment of traveler's diarrhea. The goal of the present study was to conduct a systematic review of the literature to establish the effect on treatment outcomes of using antimotility agents in conjunction with antibiotic therapy.

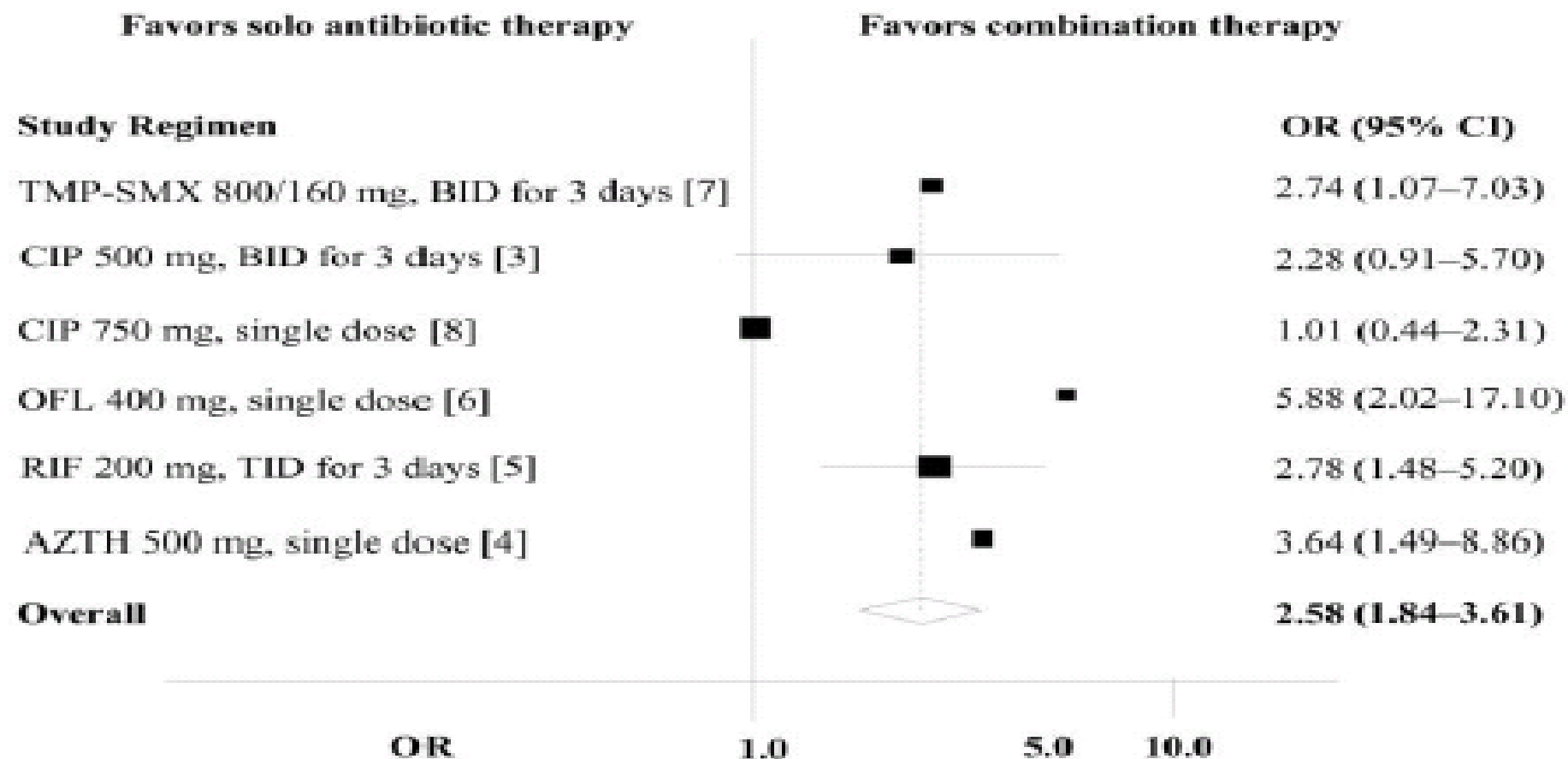
**Methods.** The meta-analysis was conducted through searches of electronic databases and pertinent reference lists (including other review articles) and consultation with experts in the field. Clinical trials on therapy of infectious diarrhea in adult populations that met eligibility criteria were studied. Data were extracted and verified by 2 independent investigators and were analyzed for outcomes of clinical cure at 24 h, 48 h, and 72 h and time to last unformed stool. Study quality, heterogeneity, and publication bias were assessed. When appropriate, effect estimates among studies were pooled and sensitivity analyses were performed.

**Results.** Nine studies consisting of 12 different adjunctive loperamide antibiotic regimens were included for analysis. Among 6 paired studies comparing antibiotics alone versus antibiotics in combination with loperamide, the odds of clinical cure at 24 h and 48 h favored combination therapy, with summary odds ratios of 2.6 (95% confidence interval, 1.8–3.6;  $P = .20$ , by  $\chi^2$  heterogeneity statistic) and 2.2 (95% confidence interval, 1.5–3.1;  $P = .20$ , by  $\chi^2$  heterogeneity statistic), respectively, with no evidence of heterogeneity. Factors that possibly affect advantage of combination therapy over solo therapy included increased frequency of pretreatment diarrhea and higher prevalence of noninvasive pathogens.

**Conclusion.** Antibiotic therapy with adjunctive loperamide offers an advantage over antibiotics alone by decreasing the illness duration and increasing the probability of early clinical cure.

# Loperamide plus antibiotics for TD: OR of clinical cure @48hrs

Clinical Infectious Diseases 2008; 47:1007–14



# Antibiotics for self-treatment of TD

| Drug          | Single dose **<br>(mg) | Multiple<br>(mg x 3<br>days) |
|---------------|------------------------|------------------------------|
| levofloxacin  | 500                    | 500 Qd                       |
| ciprofloxacin | 750                    | 500 bid                      |
| ofloxacin     | 400                    | 200 bid                      |
| moxifloxacin  | 400                    | 400 Qd                       |
| azithromycin  | 1000                   | 500 Qd                       |
| cefixime      | 400                    | 400 Qd                       |
| rifaximin     | -                      | 200 tid                      |

\*\* +/- loperamide

# Traveler's Diarrhea in Thailand: Randomized, Double-Blind Trial Comparing Single-Dose and 3-Day Azithromycin-Based Regimens with a 3-Day Levofloxacin Regimen

Clinical Infectious Diseases 2007; 44:338–46

David R. Tribble,<sup>1</sup> John W. Sanders,<sup>2</sup> Lorrin W. Pang,<sup>6</sup> Carl Mason,<sup>6</sup> Chittima Pitarangsi,<sup>6</sup> Shahida Baqar,<sup>1</sup> Adam Armstrong,<sup>2</sup> Paul Hsieh,<sup>3</sup> Anne Fox,<sup>2</sup> Elisabeth A. Maley,<sup>4</sup> Carlos Lebron,<sup>5</sup> Dennis J. Faix,<sup>3</sup> James V. Lawler,<sup>2</sup> Gautam Nayak,<sup>2</sup> Michael Lewis,<sup>6</sup> Ladaporn Bodhidatta,<sup>6</sup> and Daniel A. Scott<sup>1</sup>

<sup>1</sup>Enteric Diseases Department, Naval Medical Research Center, Silver Spring, <sup>2</sup>National Naval Medical Center, and <sup>3</sup>Uniformed Services University, Bethesda, Maryland; <sup>4</sup>Naval Medical Center, San Diego, San Diego, California; <sup>5</sup>Navy Environmental Preventive Medicine Unit 6, Pearl Harbor, Hawaii; and <sup>6</sup>Armed Forces Research Institute of Medical Sciences, Bangkok, Thailand

**1000 mg dose azithromycin more effective than 3 days of azithromycin or levofloxacin**

single-dose azithromycin, compared with the cure rates of 85% noted with 3-day azithromycin and 71% noted with levofloxacin ( $P = .002$ ). Single-dose azithromycin was also associated with the shortest median TLUS (35 h;  $P = .03$ , by log-rank test). Levofloxacin's efficacy was inferior to azithromycin's efficacy, except in patients with no pathogen identified during the first 24 h of treatment or in patients with levofloxacin-susceptible *Campylobacter* isolates, in whom it appeared to be equal to azithromycin. The rate of microbiological eradication was significantly

# Loperamide Plus Azithromycin More Effectively Treats Travelers' Diarrhea in Mexico than Azithromycin Alone

Charles D. Ericsson, MD,\* Herbert L. DuPont, MD,\*†‡§ Pablo C. Okhuysen, MD,\*†  
Zhi-Dong Jiang, MD, PhD, MPH,† and Margaret W. DuPont, MS†

\*Department of Medicine, Division of Infectious Diseases, University of Texas Medical School at Houston, Houston, TX, USA; †Center for Infectious Diseases, University of Texas School of Public Health at Houston, Houston, TX, USA; ‡Department of Medicine, Division of Infectious Diseases, St Luke's Episcopal Hospital, Houston, TX, USA; §Baylor College of Medicine, Houston, TX, USA

**176 US Students in Mexico..single dose :  
500 mg azithromycin plus loperamide (8h)  
more effective than 1000 mg azithro (20h) or  
500 mg azithro alone (16h)**

**Results.** The duration of diarrhea was significantly ( $p = 0.0002$ ) shorter following treatment with azithromycin plus loperamide (11 h) than with either dose of azithromycin alone (34 h). In the first 24 hours, the average number of unformed stools passed was 3.4 (azithromycin alone) and 1.2 (combination) for a significant ( $p < 0.0001$ ) difference of 2.2 unformed stools. This difference equated with 20% of azithromycin-treated subjects continuing to pass six or more unformed stools in the first 24 hours post-treatment compared with only 1.7% of combination-treated subjects.

**Conclusions.** For the treatment of travelers' diarrhea in an *Escherichia coli* predominant region of the world, a single 500 mg dose of azithromycin appeared as effective as a 1,000 mg dose. Loperamide was more effective than either dose of azithromycin. To realize the substantial clinical benefits of loperamide, we feel loperamide should routinely be used in combination with an antimicrobial agent to treat travelers' diarrhea.

**JTM 2007;14:312–319**



# Etiology of Travellers' Diarrhea

| Agent              | Percent |
|--------------------|---------|
| EAEC + ETEC        | 50-70   |
| <b>E.coli 0157</b> |         |
| viruses            | 0-20    |
| Unknown            | 10-40   |



# 1 vs. 3 Self-Tx Doses ?????

Start when Diarrhea is sufficient to interfere with daily activities:

**Day 1 :** antibiotic + loperamide ➡ better...stop!  
not better !

**Day 2:** antibiotic + loperamide ➡ better...stop!  
not better!

**Day 3:** antibiotic + loperamide ➡ better...stop!

# AN ANTIBIOTIC FOR ALL REASONS?

| Antibiotic          | Bowel      | Bladder    | Resp.      | Skin      |
|---------------------|------------|------------|------------|-----------|
| ciprofloxacin       | +++        | +++        | +          | +         |
| ofloxacin           | +++        | +++        | ++         | ++        |
| <b>levofloxacin</b> | <b>+++</b> | <b>+++</b> | <b>+++</b> | <b>++</b> |
| azithromycin        | +++        | +          | +++        | +++       |
| clarithromycin      | +++        | +          | +++        | +++       |

# Traveller's diarrhea self-management

- ***Most* travellers carry:**
  - loperamide (imodium)
  - antibiotic self-Rx
  - ± electrolyte replacement
- ***Some* travellers use prophylaxis**  
**( $<4$  wk)**

# Acute TD: Investigations

1. CBC
2. Stool C + S x 1
3. Blood cultures (if indicated)
4. Stool *C. Difficile* (if indicated)
5. Stool microscopy (WBC, rbc)
6. Stools O & P x 3 (persistent TD)

# Clinical Approach to Acute TD

1. Cultures
2. Assess degree of illness
3. Rehydrate
4. Treat: **mild:** loperamide or nothing  
**mod-severe:** treat with a  
quinolone or azithromycin

# Persistent TD

- definition: diarrhea  $> 30$  d
- Swiss 0.9%
- Peace Corps 1.7%
- Tour group 2.9%
- Keystone's practice 50%

Dupont, Clin Infect Dis 1996;22:124-8

Taylor, Med Clin N Am 1999;83:1033-51

# Persistent TD Etiology

**1. Infection**

**2. Post-infective**

**3. Malabsorption (Tropical sprue)**

**4. Unmasking GI disorder (IBD, Coeliac)**

**5. Idiopathic (Brainerd)**

**6. Non-tropical (Cancer, IBS)**

# Oral (cholera) vaccine for travellers'

## Diarrhea Dukoral™ (Sanofi)

*ETEC the most frequent cause of TD*

- 2 doses 1 week apart, booster at 3 months
- Protective efficacy: 60-70% against ETEC for 3 months

**\*\*Pelota, Lancet, 1991;338:1285 VanLoon, Vaccine 1996;14:162-166, Clemens, JID 1998;158:372**



# Post-infectious IBS

**Definition :** IBS following a bout of infectious gastroenteritis

**Symptoms :** ABCD **A**bdominal pain:  
**B**loating: **C**onstipation: **D**iarrhea

**Impact:**

- 39% intolerable abdominal pain
- 87% discomfort from bloating
- 53% ‡ IBS affected their quality of life

# What is the prognosis?

**Gut 2002;51:410-13**

- **N=25 with PI-IBS 6 mo post infection**
- **6 years later, 14 followed up**
- **40% (6/14) symptom free**
- **60% (6/14) symptomatic!!!**

# **Mechanism of PI-IBS: poorly understood**

- **Motility disorder**
- **Chronic Inflammatory**
- **Small bowel overgrowth  
(bacterial)**

# Persistent Travel GI problems

| Etiology                          | %  |
|-----------------------------------|----|
| Post infectious IBS               | 70 |
| Lactose intolerance               | 15 |
| Infectious (giardiasis, C. diff.) | 10 |
| IBD                               | <1 |
| Sprue:tropical coeliac            | <1 |

Keystone JS - personal communication

## CLINICAL REVIEWS

## CME

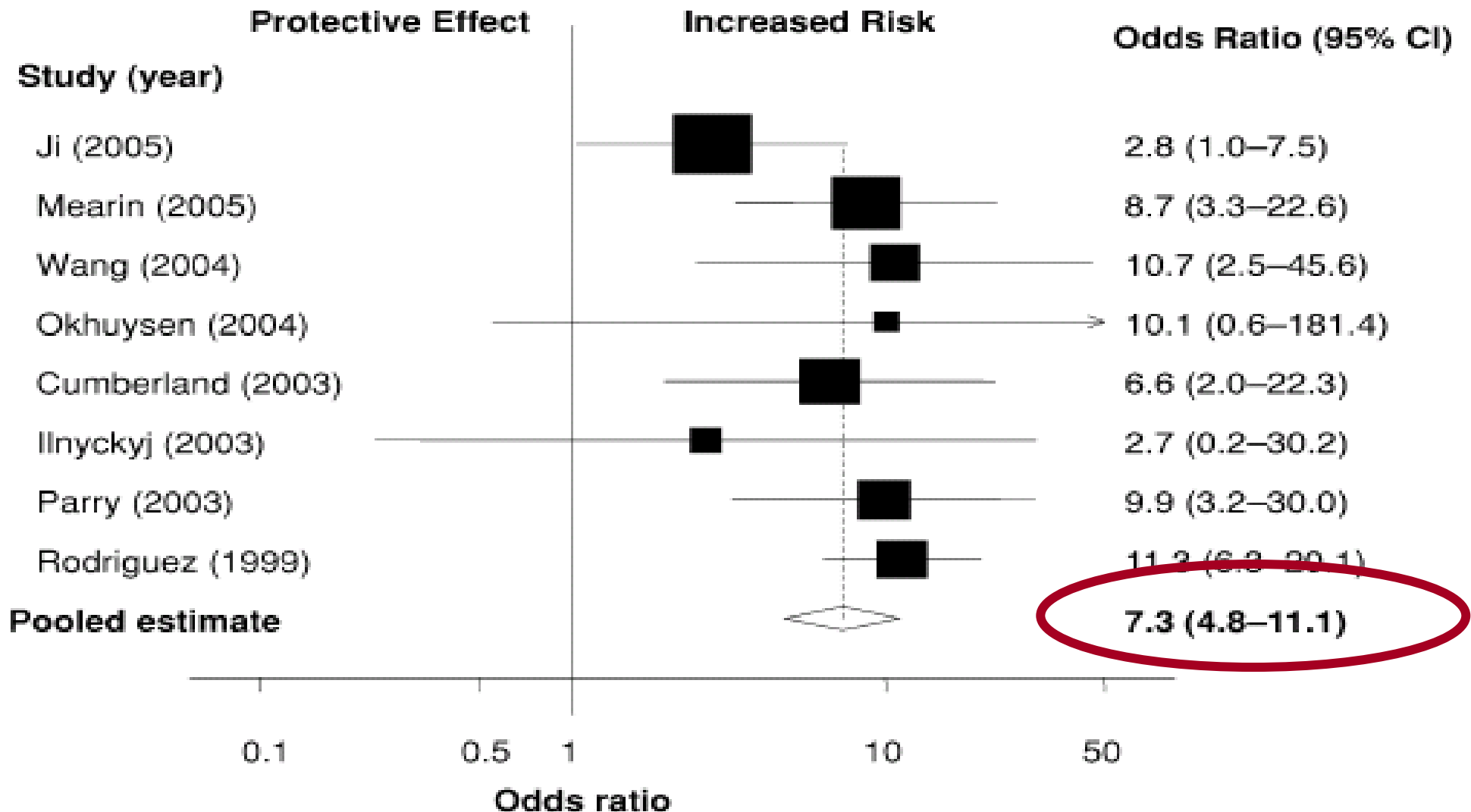
# Postinfectious Irritable Bowel Syndrome—A Meta-Analysis

Heather A. Halvorson, M.D., M.P.H.,<sup>1</sup> Carey D. Schlett, M.P.H.,<sup>2</sup> and Mark S. Riddle, M.D., M.P.H., T.M.<sup>2</sup>

<sup>1</sup>*Department of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, Bethesda, Maryland;* <sup>2</sup>*Enteric Diseases Research Program, U.S. Naval Medical Research Unit No. 3, Cairo, Egypt*

- OBJECTIVES:** Irritable bowel syndrome (IBS) is a heterogeneous disorder affecting 12% of the population worldwide. Several studies identify IBS as a sequela of infectious gastroenteritis (IGE) with reported prevalence ranging from 4% to 31% and relative risk from 2.5 to 11.9. This meta-analysis was conducted to explore the differences between reported rates and provide a pooled estimate of risk for postinfectious irritable bowel syndrome (PIBS).
- DATA SOURCES:** Electronic databases (MEDLINE, OLDMEDLINE, EMBASE, Cochrane database of clinical trials) and pertinent reference lists (including other review articles).
- REVIEW METHODS:** Data were abstracted from included studies by two independent investigators; study quality, heterogeneity, and publication bias were assessed; sensitivity analysis was performed; and a summative effect estimate was calculated for risk of PIBS.
- RESULTS:** Eight studies were included for analysis and all reported elevated risk of IBS following IGE. Median prevalence of IBS in the IGE groups was 9.8% (IQR 4.0–13.3) and 1.2% in control groups (IQR 0.4–1.8) (sign-rank test,  $p = 0.01$ ). The pooled odds ratio was 7.3 (95% CI, 4.7–11.1) without significant heterogeneity ( $\chi^2$  heterogeneity statistic,  $p = 0.41$ ). Subgroup analysis revealed an

# Meta-analysis of risk of PIIB



1: Eur J Gastroenterol Hepatol. 2005 Jan;17(1):5-9.



# Intestinal infection and irritable bowel syndrome.

Parry S, Forgacs I.

Department of Gastroenterology, King's College Hospital, London, UK.

The observation that the symptoms of irritable bowel syndrome (IBS) in some patients might follow an episode of

**“4-26% of patients develop IBS for the first time after gastroenteritis”**

held view that patients with post-infectious IBS carry a better prognosis than IBS patients more generally. The management of patients with post-infectious IBS is the standard approach that might be applied to all patients with IBS. Post-infectious IBS patients may differ from IBS patients in general in having a low-level of intestinal inflammation. Work in animal models, and detection of low-grade inflammation in intestinal biopsies combined with markers of intestinal inflammation such as faecal calprotectin all indicate a strong possibility that persisting inflammation after the acute infection may be important in the pathogenesis of post-infectious IBS

## Is Traveler's Diarrhea a Significant Risk Factor for the Development of Irritable Bowel Syndrome? A Prospective Study

study, we addressed all sequential travelers who visited the travel clinic between June and November 2004. We included only travelers aged 18–65 years who planned a trip of at least 14 days and up to 180 days. Potential participants received a full explanation of the purpose of the study, and those who were

**“No evidence that self-treatment reduces the risk”**

**Dupont 2007**



16 (13.6%)  
developed IBS

**5.5**



7 (2.4%)  
developed IBS

**1**



# Post-infectious IBS treatment

| Symptom                   | Treatment  |
|---------------------------|--|
| Diarrhea alone            | Psyllium 1-2 TBsp/day                              |
| Constipation +/- diarrhea | Psyllium + lactulose 1-2TBsp                       |
| Abdom cramps              | Motility modifiers eg domperidone or nortriptyline |

# Persistent Infection

1. Protozoa
2. Protozoa
3. Protozoa
4. Bacterial (C. difficile, EAEC)
5. Helminth (strongyloidiasis, schistosomiasis)

# Drugs for Parasitic Infections

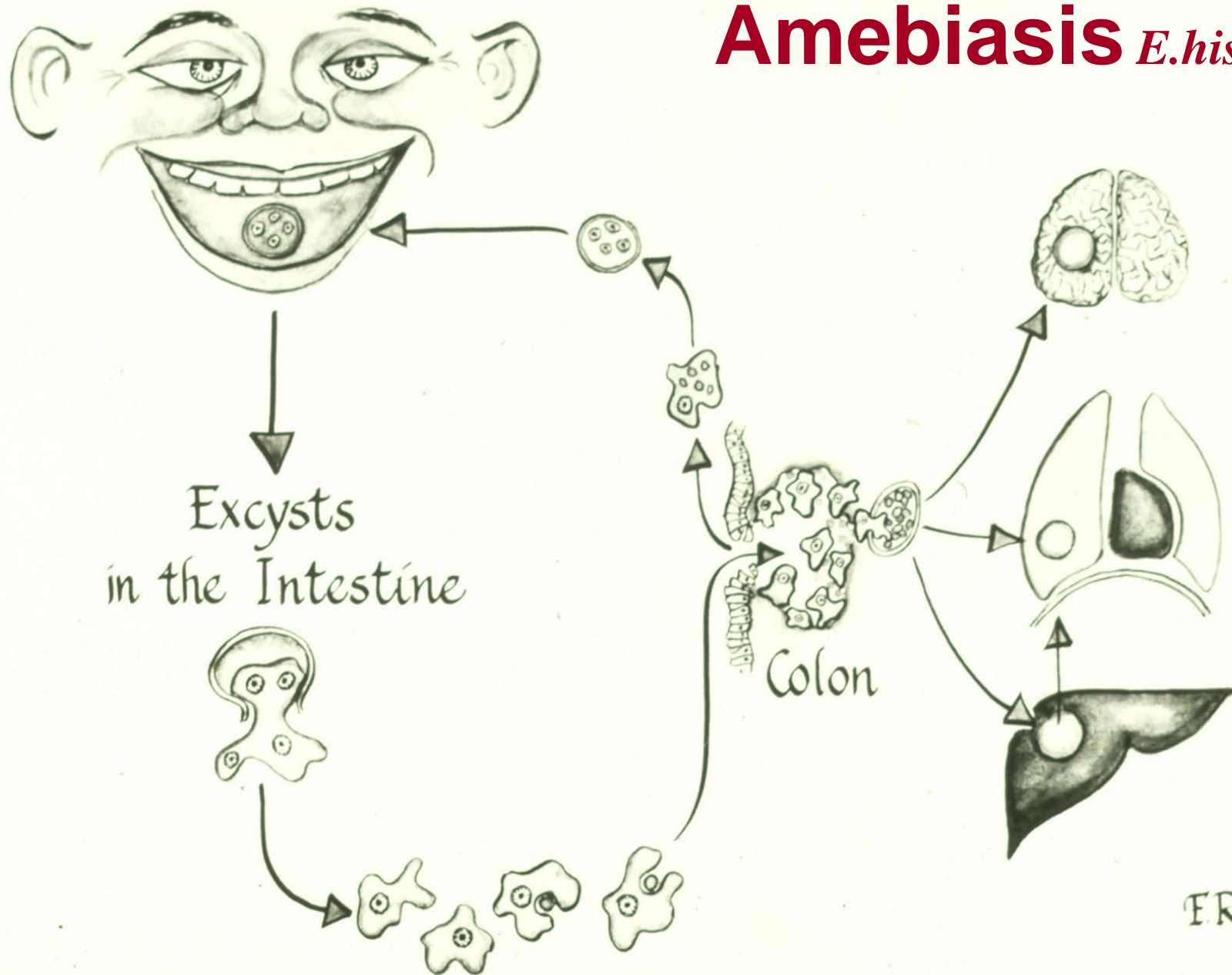
With increasing travel, immigration, use of immunosuppressive drugs and the spread of AIDS, physicians anywhere may see infections caused by parasites. The table below lists first-choice and alternative drugs for most parasitic infections. The table on page 12 summarizes the known prenatal risks of antiparasitic drugs. The brand names and manufacturers of the drugs are listed on page 14.

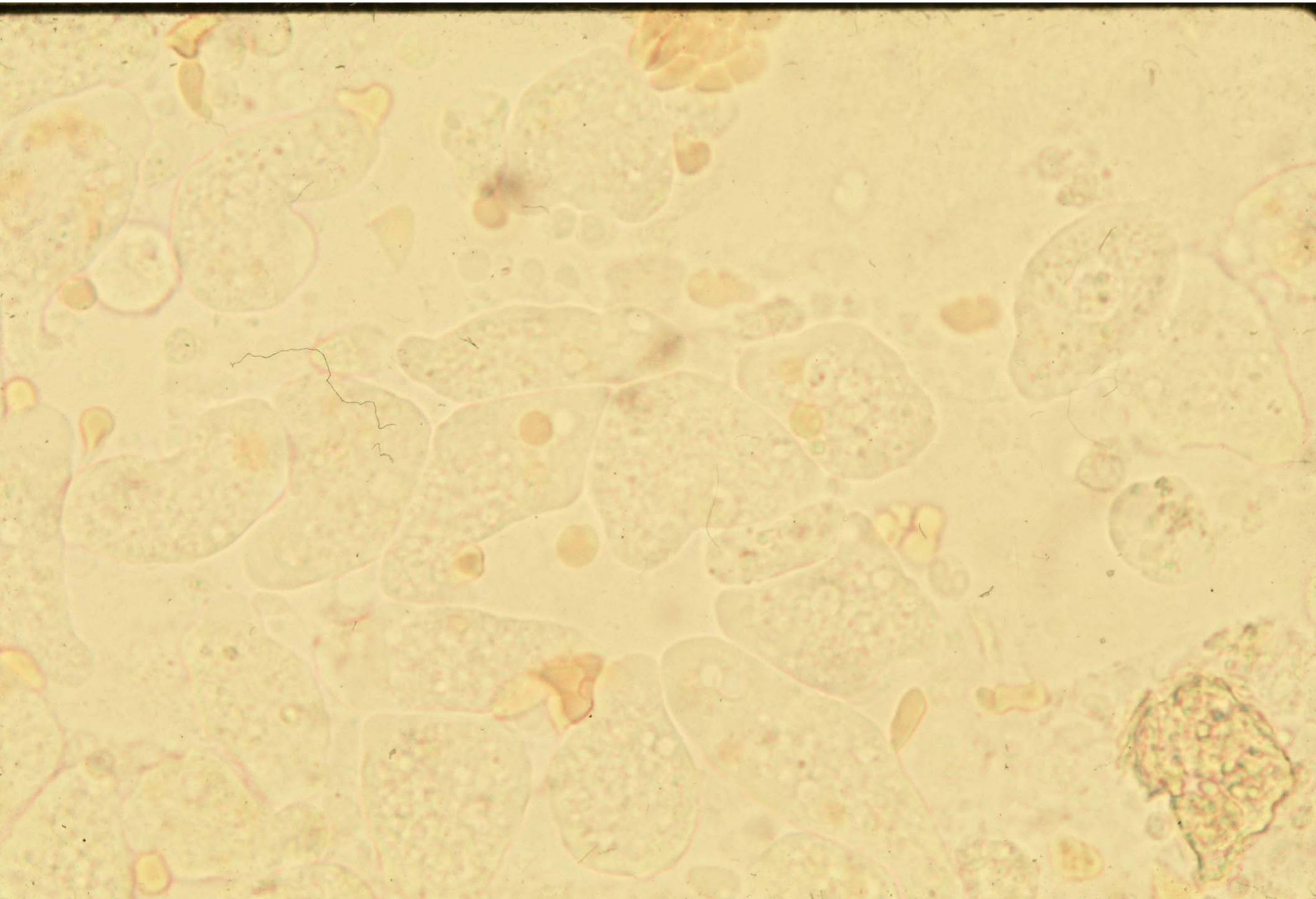
| Infection  | Drug                                | Adult dosage                     | Pediatric dosage                              |
|--|-------------------------------------|----------------------------------|---|
| <b>ACANTHAMOEBA</b> keratitis                        |                                     |                                  |   |
| Drug of choice:                                      | See footnote 1                      |                                  |   |
| <b>AMEBIASIS</b> ( <i>Entamoeba histolytica</i> )    |                                     |                                  |   |
| <b>asymptomatic</b>                                  |                                     |                                  |   |
| Drug of choice:                                      | Iodoquinol <sup>2</sup>             | 650 mg PO tid x 20d              | 30-40 mg/kg/d (max. 2g) PO in 3 doses x 20d   |
|  | OR Paromomycin <sup>3</sup>         | 25-35 mg/kg/d PO in 3 doses x 7d | 25-35 mg/kg/d PO in 3 doses x 7d              |
|  | OR Diloxanide furoate <sup>4*</sup> | 500 mg PO tid x 10d              | 20 mg/kg/d PO in 3 doses x 10d                |
| <b>mild to moderate intestinal disease</b>           |                                     |                                  |   |
| Drug of choice: <sup>5</sup>                         | Metronidazole                       | 500-750 mg PO tid x 7-10d        | 35-50 mg/kg/d PO in 3 doses x 7-10d           |
|  | OR Tinidazole <sup>6</sup>          | 2 g once PO daily x 3d           | ≥3yrs: 50 mg/kg/d (max. 2g) PO in 1 dose x 3d |
|  | <b>either followed by</b>           |                                  |   |
|  | OR Iodoquinol <sup>2</sup>          | 650 mg PO tid x 20d              | 30-40 mg/kg/d (max. 2g) PO in 3 doses x 20d   |
|  | OR Paromomycin <sup>3</sup>         | 25-35 mg/kg/d PO in 3 doses x 7d | 25-35 mg/kg/d PO in 3 doses x 7d              |
| <b>severe intestinal and extraintestinal disease</b> |                                     |                                  |   |
| Drug of choice:                                      | Metronidazole                       | 750 mg PO tid x 7-10d            | 35-50 mg/kg/d PO in 3 doses x 7-10d           |
|  | OR Tinidazole <sup>6</sup>          | 2 g once PO daily x 5d           | ≥3yrs: 50 mg/kg/d (max. 2g) PO in 1 dose x 3d |
|  | <b>either followed by</b>           |                                  |   |

# Giardiasis: Treatment

| Drug          | % cure | Comment                 |
|---------------|--------|-------------------------|
| metronidazole | 92     | tolerability, pregnancy |
| quinacrine    | 93     | compdng pharmacy        |
| paromomycin   | 50     | 50% efficacy, pregnancy |
| albendazole   | 75     | 7 days; C/I pregnancy   |
| nitazoxanide  | 80     | liquid for children     |
| tinidazole    | 95     | convenience             |

# Amebiasis *E.histolytica*







# ***E. histolytica/dispar***

| <b>Parameter</b>                   | <b><i>E. histolytica</i></b>            | <b><i>E. dispar</i></b>                 |
|------------------------------------|---|---|
| <b>diagnosis</b>                   | Serology positive<br>Stool pcr or ELISA | Serology negative<br>Stool pcr or ELISA |
| <b>Treatment:<br/>invasive</b>     | metronidazole +<br>iodoquinol           | N/A                                     |
| <b>Treatment;<br/>Non-invasive</b> | iodoquinol                              | none                                    |

# Summary

- TD is the most frequent illness in travelers and cause is primarily bacterial
- TD partially preventable and easily treatable.; every traveler should carry an antibiotic (quinolone , azithromycin) for self-Treatment; azithro for Thailand
- Persistent TD is most often Post-infectious IBS or lactose intolerance
- Treat acute illness based on symptoms alone



# Summary (cont)

- Giardiasis is the most frequent infectious cause of persistent TD
- Giardiasis treatment of choice is tinidazole
- Amebiasis may be due to *E. histolytica* or *E. dispar*, easily differentiated by amebic serology
- Invasive amebiasis is treated with an imidazole ;cyst passers require a lumen-active agent

# Further Reading

1. DuPont HL. New insights and directions in travelers' diarrhea. *Gastroenterol Clin North Am.* 2006 Jun;35(2):337-5
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## Further more reading

**DuPont HL. Therapy for and prevention of traveler's diarrhea. Clin Infect Dis. 2007 Jul 15;45 Suppl 1:S78-84.**

**Thabane M, Kottachchi DT, Marshall JK. Systematic review and meta-analysis: The incidence and prognosis of post-infectious irritable bowel syndrome. Aliment Pharmacol Ther. 2007 Aug 15;26(4):535-44.**

## **Further more readings**

**Okhuysen PC, Jiang ZD, Carlin L, Forbes C, DuPont HL. Post-diarrhea chronic intestinal symptoms and irritable bowel syndrome in North American travelers to Mexico. Am J Gastroenterol. 2004 Sep;99(9):1774-8.**

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