

Hot and bothered – infections in travellers

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Liverpool School of Tropical Medicine



Aims of talk

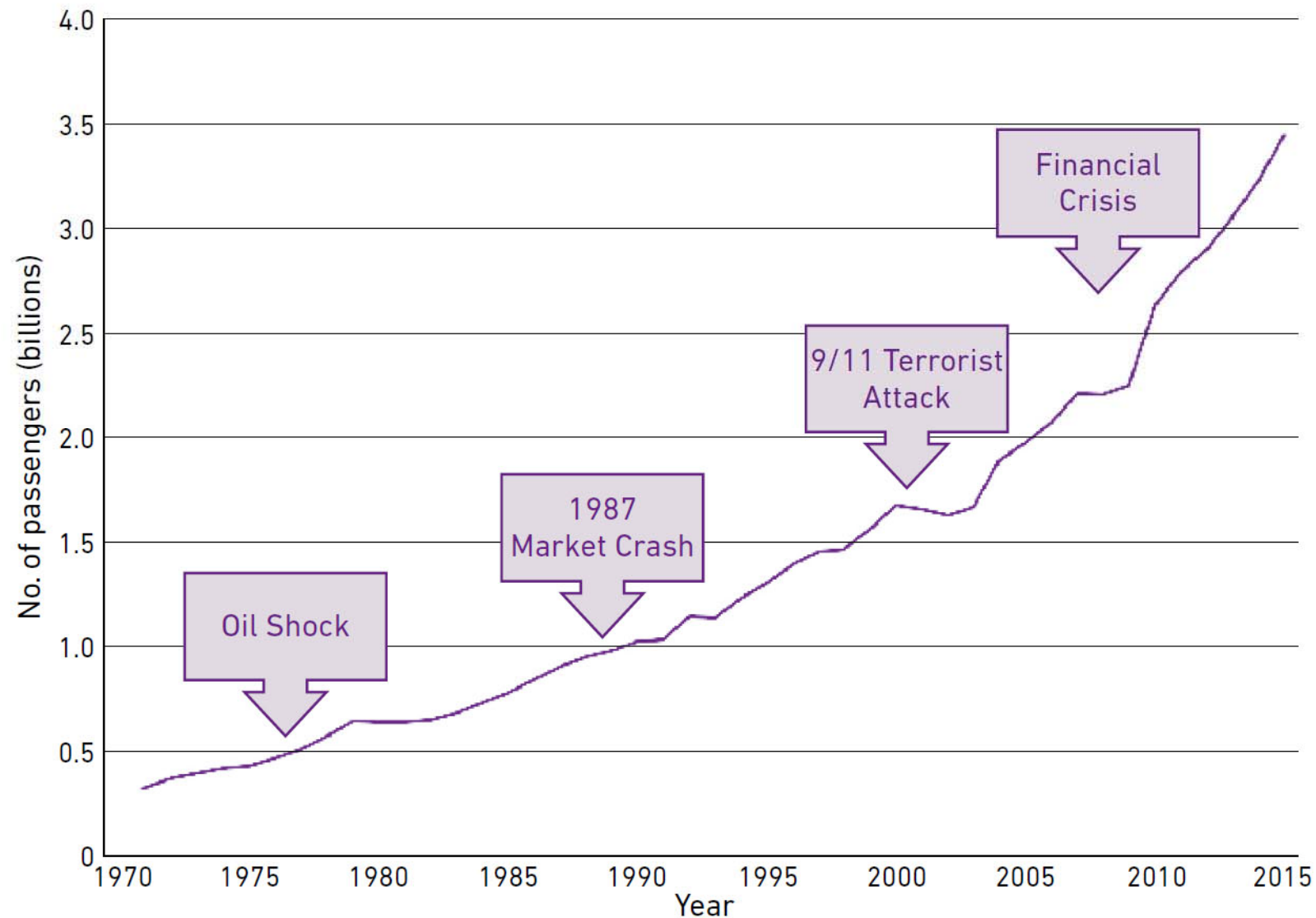
- To understand the approach to diagnosis of infection in travellers
- To understand causes of travellers diarrhoea
- To understand the causes, diagnosis, management and prevention of malaria
- To recognise some common skin conditions in travellers
- To have some fun

A new vector of disease

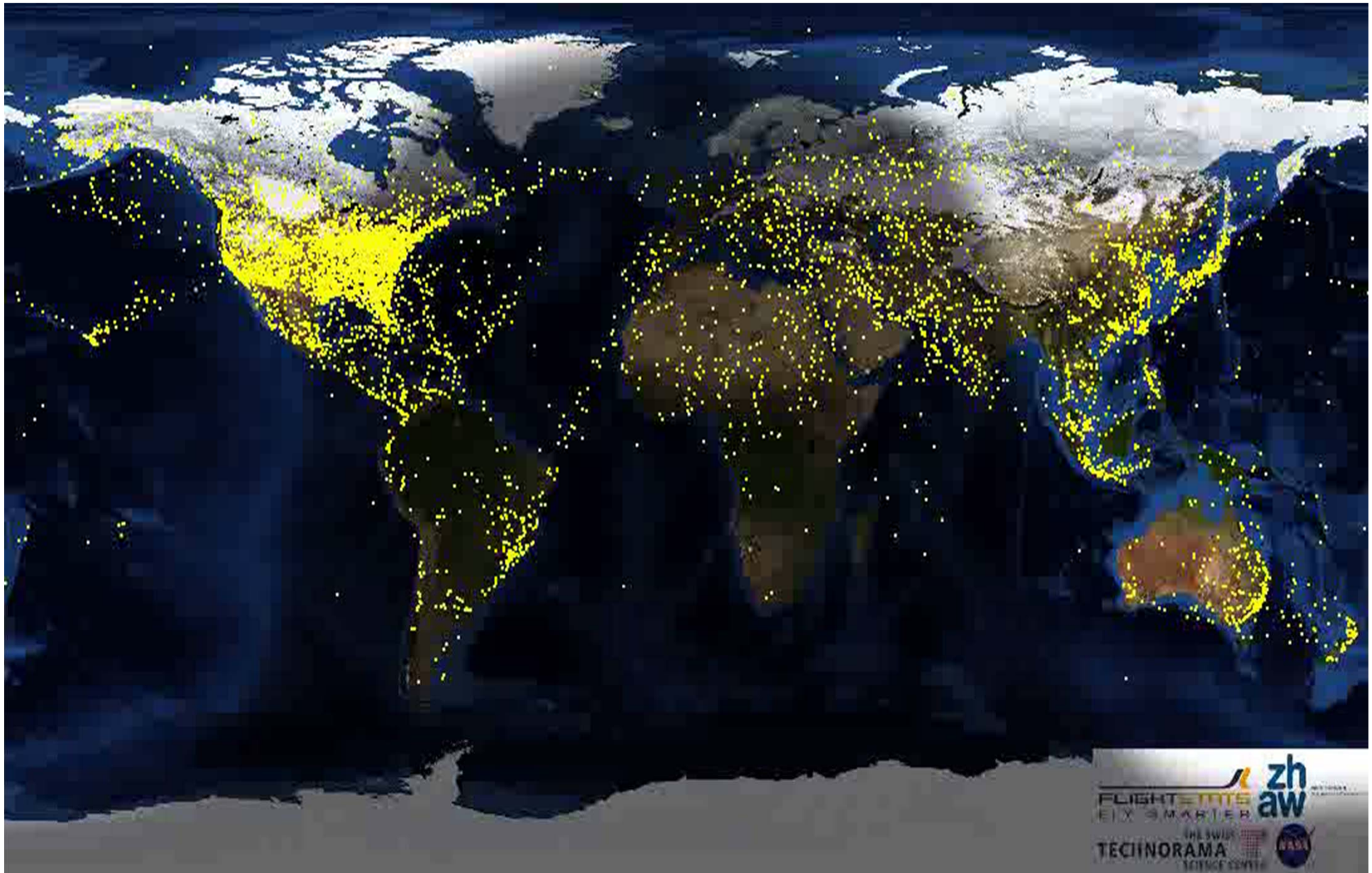
Aeroplanus magnus universalis



Growth of international travel



Zurich School of Applied Sciences <http://radar.zhaw.ch/>



Q1. Where is your next holiday? (choose one)

1. Caribbean
2. Egypt
3. Mediterranean
4. South Asia
5. South America
6. Too dangerous to travel

Unde venis?

Where have you come from ?

THE LANCET

Volume 281, Issue 7278, 23 February 1963, Pages 401-404

1963

[doi:10.1016/S0140-6736\(63\)92299-2](https://doi.org/10.1016/S0140-6736(63)92299-2) | [How to Cite or Link Using DOI](#)

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UNDE VENIS ?^{*1}

Brian Maegraith M.A. Oxon., M.B. Adelaide, D.Phil., F.R.C.P., F.R.C.P.E., PROFESSOR OF TROPICAL MEDICINE IN THE UNIVERSITY OF LIVERPOOL

Available online 17 October 2003.

Article Outline

• [References](#)

^{*1} * Annual oration delivered before the Reading Pathological Society on Oct. 25, 1962.

Travel histories

A&E setting

- 2% of >900 attendances in 1 week
- 5.3% of 310 with non trauma

Smith RM. *Eur J Emerg Med* 2005;12:230-3

British ER physicians

- 5 case scenarios
- Travel history requested in 24/145 (16%)

Smith RM. *J Trav Med* 2006;13:73-7



Travel history only taken in 26/132 AMU patients = 19.7%

271

General Physicians Do Not Take Adequate Travel Histories

Victoria A. Price, MRCP,* Rachel A.S. Smith, MBChB,* Sam Douthwaite, MRCP,[†]
Sherine Thomas, MRCP,[‡] D. Solomon Almond, FRCP,* Alastair R.O. Miller, FRCP,[‡]
Nicholas J. Beeching, FRCP,[‡] Gail Thompson, FRCP,^{‡§} Andrew Ustianowski, FRCP, PhD,[†]
and Mike B.J. Beadsworth, FRCP, MD, DTMH[‡]

*Acute Medical Unit, Royal Liverpool University Hospital, Liverpool, UK; [†]Department of Infectious Diseases and Tropical Medicine, Monsall Unit, North Manchester General Hospital, Manchester, UK; [‡]Tropical and Infectious Disease Unit, Royal Liverpool University Hospital, Liverpool, UK; [§]Health Protection Agency, Centre of Emergency Preparedness and Response, Porton Down, Salisbury, Wiltshire, UK

DOI: 10.1111/j.1708-8305.2011.00521.x

Background. Our aim was to document how often travel histories were taken and the quality of their content.

Methods. Patients admitted over 2 months to acute medical units of two hospitals in the Northwest of England with a history of fever, rash, diarrhea, vomiting, jaundice, or presenting as “unwell post-travel” were identified. The initial medical clerking was assessed.

Results. A total of 132 relevant admissions were identified. A travel history was documented in only 26 patients (19.7%). Of the 16 patients who had traveled, there was no documentation of pretravel advice or of sexual/other activities abroad in 15 (93.8%) and 12 (75.0%) patients, respectively.

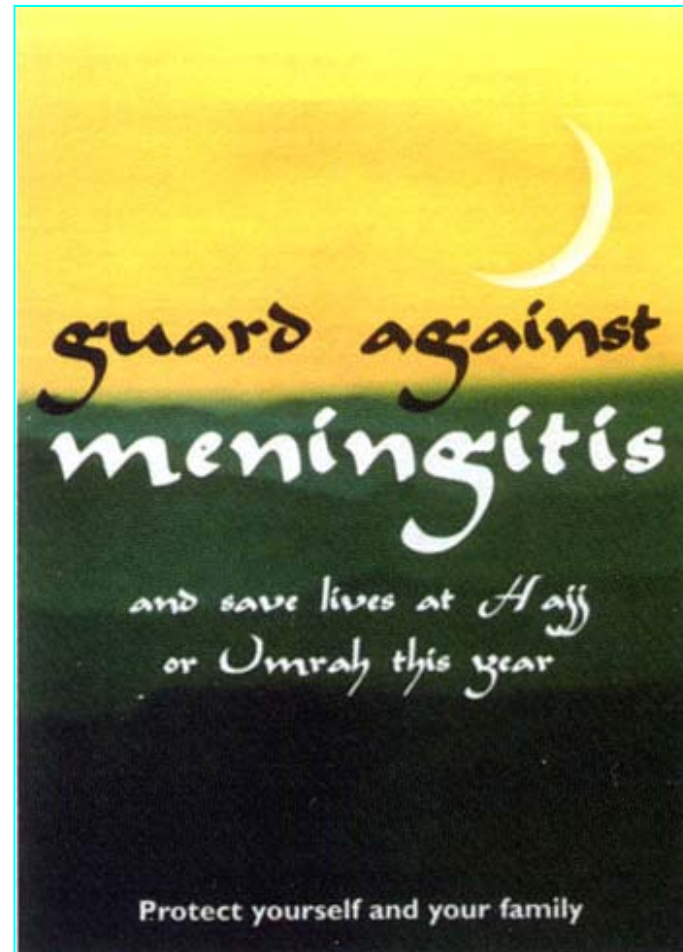
Conclusions. There needs to be better awareness and education about travel-related illness and the importance of taking an adequate travel history.

Types of returning traveller

- Tourists from home country
- Business/military/volunteer workers etc
- Visiting friends and relations (VFR)
- Migrants
- Temporary visitors (incoming tourists)

N. meningitidis W135 & Hajj - UK

- 2000
 - 45 cases
 - 8 (18%) deaths
- 2001
 - 34 cases
 - 10 (29%) deaths



ORIGINAL PAPERS

Undifferentiated Febrile Illnesses Amongst British Troops in Helmand, Afghanistan

MS Bailey^{1,2}, TR Trinick³, JA Dunbar⁴, R Hatch⁵, JC Osborne⁶, TJ Brooks⁶, AD Green⁷

¹Department of Infection & Tropical Medicine, Birmingham Heartlands Hospital; ²Department of Military Medicine, Royal Centre for Defence Medicine, Birmingham; ³204 (North Irish) Field Hospital RAMC(V), Belfast; ⁴212 (Yorkshire) Field Hospital RAMC(V), Sheffield; ⁵Pathology Laboratories, Royal Hospital Haslar, Gosport; ⁶Special Pathogens Reference Unit, HPA Porton Down, Salisbury; ⁷DCA Communicable Diseases, Royal Centre for Defence Medicine, Birmingham, UK.

Abstract

Objectives: Undifferentiated febrile illnesses have been a threat to British expeditionary forces ever since the Crusades. The infections responsible were identified during the Colonial Era, both World Wars and smaller conflicts since, but nearly all remain a significant threat today. Undiagnosed febrile illnesses have occurred amongst British troops in Helmand, Afghanistan since 2006 and so a fever study was performed to identify them.

Methods: From May to October 2008, all undifferentiated fever cases seen at the British field hospital in Helmand, Afghanistan were assessed using a standard protocol. Demographic details, clinical features and laboratory results were recorded and

Bailey MS et al. JRAMC 2011; 157(2): 150-155

“Helmand Fever”

- May-Oct 2008 n=26
- 23 diagnoses in 19 personnel
- Sandfly fever 12 (52%)
- Acute Q fever 6 (26%)
- Rickettsial infections 5 (22%)
- Coinfections 4
- Not diagnosed 7

Bailey MS et al. JRAMC 2011; 157(2): 150-155

Returned traveller

- Exotic infection from overseas
- Cosmopolitan infection
 - from overseas/during travel
 - since return
- Non-infectious problem
 - coincidental
- Other problems
 - situational, stress, psychological etc

Risk to traveller - 1 month in tropics

- Any health problem 55%
- Travellers diarrhoea 35%
- Malaria (W Africa, no prophylaxis) 2%
- Giardiasis 0.6%
- Hepatitis 0.45%

Steffen R 1988

Road hazards



NEWS MIDDLE EAST

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5 December 2010 Last updated at 13:18



Shark attack kills German tourist at resort in Egypt

A German woman has been killed in a shark attack while snorkelling off the Egyptian Red Sea resort of Sharm el-Sheikh, officials say.

The death comes after four people were injured in similar attacks at the resort earlier in the week.

Egyptian authorities had re-opened the waters after saying they captured the sharks involved in the earlier attacks.

But some experts said the shark responsible was still loose in one of the world's most popular diving areas.

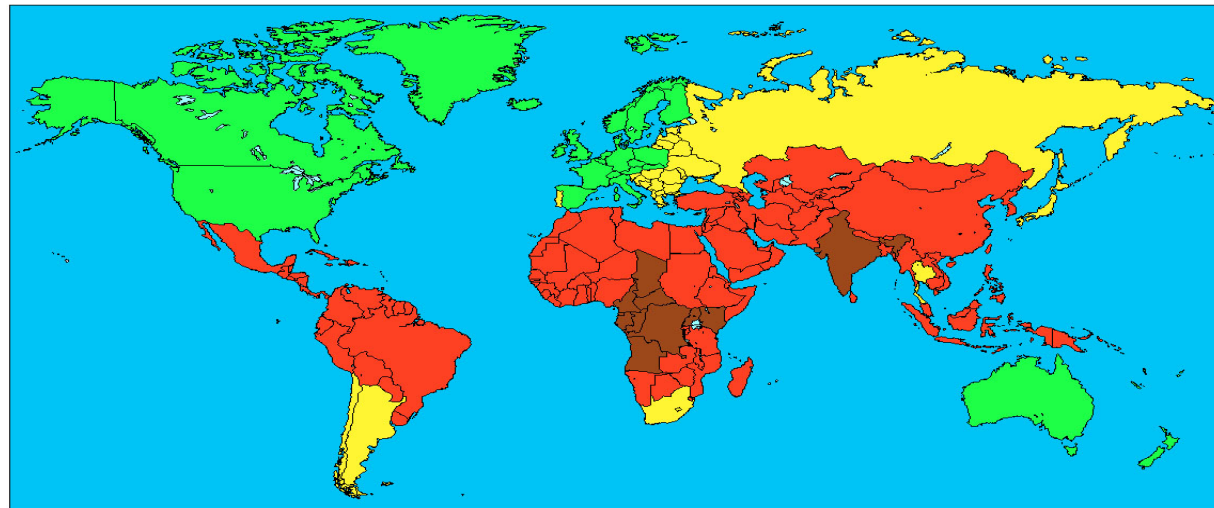


Traveller's diarrhoea

“Travel broadens the mind
and loosens the bowels”

S Gorbach

Two week incidence of travellers' diarrhea



1990's
(n > 80,000)

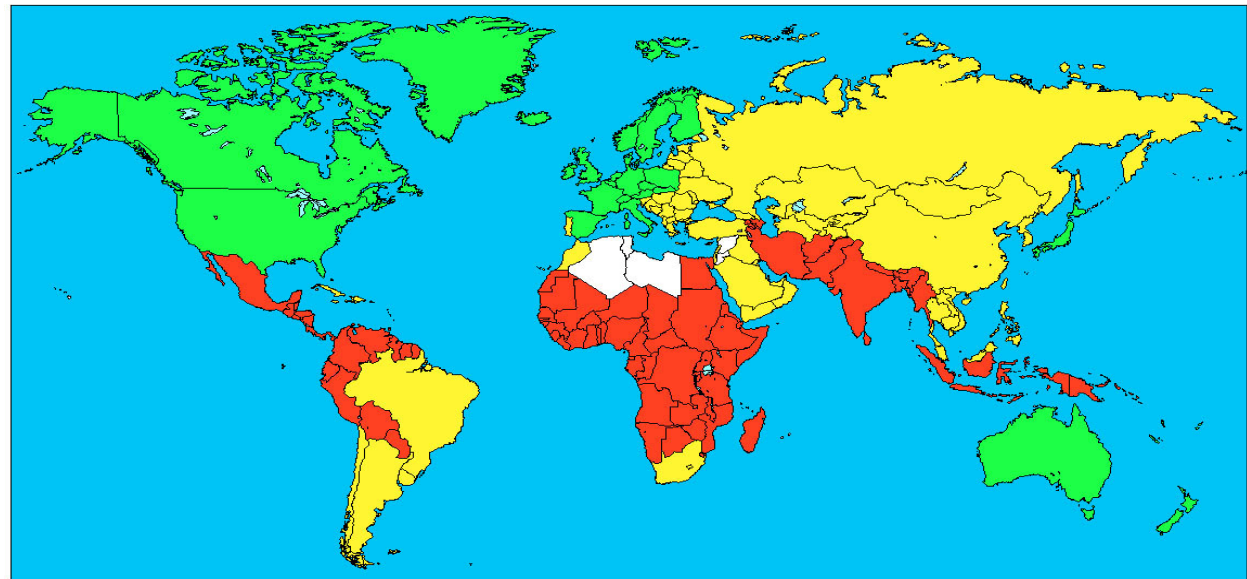
Steffen R. Clin Infect Dis. 2005;
41 Suppl 8:S536-40.

Risk: ■ Low <8% ■ Intermediate 8-20% ■ High 20-50% ■ Very high >50%

2006 - 2010
(n approx. 3,000)

c/o R Steffen

Steffen R, Hill DR, DuPont HL.
JAMA. 2015; 313:71-80.



Risk: ■ Low <8% ■ Intermediate 8-20% ■ High 20-50% ■ No recent data

Turistas

- Montezuma's revenge
- Aztec two step
- Pharaoh's Revenge (Mummy's tummy)
- Cairo two-step
- Delhi belly
- Malta dog
- Rangoon runs

Name some causes

Regional differences in aetiology

Table 2. Estimated Regional Differences in the Etiology of Traveler's Diarrhea^a

Organism	Reported Pathogens, %			
	Latin America and Caribbean	Africa	South Asia	Southeast Asia
Enterotoxigenic <i>Escherichia coli</i>	≥35	25-35	15-25	5-15
Enterotoxigenic <i>E coli</i>	25-35	<5	15-25	No data
<i>Campylobacter</i>	<5	<5	15-25	25-35
<i>Salmonella</i>	<5	5-15	<5	5-15
<i>Shigella</i>	5-15	5-15	5-15	<5
Norovirus	15-25	15-25	5-15	<5
Rotavirus	15-25	5-15	5-15	<5
<i>Giardia</i>	<5	<5	5-15	5-15

Steffen et al. JAMA 2015; 313:71-80

Regional differences in aetiology

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Enterobacteriaceae <i>E coli</i>	25-35	<5	15-25	No data
<i>Campylobacter</i>	<5	<5	15-25	25-35
<i>Salmonella</i>	<5	5-15	<5	5-15
<i>Shigella</i>	5-15	5-15	5-15	<5
Norovirus	15-25	15-25	5-15	<5
Rotavirus	15-25	5-15	5-15	<5
<i>Giardia</i>	<5	<5	5-15	5-15

Steffen et al. JAMA 2015; 313:71-80

Norovirus – Travel industry

- It imposes a considerable economic burden to hotel and holiday industry:
 - deep cleaning
 - compensation
 - adverse publicity
- There is a clear need to develop effective interventions to control the transmission of infection in semi-closed communities

Travellers diarrhoea – clinical course

- Onset usually during the first week \approx day 6
- Duration: 3 – 4 days
 - 60% improved by 48 hours
 - > 1 week – 10%
 - > 1 month – 2%
- Pathogens differ in returned travellers

During Travel	Self-determination of Illness Severity		
	Mild Diarrhea that is tolerable, is not distressing, and does not interfere with planned activities	Moderate Diarrhea that is distressing or interferes with planned activities	Severe Diarrhea that is incapacitating or prevents planned activities
			Non-dysentery Dysentery*
	<u>May</u> use loperamide or bismuth subsalicylates	<u>May</u> use loperamide alone or as an adjunct to antibiotics	<u>May</u> use loperamide as adjunct to antibiotics
		±	+
Post-travel	<u>May</u> use antibiotic (Table 2)		<u>Should</u> use antibiotic (Table 2)
	Acute travelers' diarrhea should be treated empirically as above.		
	Microbiologic testing is recommended in returning travelers with severe or persistent symptoms or in those who fail empiric therapy		
	Multiplex molecular diagnostics are preferred in patients with persistent or chronic symptoms		

elers' diarrhea management algorithm
 | Dysentery is considered severe

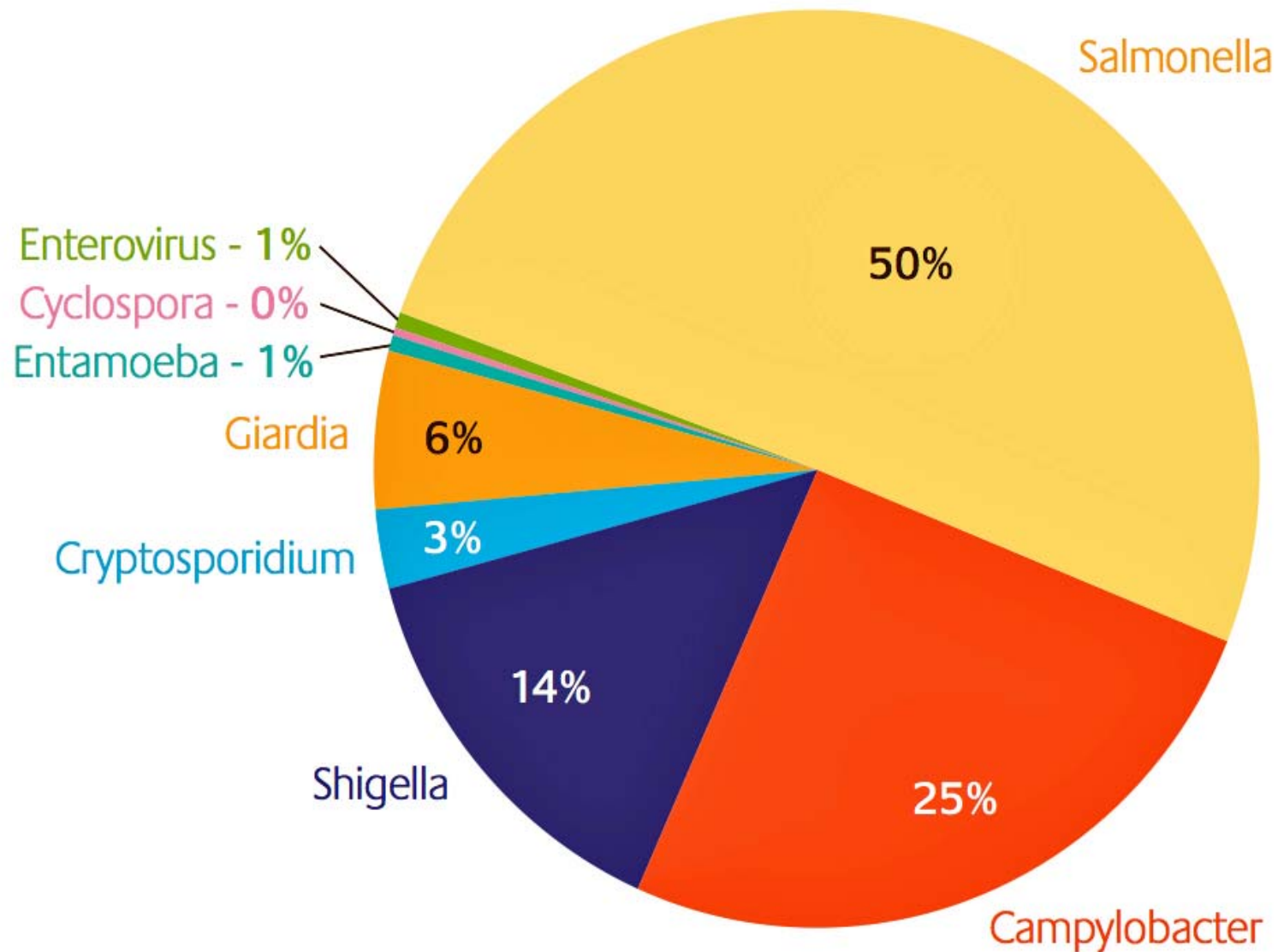
Riddle M et al. J Travel Med 2017;24 (suppl 1):S63-80

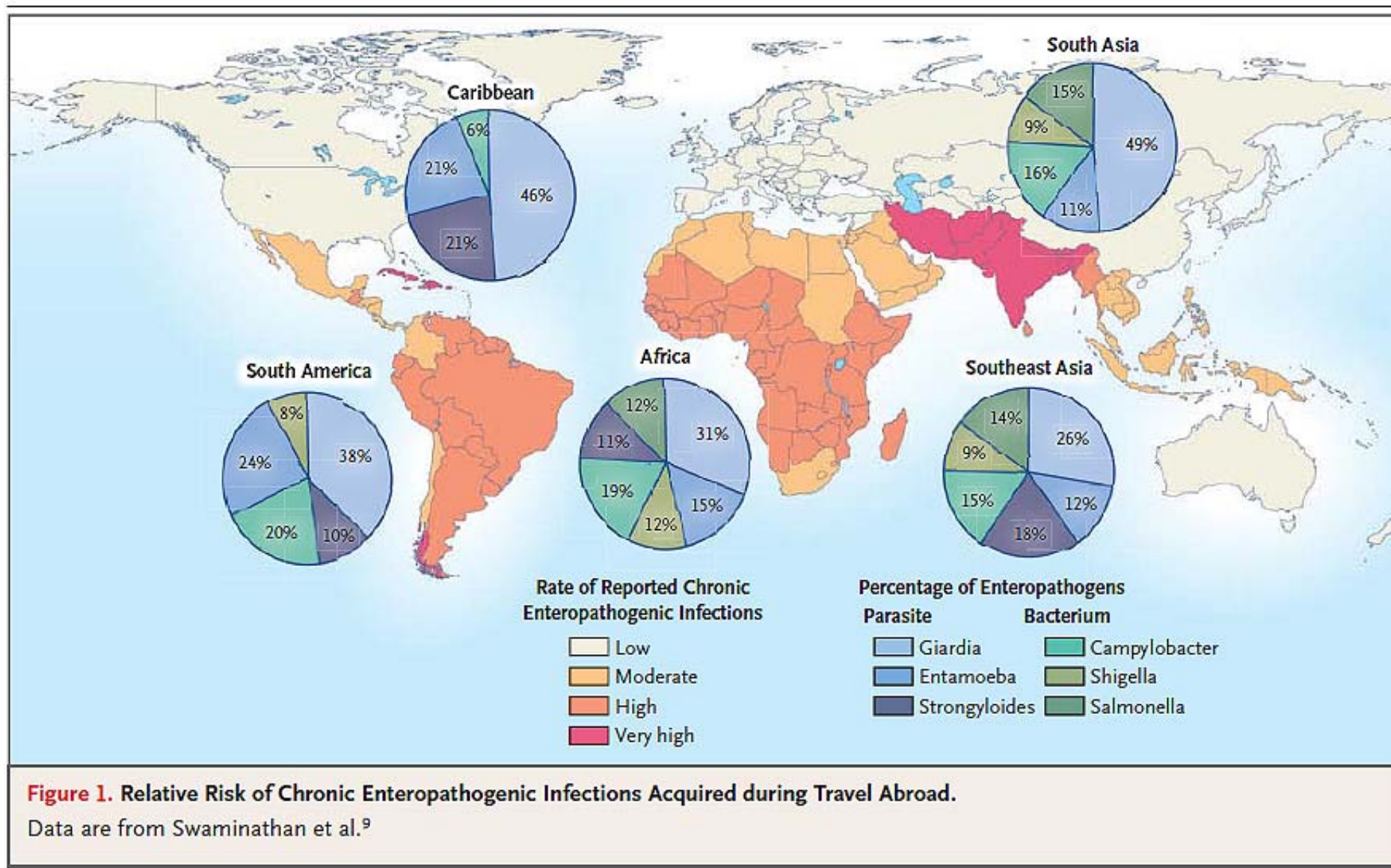
Chronic diarrhoea

3 or more liquid
or semi-formed
stools daily for
28 or more days



Figure 3. Travel-associated GI illness reported in England, Wales and Northern Ireland: 2004 – 2008 (N=24,332)





Ross AGP et al. *N Engl J Med* 2013; 368:1817-25

Management of persistent TD

De Saussure P. *Ther Adv Gastroenterol* 2009; 2(6): 367 -75

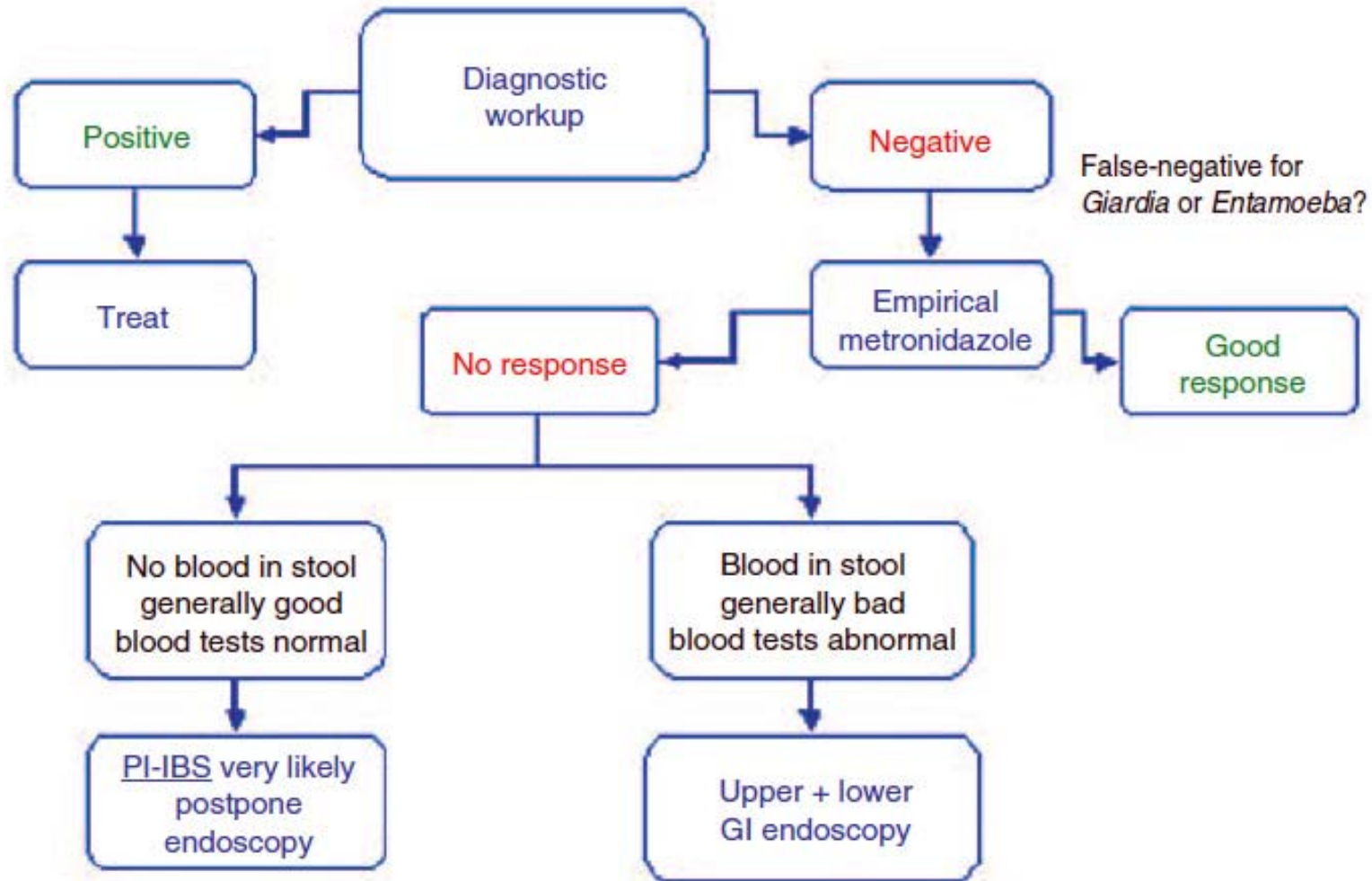


Figure 1. Basic management algorithm for patients with persistent traveler's diarrhea. See text for the detail of the diagnostic work-up. PI-IBS, post-infectious irritable bowel syndrome.

Traveller's diarrhoea resource



International Society of Travel Medicine
Promoting healthy travel worldwide
Established 1991

Journal of Travel Medicine, 2017, Vol 24, Suppl 1, S63–S80

doi: 10.1093/jtm/tax026

Original Article

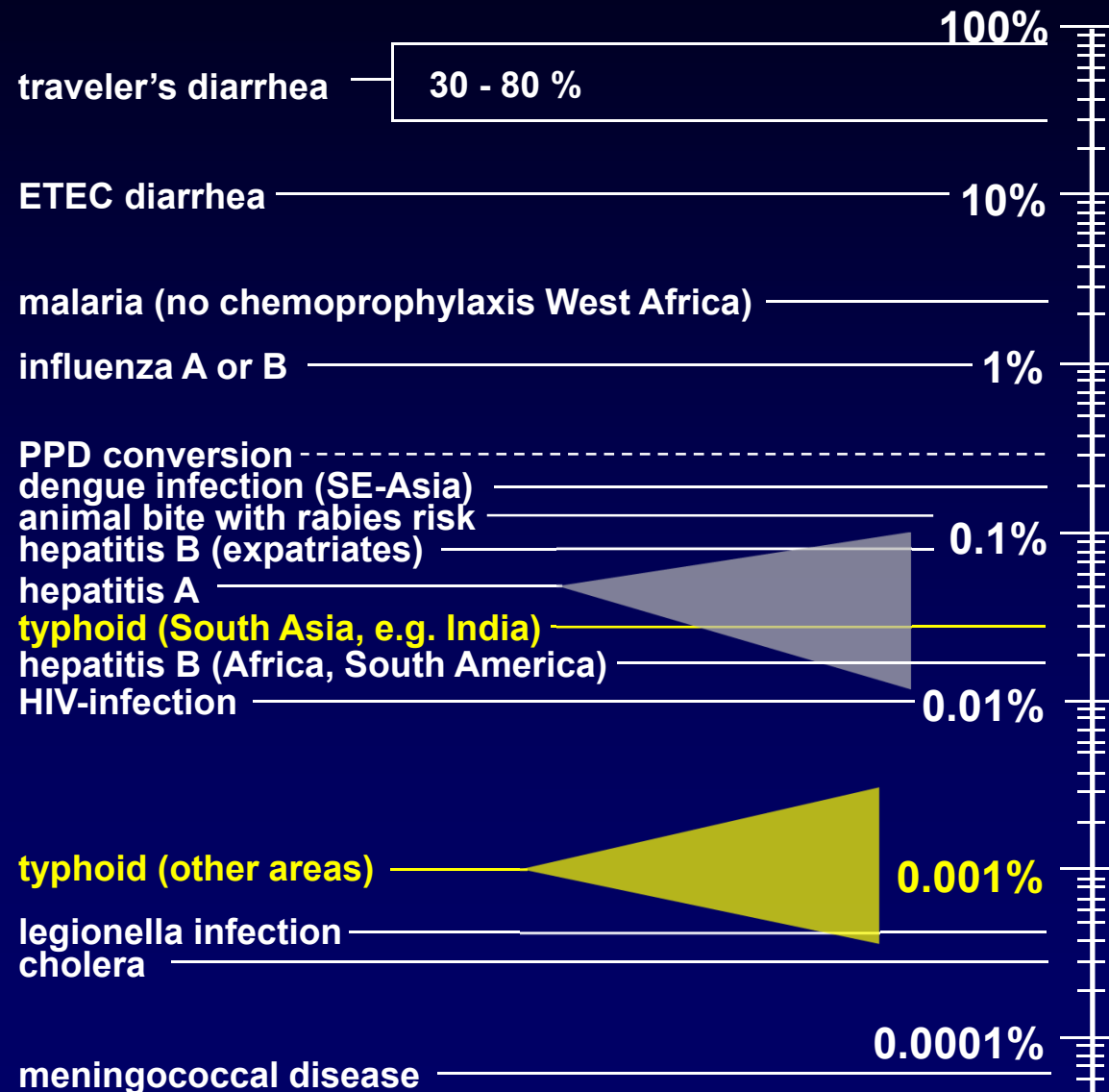
Original Article

Guidelines for the prevention and treatment of travelers' diarrhea: a graded expert panel report

Mark S. Riddle^{1*†}, Bradley A. Connor^{2*†}, Nicholas J. Beeching³, Herbert L. DuPont⁴, Davidson H. Hamer⁵, Phyllis Kozarsky⁶, Michael Libman⁷, Robert Steffen⁸, David Taylor⁹, David R. Tribble¹⁰, Jordi Vila¹¹, Philipp Zanger¹², and Charles D. Ericsson¹³

Journal of Travel Medicine 2017; 24(Suppl 1): S63–S80 doi: 10.1093/jtm/tax026

Incidence/month of health problems during a stay in developing countries – 2005



Steffen R
NECTM 2006

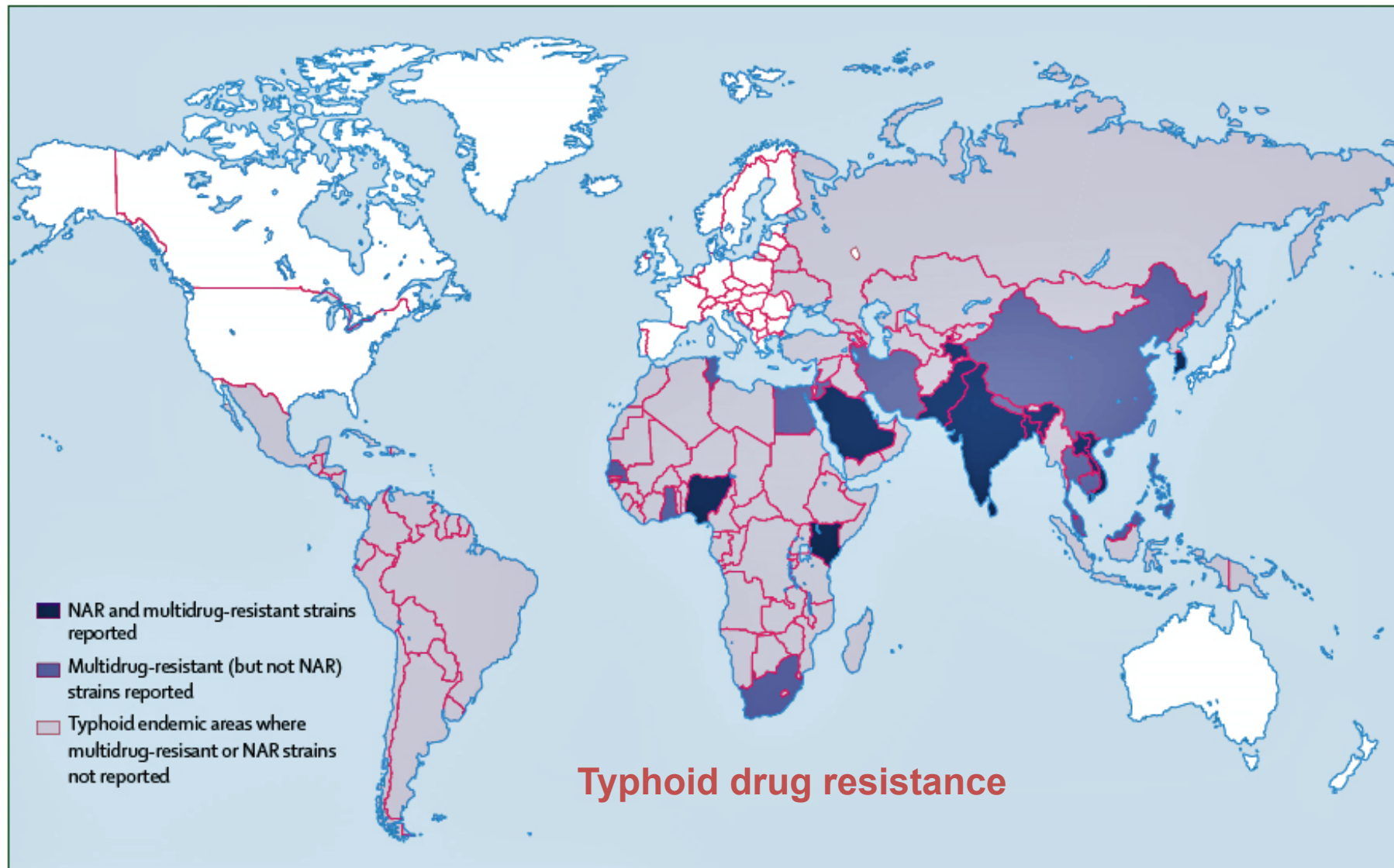


Figure: Global distribution of antimicrobial resistance in *Styphi* (1990–2004)

Adapted from Parry and colleagues⁹⁶ and updated on basis of data from past 3 years.

Bahn MK *et al. Lancet* 2005; 366: 749-62 after Parry CM *et al. NEJM* 2002; 347:1770

Resistant organisms

- 110/492 (22.4%) had travelled
- Decreased ciprofloxacin sensitivity
- Travel 31.8%
- No travel 17.8%
- OR 2.15 $P < 0.001$

***EID* 2011; 17:123-5**

Foreign Travel and Decreased Ciprofloxacin Susceptibility in *Salmonella enterica* Infections

Manar Al-Mashhadani, Robert Hewson, Roberto Vivancos, Alex Keenan, Nick J. Beeching, John Wain, and Christopher M. Parry

To determine antimicrobial drug resistance patterns, we characterized nontyphoidal *Salmonella enterica* strains isolated in Liverpool, UK, January 2003 through December 2009. Decreased susceptibility to ciprofloxacin was found in 103 (20.9%) of 492 isolates. The lower susceptibility was associated with ciprofloxacin treatment failures and with particular serovars and phage types often acquired during foreign travel.

GISA

**ESBL
CPE**

C Diff

BBV

VRE

MRSA

Gormley's "Another Place" Crosby



GeoSentinel 2007-2011

42 713 returned travellers

53 clinics 24 countries

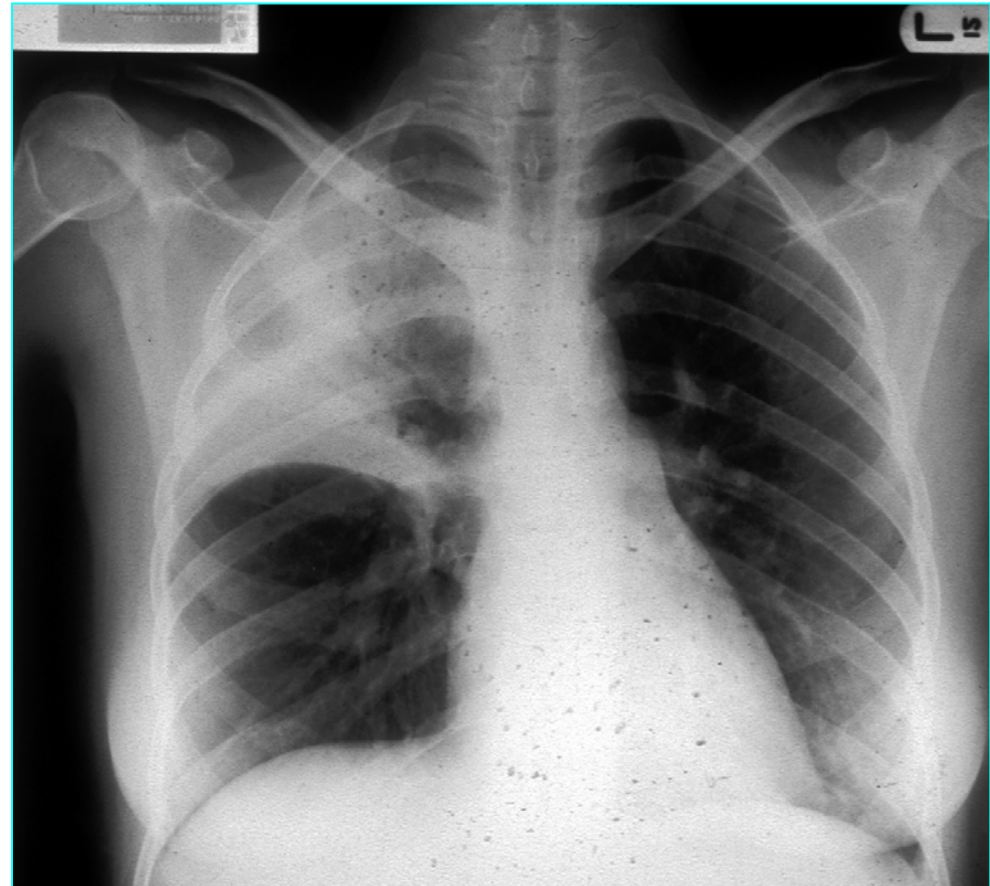
- Gastro 14 346 (34%)
- Febrile 9 817 (23%)
- Derm 8 227 (20%)
- Resp 4 613 (11%)

Leder K *et al. Ann Intern Med* 2013; 158: 456-68

Spanish imports - respiratory



**Legionnaire's - Benidorm
Rio Park hotel ~1980**



**Penicillin resistant pneumococcus ~
1997**

GeoSentinel fever study n=6957

	Fever	Mal	DEN	No diag	Resp	Diarrh
Oceania	51	59	6	12	10	4
SS Africa	41	42	1	19	10	10
SE Asia	33	7	18	22	17	17
SC Asia	27	7	9	20	14	22
N Asia	24	1	0	26	39	11
N Africa	22	5	1	13	13	38
All		21	6		14	15

Figures are % of travellers returning from each region

Wilson M *et al.* CJD 2007;44:1560-8

GeoSentinel study (CDC)

Africa:

Malaria ++, schistosomiasis, tick typhus

SE Asia:

Dengue, bacterial diarrhoea

SC Asia:

Dengue, enteric fever, hepatitis, giardiasis

CS America:

Dengue, cutaneous leishmaniasis, myiasis

Caribbean:

Dengue, cutaneous larva migrans

English units 1998-9

4 centres 390/421 adult travel
admissions infectious cause

93% UK domiciled

2918 bed days (21 ITU)

Malaria 20% bed days & 80% ITU stay

Median length of stay 4 days

W Africa 39/65 (59%) malaria OR 5.22

E Africa 44/72 (61%) malaria OR 5.82

S Asia 8/82 (10%) malaria OR 0.21

Harling R *et al.* J Infect 2004; 48: 139-144

Returned traveller

- Exotic infection from overseas
- Cosmopolitan infection
 - from overseas/during travel
 - since return
- Non-infectious problem
 - coincidental
- Other problems
 - situational, stress, psychological etc

Diagnostic approach

- History
- More history
- Detail of geography, timing
- Occupational and recreational exposures
- Compliance with protection
- Knowledge of prevailing infections
- Signs and tests ordered and interpreted in light of
 - Pretest probability
 - Quality of tests

Clinical approach to fever

- Is it malaria ?
- Is it dangerous ?
- Is it new ?
- Is it resistant ?
- Is it reportable ?
 - CCDC
 - ProMED, EuroTravNet, GeoSentinel
- Is it worth writing up ?

Fever in the returning traveller

Doug Fink,^{1 2} Robert Serafino Wani,³ Victoria Johnston^{1 4}

¹The Hospital for Tropical Diseases, Mortimer Market Centre, London

²Division of Infection and Immunity, University College London, London

³Department of Infection, Barts Health NHS Trust, Royal London Hospital

⁴London School of Hygiene and Tropical Medicine, London, UK

Correspondence to: douglas.fink@nhs.net

International travel is increasingly common. The United Nations World Tourism Organisation estimates that by 2030 nearly 2 billion people will travel internationally each year, most of them to emerging economies.¹ In the UK alone, there were more than 70 million visits abroad by UK residents in 2016, and 37 million overseas residents visiting the UK.²



0.5 HOURS



See <http://learning.bmj.com> for linked learning module

What are the causes of fever in returning travellers?

The GeoSentinel network represents the most extensive global real time surveillance database of travel related morbidity encompassing more than 60 travel medicine clinics.²²

Approximately one third of febrile travellers presenting to the GeoSentinel network have confirmed gastrointestinal, respiratory tract, or genitourinary infections, and a further third have a systemic febrile illness attributable to a specific diagnosis, such as malaria.¹⁵ Bacteraemia has been reported in 5%-10% of returning travellers managed in secondary care.^{23 24} A substantial proportion of patients remain undiagnosed (21%-40%), possibly because relevant diagnostic tests were not performed on presentation or these

1 Triage

All febrile travellers should be assessed for evidence of sepsis



qSOFA score

2+ of the following indicates severe infection:

- Glasgow Coma Scale < 15
- Respiratory rate > 22
- Systolic blood pressure < 100

Follow local sepsis pathway

- Consider:
- Empirical therapy
- Referral to intensive treatment unit (ITU)

Immune status

Use a lower threshold for admission in those with compromised immune status, as infection can present atypically in this group

May be compromised by:

- Malignancy
- Transplant
- Age
- HIV status
- Diabetes
- Immunosuppressive drugs (including steroids)

2 Isolation

Contact precautions are often required until a diagnosis is confirmed and treatment commenced



Clinical presentation

Are any of the following present?

- Rash
- Diarrhoea
- Respiratory symptoms
- Haemorrhage
- Gastrointestinal or respiratory secretions

Yes

No

Isolation not required

Isolate patient according to risk

Contact

Single room or patient cohorting

- Standard contact precautions
- Hand hygiene
- Gloves
- Aprons
- Surgical face mask

Airborne

Negative pressure single room

- FFP3 respirator
- Enhanced precautions for aerosol-generating procedures
- Fluid repellent surgical face mask
- Eye protection
- Plastic apron
- Hand hygiene
- Gloves

Enhanced

Fluid repellent surgical face mask

- Eye protection
- Plastic apron
- Hand hygiene
- Gloves

3 Travel risk assessment

- Focused travel history
- Where did you go?
- What did you do there?
- When did you become unwell?

Is there risk of viral haemorrhagic fever (VHF)?

- Did the patient's symptoms start within 21 days of travel to a VHF endemic country? Check www.promedmail.org
- Ebola and Marburg virus disease risk
 - Caves or mines exposure
 - Contact with: Antelopes, Bats, Primates
- Lassa fever risk
 - Exposure to basic rural conditions
- CCHF (Crimean-Congo Haemorrhagic fever) risk
 - Tick bite or contact
 - Animal slaughter exposure

Is there risk of an emerging severe acute respiratory illness?

- Lower respiratory tract infection
- Symptoms within 14 days of travel to Middle East — MERS
- Symptoms within 10 days of travel to China — Influenza
- Contact with birds
- Exposure to known case

Is there risk of antimicrobial resistance?

- Travel to: Asia, Africa, Middle East
- Exposures: Healthcare abroad, Antibiotic use during travel

Enhanced contact precautions

Inform laboratory services

Discuss with local infection service

Notify public health

Specialist tests required

Tailor empirical therapy

Consider rectal swab screening

Is the patient at risk of malaria?

Patient returns from endemic country www.map.ox.ac.uk

Urgent diagnostic tests

Empirical treatment

Any of these features may suggest severe malaria:

Parasite count: >10% = severe, >2% = at risk

Central nervous system: GCS < 11, Prostration, Seizures

Organ dysfunction: AKI, Jaundice, Pulmonary oedema

Blood markers: Acidosis, Hypoglycaemia, Anaemia

4 Diagnosis

Once immediate risks have been addressed, take a more detailed travel history to help to identify the infection and guide management

Examination

- Consider empirical treatment for specific clinical scenarios

Routine investigations

- Blood cultures
- Also consider: Respiratory virus swab, Focal microbiology or virology samples, Imaging, HIV test, Routine blood tests

Specialist investigations

Discuss with local infection specialist, as quality and timing of samples are often crucial

Disclaimer: This infographic is not a validated clinical decision aid. The information is provided without any representations, conditions, or warranties that it is accurate or up to date. BMJ and its licensors assume no responsibility for any aspect of treatment administered with the aid of this information. Any reliance placed on this information is strictly at the user's own risk. For the full disclaimer wording see BMJ's terms and conditions: <http://www.bmj.com/company/legal-requirements/>

Fink D et al. *BMJ* 27 Jan 2018; 360: 158-61

<http://dx.doi.org/10.1136/bmj.j5773>

Triage and isolation

thebmj Visual summary 

Fever in the returning traveller

Triage and initial assessment

1 Triage

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Clinical presentation

Are any of the following present?

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- Respiratory symptoms
- Haemorrhage
- Gastrointestinal or respiratory secretions

Yes

No

Isolation not required

Isolate patient according to risk

 Contact

 Droplet

Single room or patient cohorting

Standard contact precautions


Hand hygiene

Gloves

Aprons

Surgical face mask

 Airborne

 Enhanced

Negative pressure single room

FFP3 respirator

Enhanced precautions for aerosol-generating procedures

Fluid repellent surgical face mask

Eye protection

Plastic apron

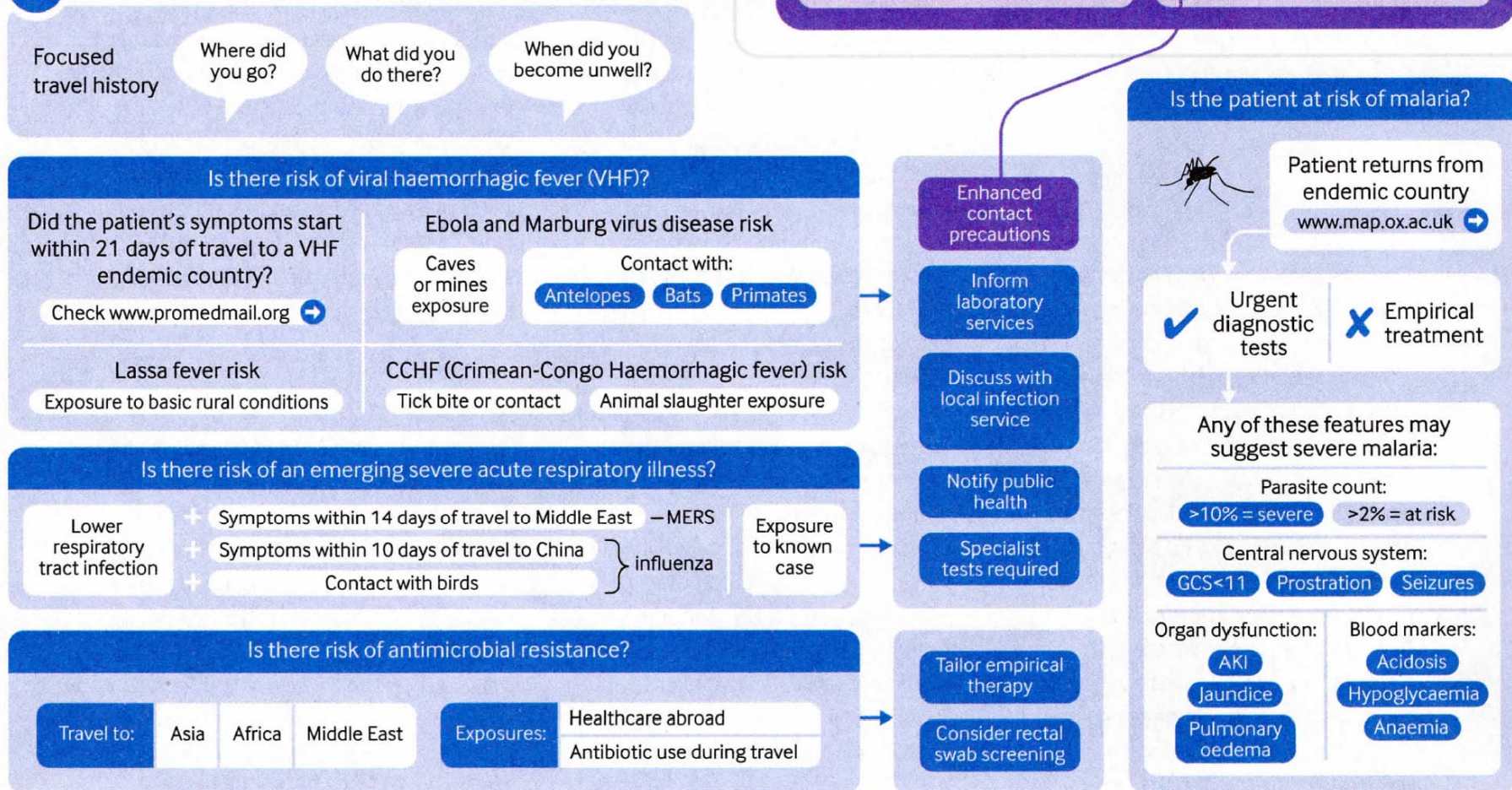
Hand hygiene

Gloves

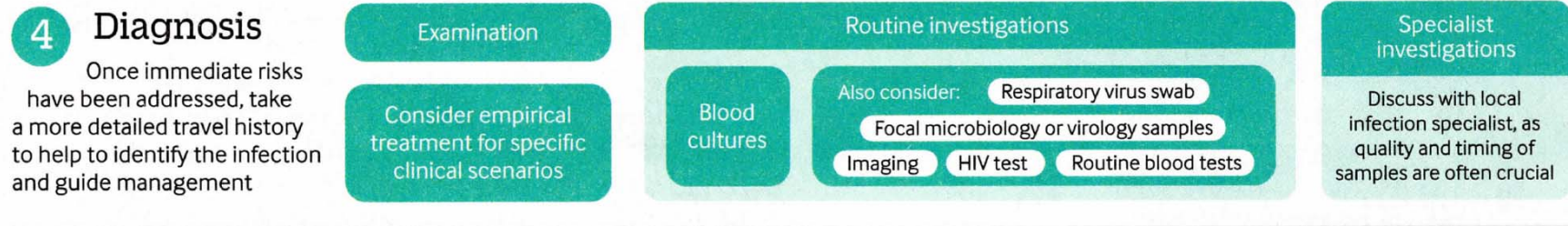
3 Travel risk assessment

Specific risk assessments

3 Travel risk assessment



Detailed history and examination



The Royal Liverpool and
Broadgreen University Hospitals
NHS Trust



University College London Hospitals
NHS Foundation Trust



Imported Fever Service

A national specialist service for acute imported fever diagnosis providing:

- Round-the-clock on-call expert clinical and microbiological advice to support patient management, infection control and public health interventions, from referral to delivery and interpretation of final results.
- A 24-hour on-call diagnostic service for viral haemorrhagic fevers.
- Next working day diagnostic service for a range of acute imported fevers of infectious origin.

Aiming to supplement existing clinical & diagnostic services.



0844 778 8990

Travel history

- **Where** travelled, exact location
- **When** travelled, exact dates
- **Why** travelled, work / leisure
- **What** specific exposures
- **Which** vaccinations, malaria prophylaxis,
anti-mosquito measures ?
compliance

Exposure and infection

- Raw foods
enterococci, trichinosis
- Untreated water, milk
hepatitis, brucellosis, shigella
- Fresh water contact
schistosomiasis, leptospirosis
- Sex
HIV, syphilis, GC
- Insect bites
malaria, arbovirus,
trypanosomes
- Animals
rabies, Q fever, brucellosis,
plague
- People
VHF, hepatitis, meningococcal

Woman Treated For Rabies Dies In London Hospital

PA | Posted: 28/05/2012 18:50 Updated: 29/05/2012 09:58 **PRESS ASSOCIATION**



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28 May 2012

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The woman was being treated by University College London Hospitals

A woman who was being treated for rabies in London has died, University College London Hospitals NHS Foundation Trust said on Monday.

The woman, believed to be a grandmother in her 50s, was reportedly turned away twice by doctors at Darent Valley Hospital in Dartford, Kent, before she was finally diagnosed.



Review

Foreign travel, casual sex, and sexually transmitted infections: systematic review and meta-analysis

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ARTICLE INFO

Article history:

Received 10 June 2008

Received in revised form 31 October 2008

Accepted 15 February 2010

Corresponding Editor: William Cameron,
Ottawa, Canada

Keywords:

Sexual behavior
International travel
Sexual partnerships
Systematic review
Meta-analysis

SUMMARY

Objectives: With increasing international travel it is important to understand how frequent casual travel sex and unprotected intercourse are, and what impact this may have on the risk of acquiring sexually transmitted infections (STIs).

Methods: We conducted a systematic review, and where appropriate meta-analyses, to ascertain the influence of foreign travel on behavior, including new partnerships, unprotected intercourse, and STI acquisition.

Results: The pooled prevalence of travel-associated casual sex was 20.4% (95% confidence interval (CI) 14.8–26.7%), with 49.4% (95% CI 38.4–60.5%) of these having unprotected intercourse. The predominant characteristics of people who had new sexual partners abroad were: young age, male gender, single status, and traveling alone or with friends, with a previous history of multiple sexual partners or an STI. People who travel or stay abroad for longer periods and men who have sex with men are at higher risk of developing new sexual partnerships and having unprotected intercourse. The risk of developing an STI is increased up to 3-fold in people who experience casual travel sex.

Conclusions: New sexual partnerships and unprotected intercourse abroad are relatively common. People who develop new sexual partnerships and have unprotected intercourse abroad have an increase

Travel and new sex partners

- Clinical series 31.8%
 - Travellers 19.7%
 - General population 9 %
 - Overall 20.4%
-
- Peru < Ibiza Long stay>short stay
 - ~50% unprotected

Thai imports - rash & fever



HIV seroconversion



Secondary syphilis

Incubation period < 10 days

- Arbovirus including dengue
- Enteric bacterial
- Typhus (louse borne, flea borne)
- Plague
- Typhoid
- Haemorrhagic fevers

Incubation > 21 days

Malaria

TB

Viral hepatitis

HIV

Katayama fever

Amoebic liver abscess

Leishmaniasis

Filariasis

Tuberculosis



THE INDEPENDENT

section two

Graduate plus 32-36
Business 32-36
Sport 37-40

20 April 1995

The terror is infectious

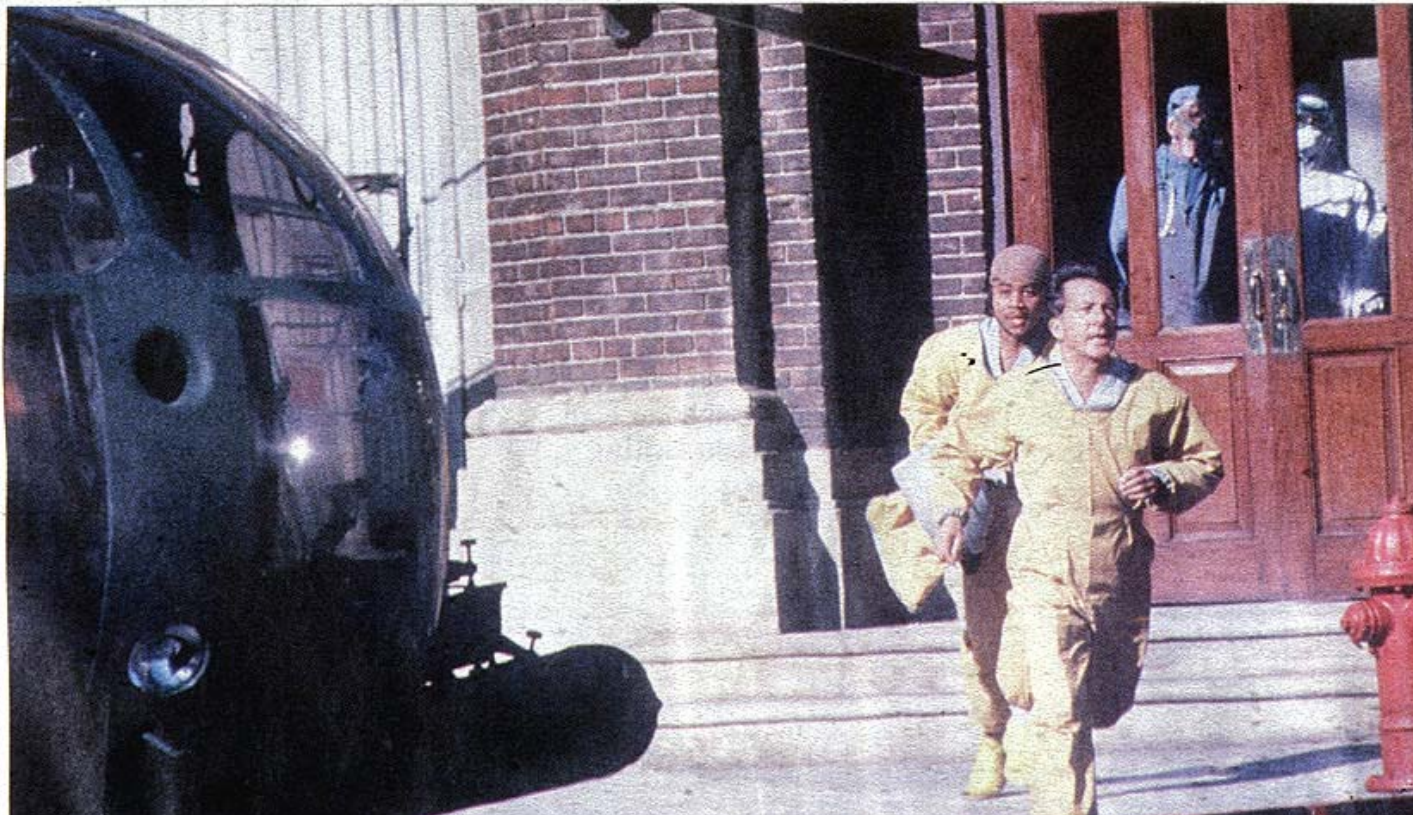
Fear of new and deadly diseases has spawned a wave of lurid fiction.
The reality may be even more frightening. Steve Connor reports

Vic Rail was a worried man. A dozen of the prize racehorses trained by him in Brisbane had already succumbed to a mysterious illness when he himself began to feel under the weather. By late September 1994, Vic's lungs had become a "hot zone" of actively replicating virus. His temperature had soared to over 40°C with a fever that had knocked him for six. Already the infectious agent had made the cells lining his lungs clump together, causing watery liquid to leak into the tiny air sacs where oxygen enters the blood. Vic was drowning in his own body fluids.

After nearly a week in intensive care, Vic died of pneumonia at the age of 39. By this time, some of Australia's leading virus-hunters were already on the trail of the mystery infectious agent. They had isolated something from the dead horses and a post-mortem revealed the telltale signs of virus lurking in Vic's kidneys - his lungs were too ravaged for analysis.

Under a high-powered electron microscope - the sort that can make the inside of a human cell look like the Albert Hall - the virus bore the characteristic shape of a group familiar to expert virologists. Further tests to determine its genetic structure confirmed that it was a morbillivirus, a type that includes the infectious agents responsible for canine distemper, cattleinderpest and human measles.

The scientists studying the mystery outbreak at Vic's stables were now in little doubt of the gravity of their find. No living scientist had reported a new human morbillivirus. In fact, what took place in Vic's lungs had not happened since the 10th century,



1918-1919. Last November Swiss scientist in the Ivory Coast became infected with EI while dissecting a chimpanzee, probably the first human since the Seventies; she survived and is said by the Institut Pasteur in Paris to be recovering well.

What makes HIV such a troubling infectious agent is that it can be passed unwittingly during the most intimate between people who can appear perfectly healthy for several years. The virus itself is not particularly infectious, but delayed action combined with its transmission during the compulsive human activity cause the complacency denial that makes it such a great threat.

The problem with HIV any other new virus is that the world at the end of the 20th century is a much more impenetrable place for infectious agents. It was 50, even 25 years ago infections thrive on a large number of humans living in proximity. In 1900, a mere 1 per cent of the world's population lived in cities. By 2010 it is expected that more than half of humanity will live in huge cities, notably the megacities of the developing world. In 1994 there were 10 cities with a population exceeding 10 million. By the year 2000 there will be 15, of which the majority will be in the poorest countries that cannot afford the sanitation and infrastructure that can stem the spread of disease.

There will be more pressure to develop pristine environments for human habitation, such as the rainforests, from which viruses are most likely to enter their natural reservoir of host animals, so increasing

Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence

Advisory Committee on Dangerous Pathogens

VIRAL HAEMORRHAGIC FEVERS RISK ASSESSMENT (Version 3: 11.08.2014)

A) Does the patient have a fever ($>38^{\circ}\text{C}$) or history of fever in past 24 hours AND has returned from (or is currently residing in) a VHF endemic country (<http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/ViralHaemorrhagicFever/VHFMaps/>) within 21 days?
OR
B) Does the patient have a fever ($>38^{\circ}\text{C}$) or history of fever in past 24 hours AND has cared for / come into contact with body fluids of / handled clinical specimens (blood, urine, faeces, tissues, laboratory cultures) from an individual or laboratory animal known or strongly suspected to have VHF?

NO to A AND B

VHF Unlikely;
manage locally

YES to A only

YES to B

ADDITIONAL QUESTIONS:

- Has the patient travelled to any area where there is a current VHF outbreak? (<http://www.promedmail.org/>)
- Has the patient lived or worked in basic rural conditions in an area where Lassa Fever is endemic? (http://www.hpa.org.uk/web/HPAweb&Page&HPAwebStandard/HPAweb_C/1254510365073/)
- Has the patient visited caves OR mines, or had contact with primates, antelopes or bats in a Marburg / Ebola endemic area? (http://www.hpa.org.uk/web/HPAweb&Page&HPAwebStandard/HPAweb_C/1254510365073/)
- Has the patient travelled in an area where Crimean-Congo Haemorrhagic Fever is endemic (http://www.hpa.org.uk/web/HPAweb&Page&HPAwebStandard/HPAweb_C/1195733776241/) AND sustained a tick bite* or crushed a tick with their bare hands OR had close involvement with animal slaughter?

No to ALL additional questions

YES to ANY ADDITIONAL QUESTION

CLINICAL QUESTION TO DETERMINE INFECTION CONTROL BEHAVIOUR AND PROTECT STAFF: does the patient have extensive bruising or active bleeding?

NO

LOW POSSIBILITY OF VHF

- Urgent Malaria investigation
- Urgent local investigations as normally appropriate, including blood cultures

Malaria Negative

Alternative diagnosis confirmed?

Yes

VHF Unlikely;
manage locally

No

Clinical concern OR continuing fever after 72 hours?

Yes

Discuss with Infection Consultant (Infectious Disease/Microbiology/Virology) Possibility of VHF; Infection Consultant to consider discussion of VHF screen with Imported Fever Service (0844 7788990)

No

* If an obvious alternative diagnosis has been made e.g. tick typhus, then manage locally

Continuing fever after 72 hours?

Yes

Discuss with Infection Consultant (Infectious Disease/Microbiology/Virology) Possibility of VHF; Infection Consultant to consider discussion of VHF screen with Imported Fever Service (0844 7788990)

No

Is the patient fit for outpatient management?

Yes

- Inform/update Local Health Protection Unit
- Ensure patient contact details recorded
- Patient self isolation
- Follow up VHF screen result
- Review daily

HIGH POSSIBILITY OF VHF

- ISOLATE PATIENT IN A SIDE ROOM
- Urgent Malaria investigation
- Full blood count, U&Es, LFTs, Clotting screen, CRP, glucose, blood cultures
- Inform laboratory of possible VHF case (for specimen waste disposal purposes if confirmed)

Malaria Negative

- Discuss with Infection Consultant (Infectious Disease/Microbiology/Virology)
- Infection Consultant to arrange VHF screen with Imported Fever Service (0844 7788990)
- Notify Local Health Protection Unit
- Consider empiric antimicrobials

CLINICAL QUESTION TO DETERMINE INFECTION CONTROL BEHAVIOUR AND PROTECT STAFF: does the patient have extensive bruising OR active bleeding OR uncontrolled diarrhoea OR uncontrolled vomiting?

No

Admit

Yes

VHF Result

Negative

Manage locally

Positive

CONFIRMED VHF

- Contact High Level Isolation Unit for transfer (020 7794 0500: Royal Free)
- Launch full public health actions, including categorisation and management of contacts
- Inform lab if other lab tests are needed

Please note this algorithm is a guide designed to aid early diagnosis of VHF cases

INFECTION CONTROL MEASURES

MINIMAL RISK

Standard precautions apply:
Hand hygiene, gloves, plastic apron
(Eye protection and fluid repellent surgical facemask and for splash inducing procedures)

STAFF AT RISK

Hand hygiene, gloves, plastic apron, fluid repellent surgical facemask, eye protection (FFP3 respirator for aerosol generating procedures)
Patients that have extensive bruising, active bleeding, uncontrolled diarrhoea, uncontrolled vomiting:
Hand hygiene, double gloves, fluid repellent disposable gown/suit, eye protection, FFP3 respirator

STAFF AT HIGH RISK

Hand hygiene, double gloves, fluid repellent disposable gown or suit, plastic apron (over disposable gown/suit) eye protection, FFP3 respirator

Containment of imported VHF

- Risk assessment – epi & clinical
- Possible case – negative pressure room
- Staff precautions - blood & secretion/air
- Liaise with lab
 - Exclude malaria
 - Specialist tests
- Liaise with public health
 - Identify contacts
 - Transfer as appropriate
- Prepare for media onslaught

VHF ward 38 Fazakerley Hospital Liverpool c1980



2018



Recent cases

Fri evening March 2018

- 27 M
- Arrived 2 weeks ago from Zambia near DRC border
- Unwell several days
- Rash

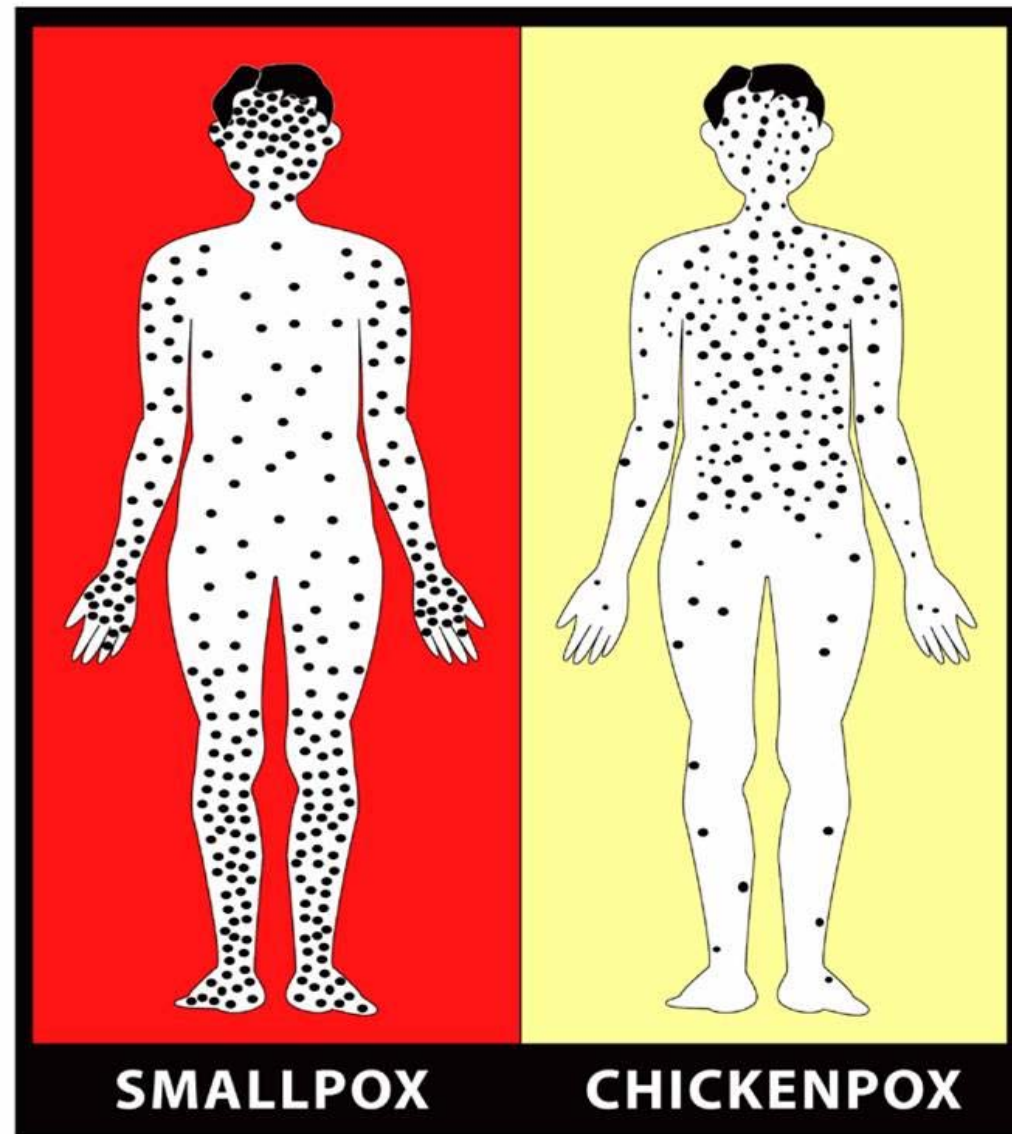
What are you worried about?

Diagnosis? Choose one

- Chickenpox
- Disseminated herpes
- Drug rash
- Monkeypox
- Something else

Name some differences between
chickenpox and
smallpox/monkeypox

Rash distribution



Smallpox vs. chicken pox

- **Smallpox**

- Incubation 7-17d
- Severe illness
- Prodrome
 - Headache and back pain
- Centrifugal
- Synchronous
- Rash not initially itchy
- Lesions round
- Scabs form 10-14d
- Scabs separate 14-28d

- **Chicken pox**

- Incubation 14-21 d
- Usually mild
- Prodrome
 - Mild malaise
- Centripetal
- Asynchronous
- Rash initially itchy
- Lesions oval
- Scabs form 4-7d
- Scabs separate <14d

Classical smallpox lesions:

Pustules

Deep

Painful

Can be rolled



Smallpox clinical course



- Prodrome (d 1-3)
 - Acute onset fever, malaise, headache, backache, prostration, anxiety
 - Erythematous rash (d 2-3)
- Maculopapular rash (d 4-6)
 - Face, hands, arms → extremities, trunk
- Vesicular rash (d 8-14)
- Complications
 - Haemorrhage
 - Encephalitis
 - Keratitis

Vesicular rashes

Chickenpox

Multiple stages
present

Not too ill





Check mouth and genitals (and hair)

Differential diagnoses

Eczema
herpeticum



Birmingham 1980 **NJ Beeching**

What is the best test?

- Electron microscopy of lesion fluid
- Serology for VZV
- PCR of lesion fluid for VZV or HSV
- PCR of lesion fluid for pox virus
- Something else

Diagnosis

- Chickenpox
- Responded well to aciclovir – had already been started empirically

Sep 2018

Returned traveller from Nigeria

- Fever and rash
- Very painful leg
- Mild confusion

Diagnosis

- Monkeypox
- BMJ best practice review

BMJ Best Practice: Poxvirus infection

bestpractice.bmj.com

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Poxvirus infection View PDF

OVERVIEW	THEORY	DIAGNOSIS	MANAGEMENT	FOLLOW UP	RESOURCES
Summary	Epidemiology Aetiology Case history	Approach History and exam Investigations Differentials Criteria	Approach Treatment algorithm Emerging Prevention Patient discussions	Monitoring Complications Prognosis	Guidelines Images and videos References

Last reviewed: September 2018 Last updated: September 2018

IMPORTANT UPDATES

Summary

Human smallpox has been eradicated since 1977, but monkeypox is endemic in West and Central Africa....

[READ MORE ▾](#)

Definition

Viruses belonging to the Poxvirus family (genus *Orthopoxvirus*) that can naturally infect humans and mammals include variola virus (smallpox), monkeypox virus, vaccinia virus, cowpox virus, buffalopox virus, camelpox virus, and cantagalo virus. This topic focuses on human disease associated with smallpox and monkeypox infection....

[READ MORE ▾](#)

History and exam

FEEDBACK

Possible contact

- 24 Female
- Works in bar
- Fever, myalgia, back pain for 12 days
- Rash for 5 days

- Attended walk in service
- Call from public health

Monkeypox contact



Diagnosis? Choose one

- Chickenpox
- Disseminated herpes
- Drug rash
- Monkeypox
- Something else

Diagnosis

- Herpes simplex type 2



COVID-19

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OVERVIEW

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THEORY

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RESOURCES

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Last reviewed: January 2020

Last updated: February 2020

[🔔 IMPORTANT UPDATES](#)

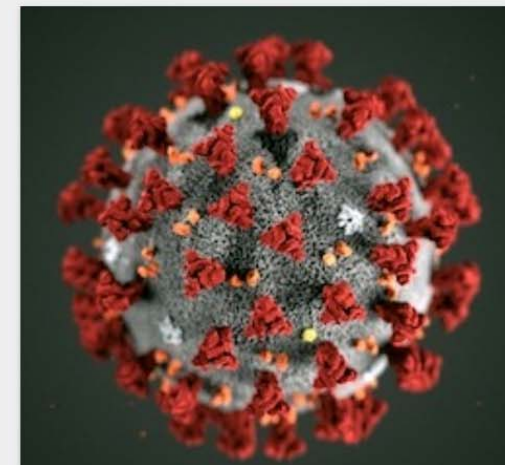
Summary

The World Health Organization has declared a public health emergency of international concern and rates the global risk assessment as high.

The situation is evolving rapidly with case counts and deaths increasing each day.

Cases have been reported in at least 24 countries outside of China.

Person-to-person spread has been confirmed, but it is uncertain how easily the virus spreads between people.



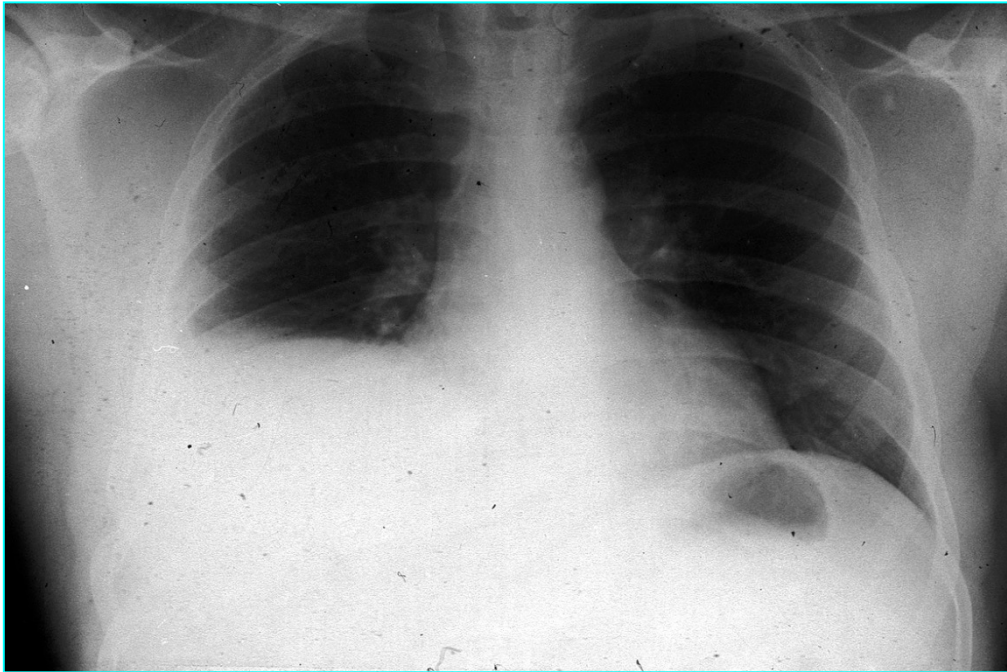
<https://bestpractice.bmj.com/topics/en-gb/3000168>

Fever and localizing signs

- Rash
 - dengue, typhoid, HIV, syphilis
- Jaundice
 - malaria, hepatitis, leptospirosis
- Lymphadenopathy
 - HIV, rickettsial infections
- Hepatomegaly
 - amoebic liver abscess, leptospirosis
- Splenomegaly
 - malaria, typhoid, brucella
- Eschar
 - typhus, CCHF
- Haemorrhage
 - VHF, rickettsial infection

Indian sea captain





Clinical and
radiological
signs

Right lung base



Diagnosis?

Amoebic liver abscess

Abscess
in right
lobe of
liver on
US

Positive
amoebic
serology



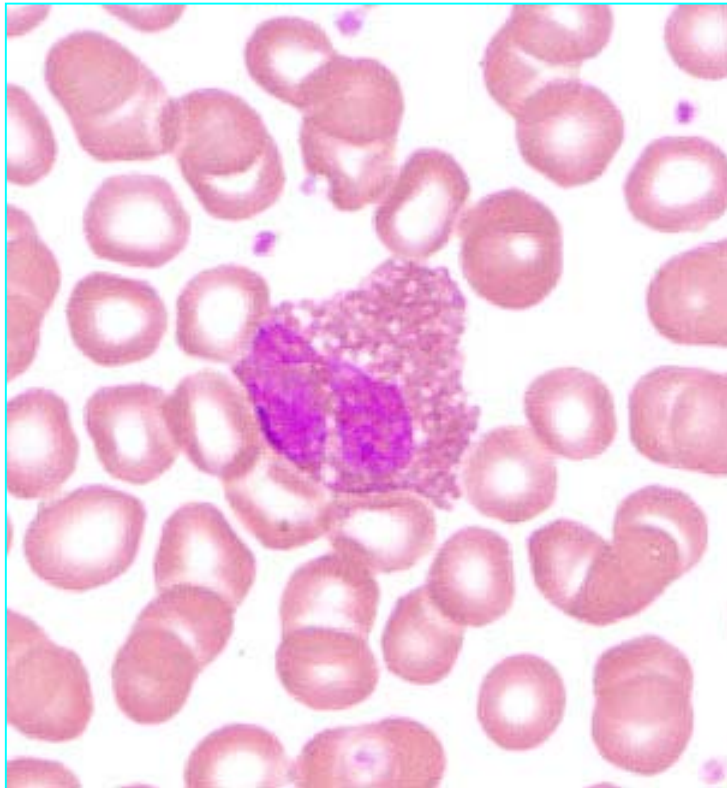
Investigations

- Thick and thin films (antigen detection)
- FBC, U & E's, LFT's
- Blood cultures
- Save serum for serology, EDTA for PCR
- Urine analysis and culture
- Stool microscopy and culture
- CXR
- Liver ultrasound etc as required

Simple clues in investigations

- Blood films
 - malaria, trypanosomes, borellia
- Thrombocytopenia
 - malaria, arboviruses, rickettsiae, leptospirosis
- Eosinophilia
 - schistosomiasis, strongyloidiasis, loiasis

**Eosinophilia
means worms**





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JOI 2010; 60: 1-20



www.elsevierhealth.com/journals/jinf

CLINICAL GUIDELINES OF THE BRITISH INFECTION SOCIETY

Eosinophilia in returning travellers and migrants from the tropics: UK recommendations for investigation and initial management

Anna M. Checkley^{a,*}, Peter L. Chiodini^a, David H. Dockrell^b, Imelda Bates^c, Guy E. Thwaites^a, Helen L. Booth^d, Michael Brown^a, Stephen G. Wright^a, Alison D. Grant^a, David C. Mabey^a, Christopher J.M. Whitty^a, Frances Sanderson^e, On behalf of the British Infection Society and The Hospital for Tropical Diseases

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Common sense

Establish the presence of fever before investigation

Retrospective investigation of fever that has settled is pointless

Bryceson A 1988



ELSEVIER

JOI 2009; 59: 1-18



www.elsevierhealth.com/journals/jinf

REVIEW

Fever in returned travellers presenting in the United Kingdom: Recommendations for investigation and initial management

Victoria Johnston ^{a,*}, Jane M. Stockley ^b, David Dockrell ^c, David Warrell ^d, Robin Bailey ^a, Geoffrey Pasvol ^e, John Klein ^f, Andrew Ustianowski ^g, Michael Jones ^h, Nicholas J Beeching ⁱ, Michael Brown ^a, Ann L.N. Chapman ^c, Frances Sanderson ^j, Christopher J.M. Whitty ^a, On behalf of the British Infection Society and the Hospital for Tropical Diseases

Fever with rash

	SSA	SEA	SCA	ME/NA	SA	Diagnostics	Comments / empirical Rx
Dengue						Dengue PCR (1-8 days post symptom onset) IgM ELISA (>4 days)	Manage symptomatically as outpatient with daily FBC unless high risk of shock (high haematocrit, falling platelets). Supportive management but avoid aspirin. Vaccination (YF, JE, TBE) history required to interpret results.
HIV						HIV (antigen and antibody)	Many rapid tests do not pick up seroconversion illness
Rickettsiae						Acute phase + 3-6 wk serum	Consider empirical Rx doxycycline if exposure to ticks in game park, headache, fever +/- rash/veschar
Schistosomiasis, acute						Not helpful	Empirical Rx praziquantel if appropriate presentation and exposure 4-8 wks previous. Consider steroids
VHF						PCR to ref lab	Always contact regional centre. VHF are also endemic in South America (arenaviruses) and Europe / Asia (Congo-Crimean haemorrhagic fever), however are rarely encountered in travellers


Fever with jaundice

	SSA	SEA	SCA	ME/NA	SA	Diagnostics	Comments / empirical Rx
Leptospirosis						CSF + BC < 5 days EIA IgM > 5 days	Rx on suspicion doxycycline / penicillin (may not be helpful after jaundice has developed). Transfer BC at room temp to reference lab
Viral Hepatitis						Anti-HAV IgM, HBsAg, anti-HEV IgM	Acute hepatitis C should also be considered in homosexual men
VHF						PCR to ref lab	Always contact regional centre. VHF are also endemic in South America (arenaviruses) and Europe / Asia (Congo-Crimean haemorrhagic fever), however are rarely encountered in travellers
Yellow fever						EDTA (blood) +/- CSF for PCR; IgG / IgM serology	Require confirmation of YF vaccine history

Johnston V et al. JOI 2009; 59: 1-18

MALARIA

Malaria is present in the countries listed. You can catch it on a short visit or on a stopover. Even if you used to live abroad you may have lost immunity



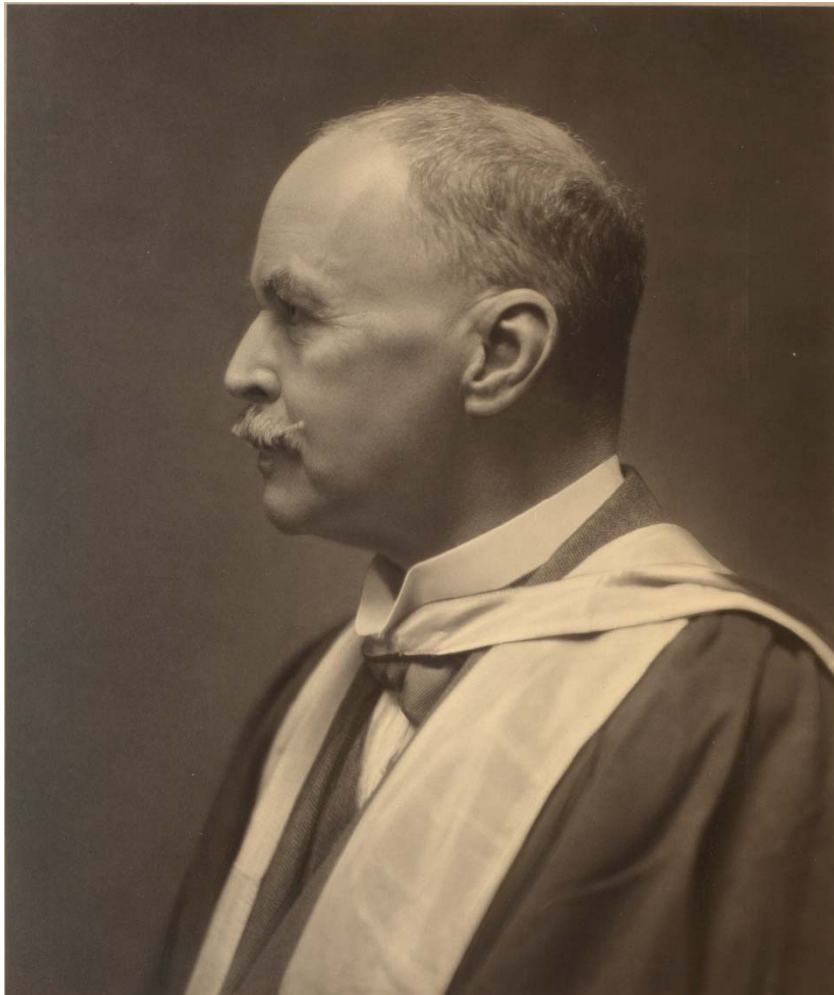
Afghanistan	Ethiopia	Rwanda
Algeria	French Guiana	Nepal
Andaman Islands	Gabon	New Hebrides
Angola	Gambia	Nicaragua
Argentina	Ghana	Norfolk Islands
Bahamas	Guatemala	Niger
Bangladesh	Guinea	Nigeria
Belize	Guinea-Bissau	Senegal
Bolivia	Guyana	Sierra Leone
Bosnia	Haiti	South Africa
Brazil	Honduras	South Korea
Burma	India	Spain
Burkina Faso	Indonesia	Swaziland
Burundi	Iran	Tanzania
Cambodia	Iraq	Thailand
Cameroon	Ireland	Togo
Cape Verde	Israel	Tunisia
Casablanca	Jordan	Turkey
Central African Republic	Kampuchea	Uganda
Chad	Kenya	United Arab Emirates
Colombia	Korea	
Congo	Laos	
Cote d'Ivoire	Lebanon	
Czech Republic	Libya	
Dominican Republic	Madagascar	
Dominican Republic	Malawi	
Dominican Republic	Malaysia	
Dominican Republic	Maldives	
Dominican Republic	Mali	
Dominican Republic	Mauritania	
Dominican Republic	Mexico	
Dominican Republic	Morocco	
Dominican Republic	Mozambique	
Dominican Republic	Namibia	
Dominican Republic	Nepal	
Dominican Republic	Nicaragua	
Dominican Republic	Norfolk Islands	
Dominican Republic	Niger	
Dominican Republic	Nigeria	
Dominican Republic	Senegal	
Dominican Republic	Sierra Leone	
Dominican Republic	South Africa	
Dominican Republic	South Korea	
Dominican Republic	Spain	
Dominican Republic	Swaziland	
Dominican Republic	Tanzania	
Dominican Republic	Thailand	
Dominican Republic	Togo	
Dominican Republic	Tunisia	
Dominican Republic	Turkey	
Dominican Republic	Uganda	
Dominican Republic	United Arab Emirates	
Dominican Republic		

PROTECT YOURSELF BY TAKING ANTI-MALARIAL TABLETS BEFORE AND DURING YOUR STAY ABROAD AND FOR ONE MONTH AFTER YOUR RETURN HOME

Tablets available from chemists and on some aircraft

See page 18 (opposite) for details. Prepared for the Health Departments of England, Scotland, Wales and Northern Ireland by the Central Office of Information, November 1971. Printed in England for the Ministry of Information by the Ministry of Information Ltd., Ltd. 10/45/71. Price 60p.

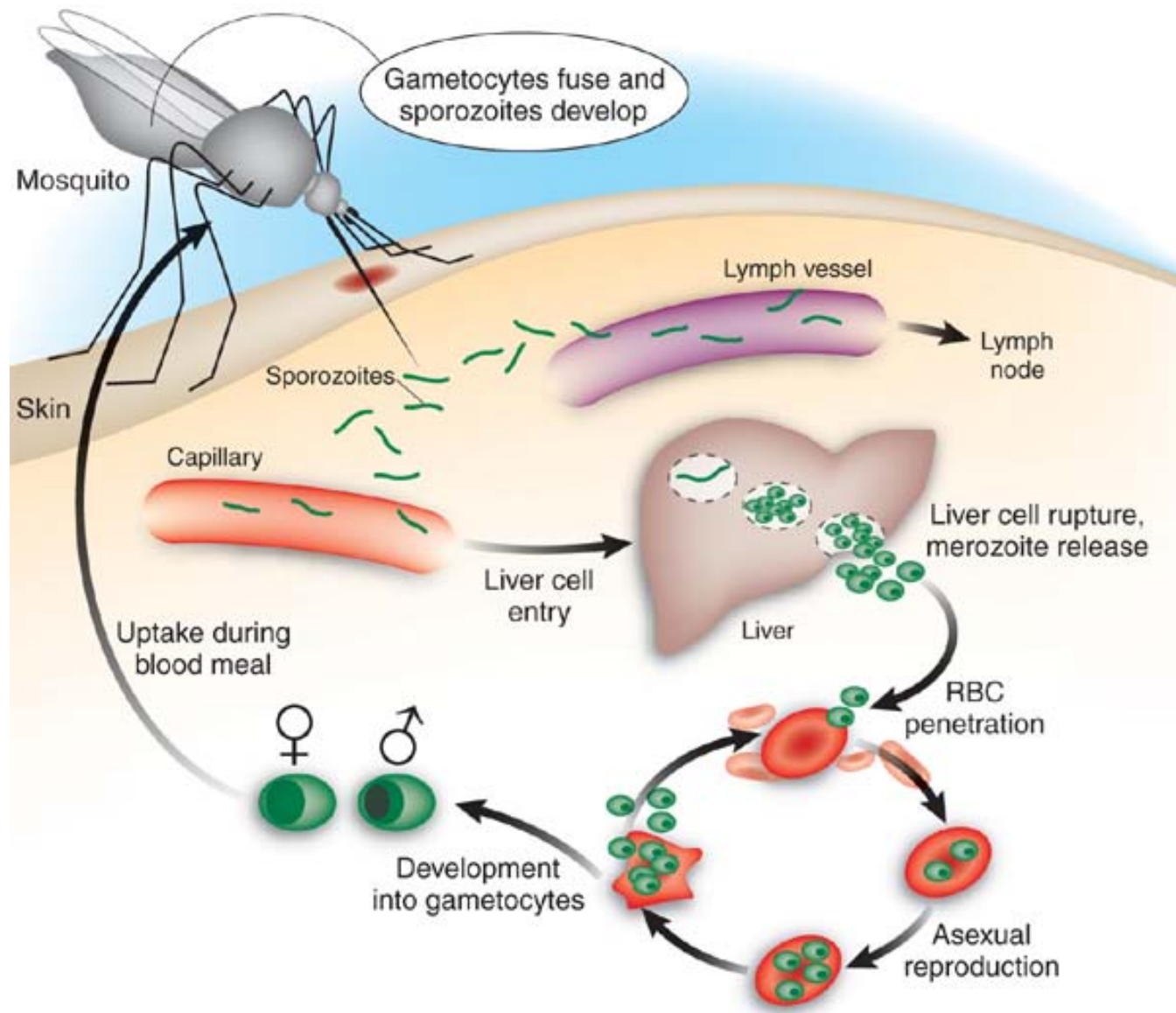
Sir Ronald Ross



Species of malaria (*Plasmodium*)

- *P falciparum* lethal. Esp from SS Africa
- *P vivax* benign
- *P ovale* benign mostly West Africa
- *P malariae* persistent, not usually lethal
- *P knowlesi* monkey malaria - Sarawak

Malaria life cycle



JonesMK et al. Nature Medicine **12**, 170 - 171 (2006)

Malaria

- What symptoms do people get?
- How is it diagnosed?

Clinical features of uncomplicated malaria

- Fever in over 90%
- Non specific symptoms
 - fever, “flu” like illness, headache, rigors, sweats
jaundice, respiratory or GI symptoms
- High index of suspicion necessary

Fever from Africa

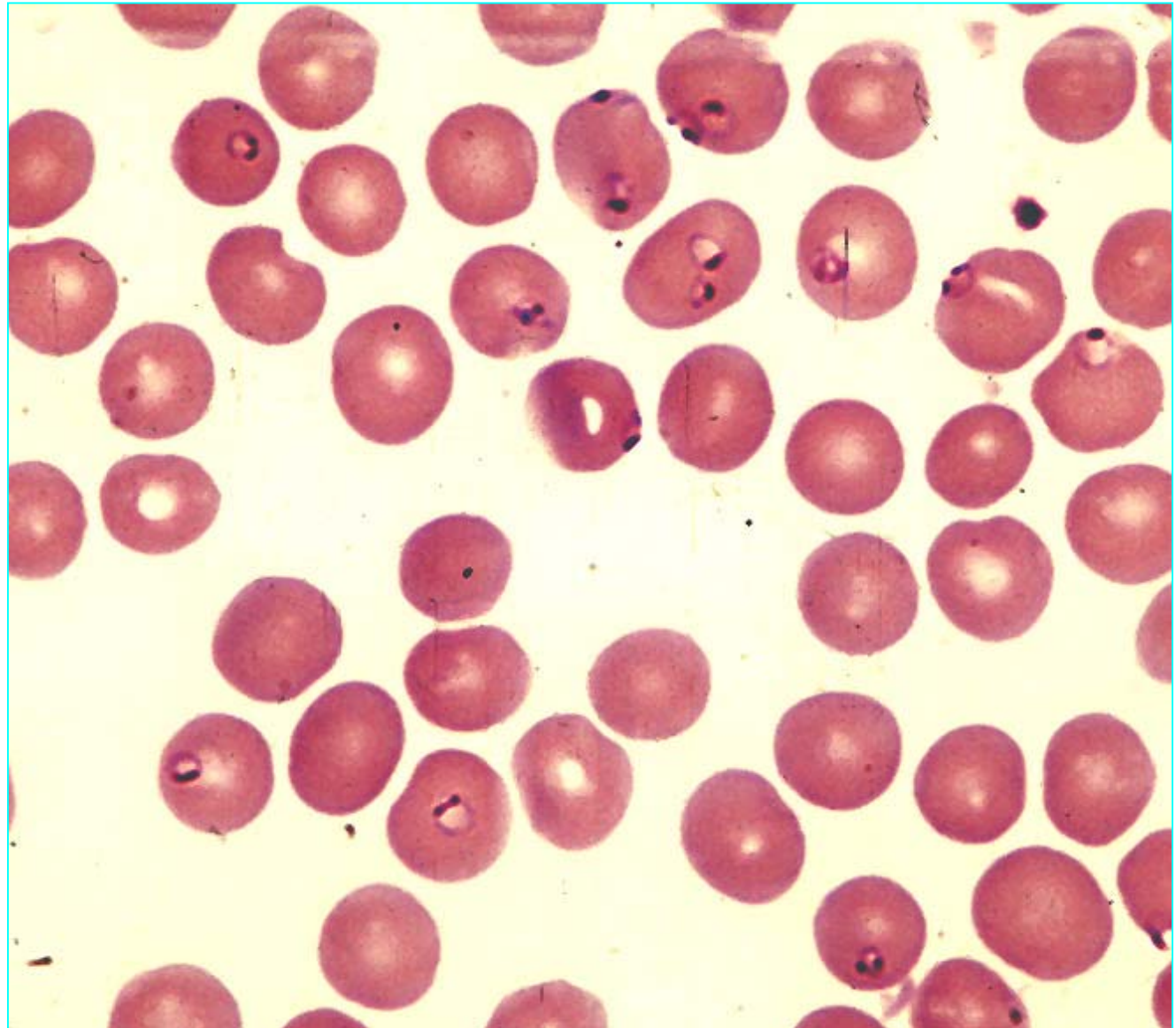
- From West Africa or sub Saharan Africa
 - 60% likelihood of *P. falciparum* if gets to hospital
 - 95% likely if thrombocytopenia also present
 - Other species *P. ovale* W Africa, *P. vivax* elsewhere followed by *P. malariae* everywhere
- Next most common are respiratory and enteric infections
- Consider exotica such as rickettsial infections (tick typhus), dengue etc

Malaria

- How is it diagnosed?
- History of travel
- (Long incubation period for vivax up to 2 years)
- Blood film examination under microscope
 - To detect parasite
 - To count them
 - To tell what species
- Other blood tests

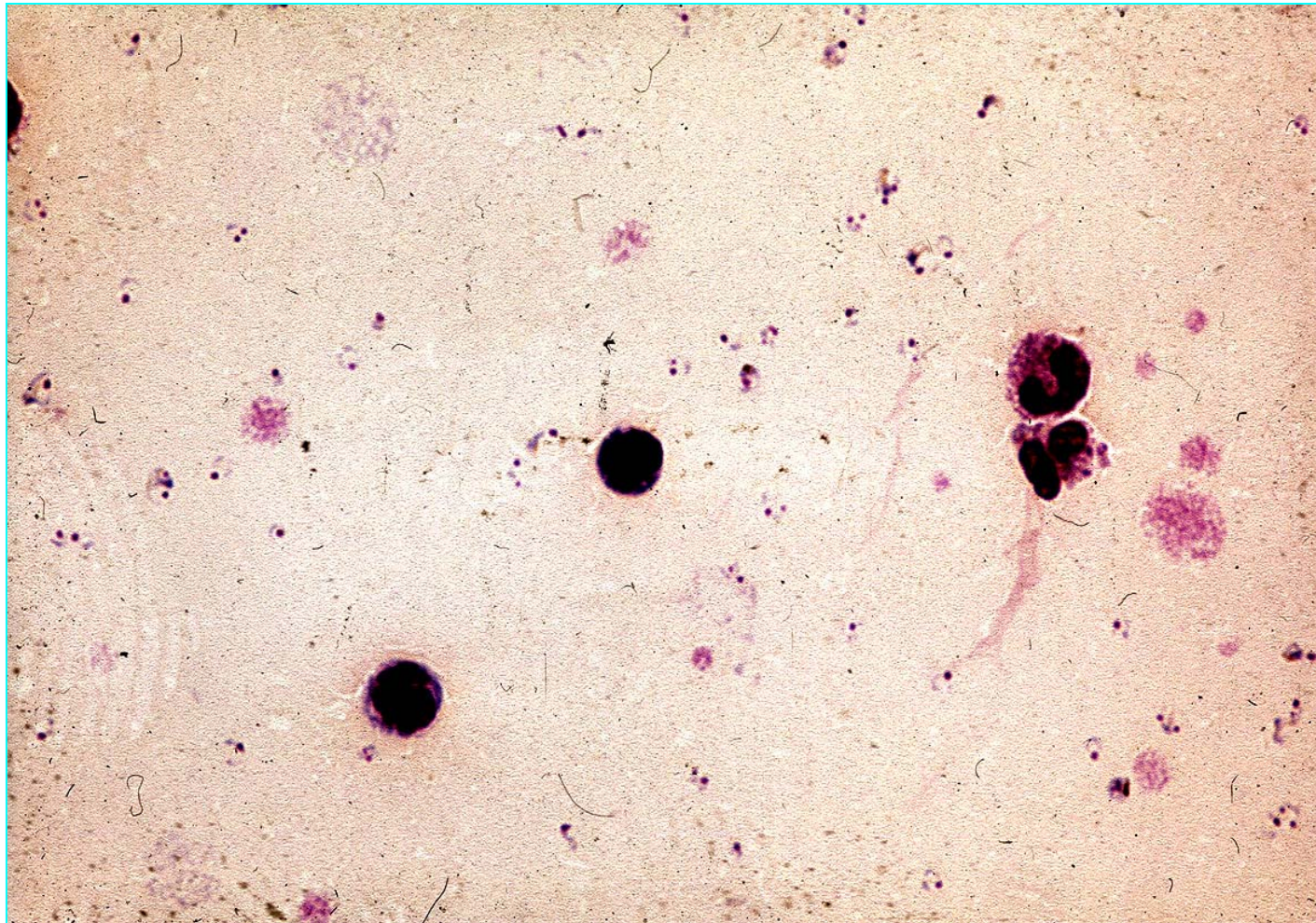
Malaria blood films

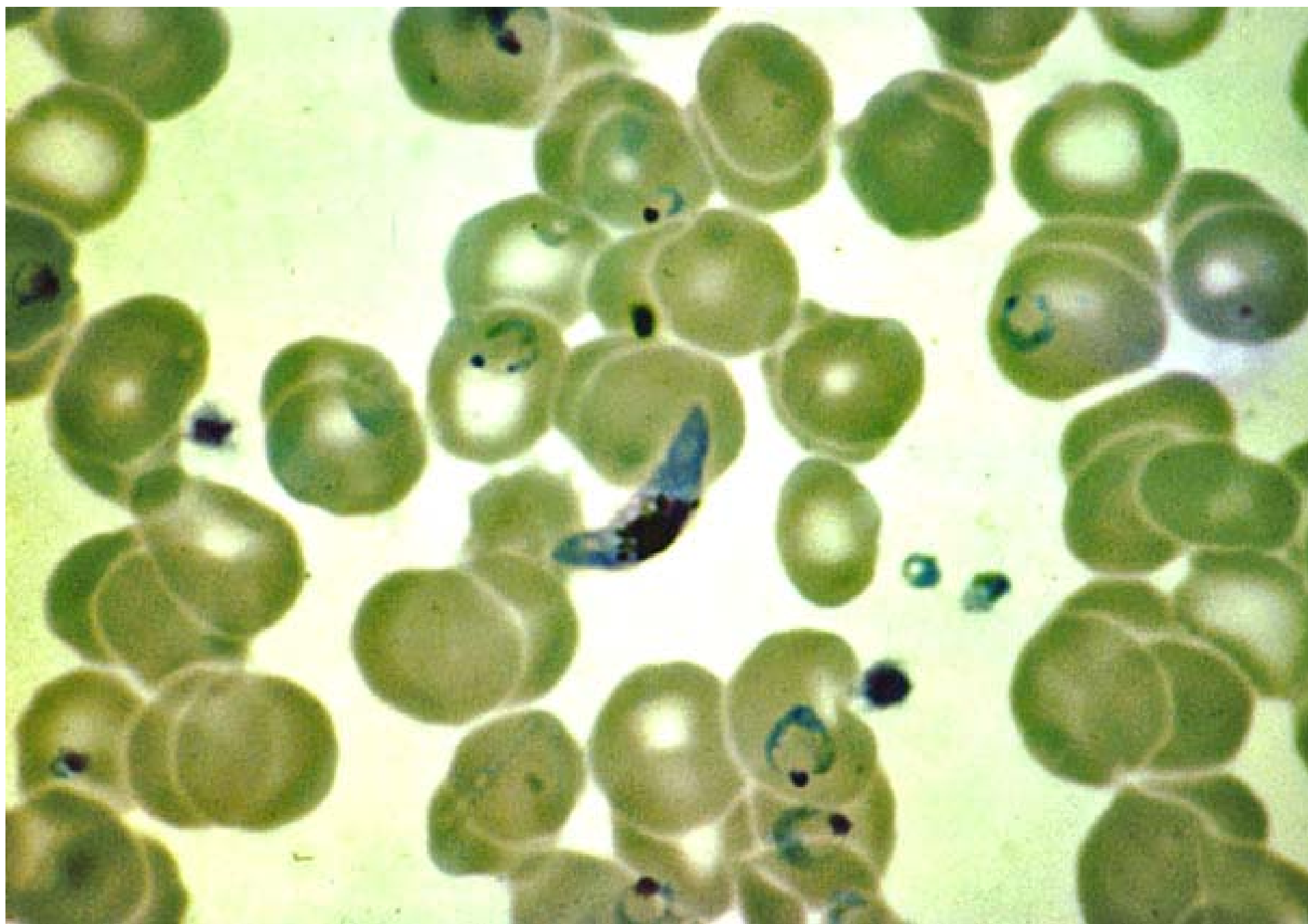
Thin
film



Malaria blood film

Thick
film





Malaria mistakes

- Can not be diagnosed on clinical features
- Symptoms are non specific -
fever, “flu” like illness, headache, rigors,
sweats, jaundice, respiratory or GI
- Classical periodicity of fever often not present
- Splenomegaly often absent
- Prolonged incubation of non falciparum malaria
- Chemoprophylaxis not always effective
- Routinely ask a travel history in febrile patients and ask for blood films
- Films may be negative



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JOI 2016; 72: 635-49

BIAM
British Infection Association

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UK malaria treatment guidelines 2016



David G. Lalloo^{a,*}, Delane Shingadia^b, David J. Bell^c,
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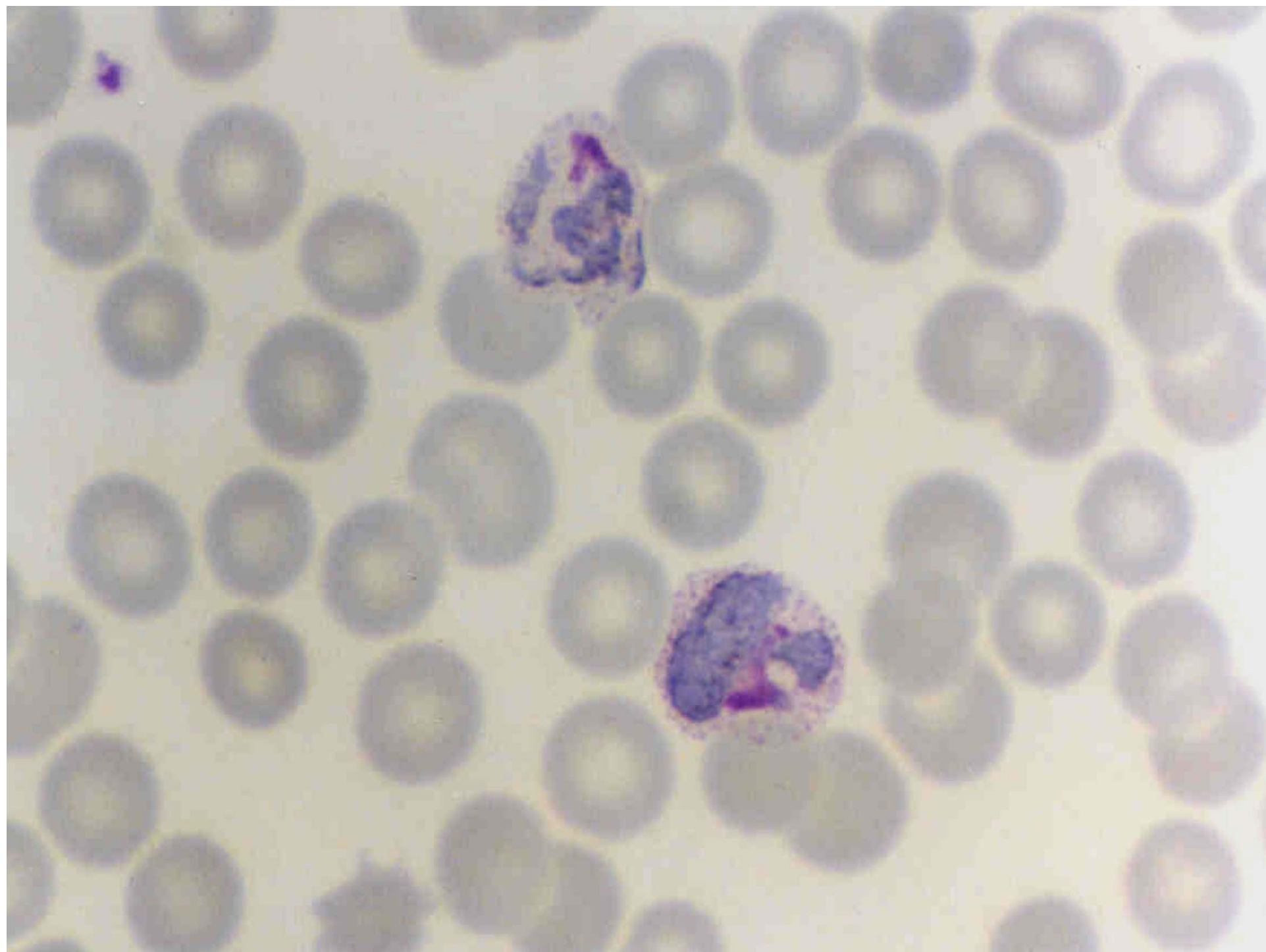
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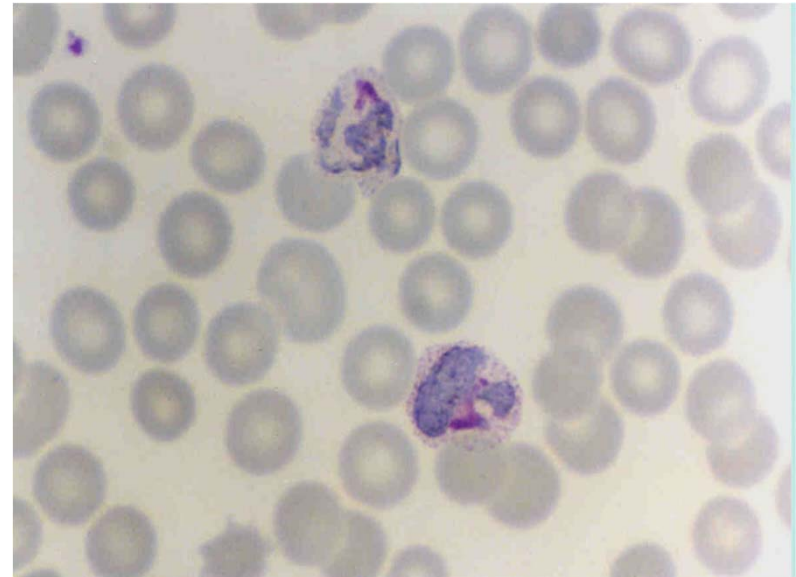
Revision Patient 1

- Fever from India
- Thrombocytopenia
- Blood film



Revision Patient 1

- Fever from India
- Thrombocytopenia
- Blood film



- What is the diagnosis? *Plasmodium vivax*
- What is the treatment? Chloroquine plus Primaquine

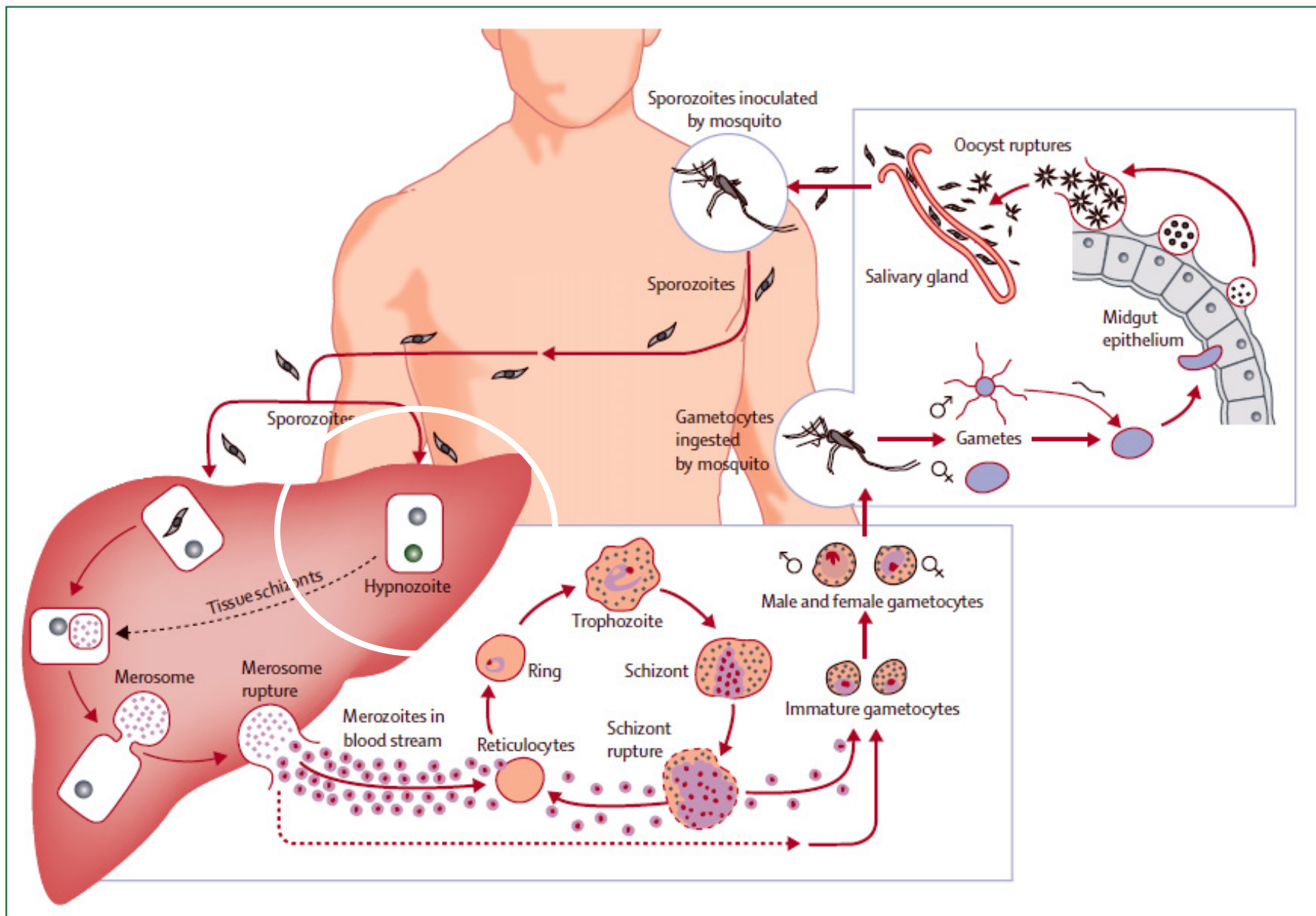


Figure: Life cycle of the human malaria parasite *Plasmodium vivax*

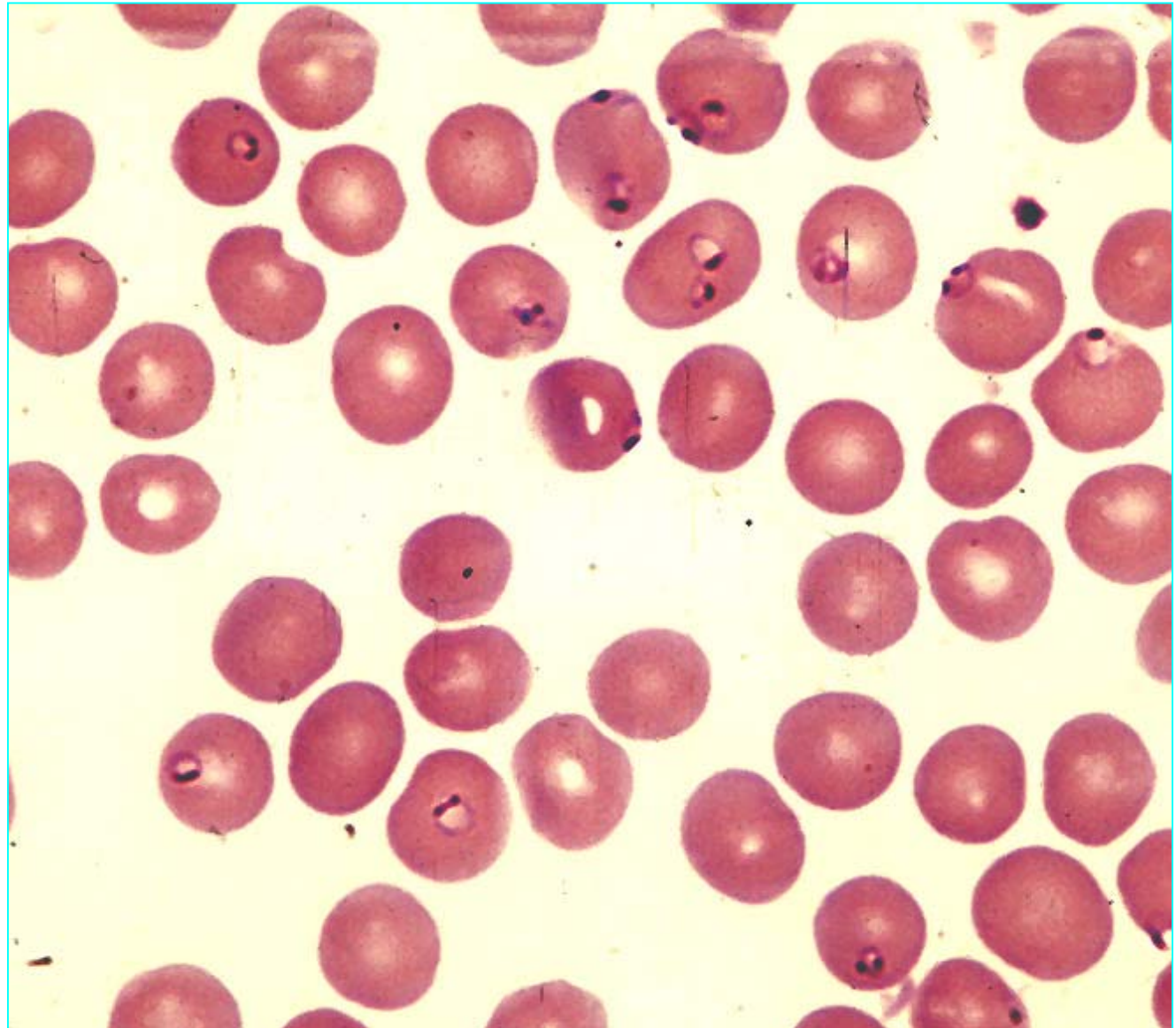
Mueller I et al. *Lancet Infect Dis* 2009; 9: 555-66

Revision Patient 2

- Fever from Nigeria
 - Unwell with hypotension, confusion, jaundice
 - Thrombocytopenia
 - Blood film
-
- What is the diagnosis?
 - What is the treatment?

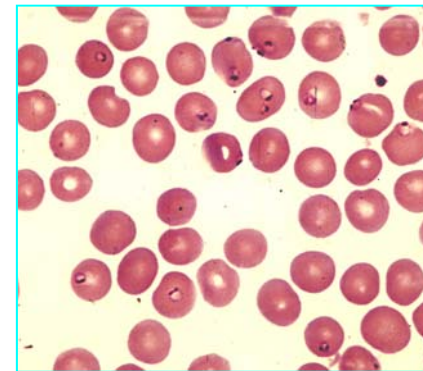
Malaria blood films

Thin
film



Revision Patient 2

- Fever from Nigeria
- Unwell with hypotension, confusion, jaundice
- Thrombocytopenia
- Blood film



- What is the diagnosis? *Plasmodium falciparum*
- What is the treatment? Artesunate or quinine IV
Supportive care

Malaria Prevention

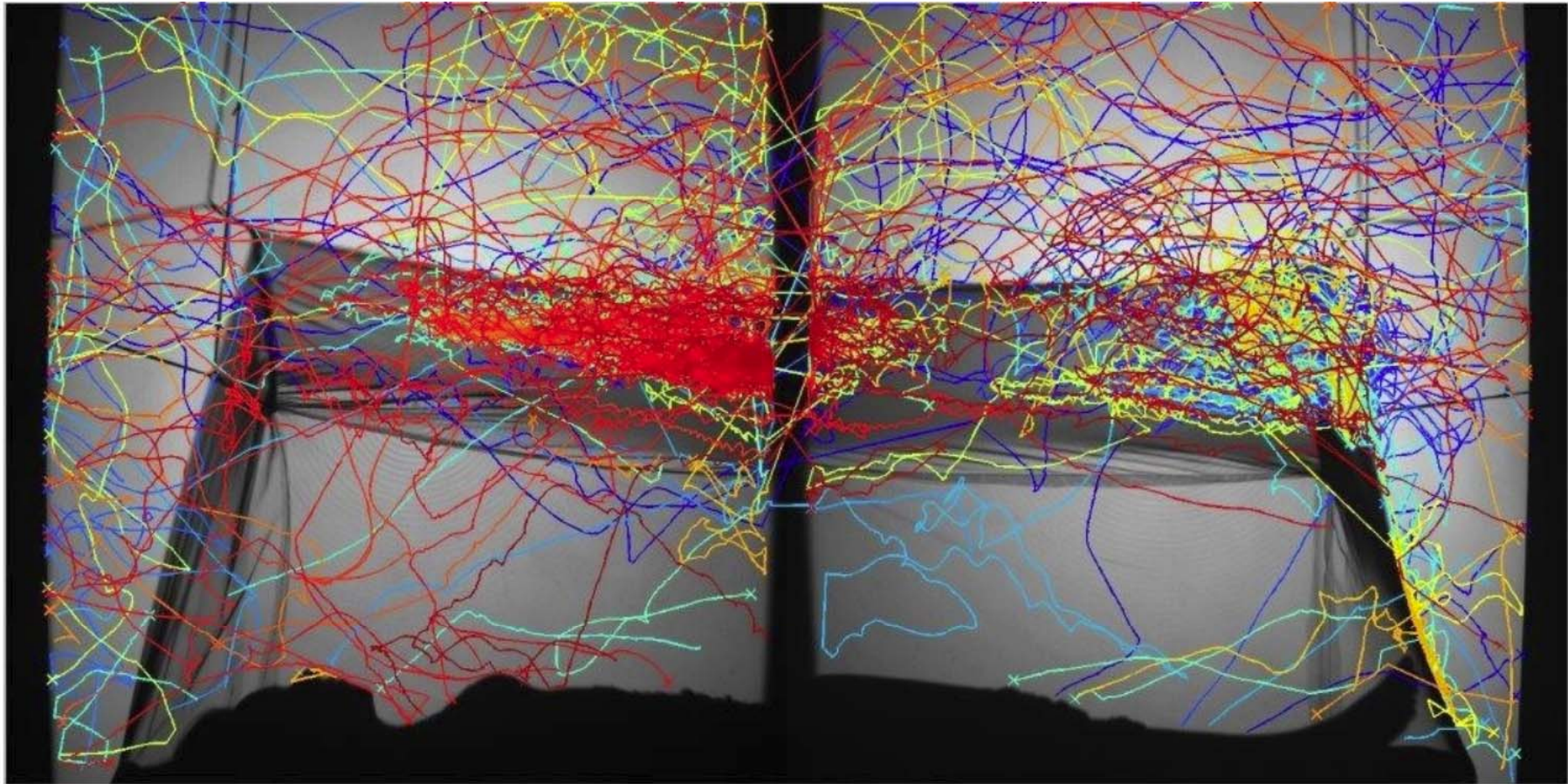
Control in tropics

- Fogging
- Insecticides (resistance)
- Get rid of water that mosquitoes lay eggs in
- Release sterile mosquitoes
- Treat cases
- Sometimes chemoprophylaxis to stop people catching it
- Use bed nets impregnated with insecticide

How does an insecticide treated bed net actually work?

PRESS RELEASE 1 SEP 2015

437



New research from LSTM has revealed precisely how insecticide-treated bed nets are so effective against malaria mosquitoes.

Liverpool, 1 September 2015 - Communities in the poorest countries are the most vulnerable to malaria and 90% of all

Malaria

- How is it prevented in travellers?

OFFERS FANTASY BINGO DATING JOBS BUYS&SELL COMPETITIONS HOROSCOPES CARTOONS CROSSWORDS



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M News UK News British Airways

British Airways stewardess dies after catching deadly malaria following long-haul flight

18:35, 18 JUL 2015

UPDATED 14:16, 19 JUL 2015

BY STEPHEN HAYWARD

F&F

FREE CLICK & COLLECT



Malaria death: A British Airways stewardess died after a long-haul flight from Ghana

Malaria

- How is it prevented in travellers?

A Awareness

B Bite prevention

- Personal repellants
- Sprays
- Nets
- Keeping indoors (air conditioning)

C Chemoprophylaxis

D Diagnosis and treatment

Prevention

10 JUMBO MOSQUITO COILS

NINJA

10 நினை

PROTECTION FROM DENGUE CARRYING MOSQUITOES

தென்னை உலக உருவத்தை

பெரும் நுளம்புகளிலிருந்து பாதுகாப்பு

NINJA

d - trans allethrin - 0.1%

MOSQUITO COILS

நினை

பி-டான்ஸ் அலத்திரின் 0.1%

உருவ உருவ

பி-டான்ஸ் அலத்திரின் - 0.1%

நுளம்புச் சுருள்கள்

لنقاوم المكلاريا

بإبادة البعوض

والتنويم تحت الناموسية

المركز الوطني لمكافحة الأمراض

أبوظبي - ٢٠١٩

Antimalarials - which ones ?



Malaria summary

- Protozoal infection transmitted by mosquitoes
- The most common lethal tropical infection in UK travellers
- Control worldwide a major problem
- Highest death rate in tropics in children
- LSTM makes major contributions to all aspects of control
- Still a long way to go

Summary - Diagnostic approach

- History
- More history
- Detail of geography, timing
- Occupational and recreational exposures
- Compliance with protection
- Physical signs (rash, eschar etc)
- Knowledge of prevailing infections

- Tests ordered and interpreted in light of
 - Pretest probability
 - Quality of tests

Don't forget

- Think malaria
- Exclude VHF
- Blood film – thrombocytopenia, eosinophilia
- Think about antimicrobial resistance
- If malaria is excluded, is empirical therapy indicated while awaiting results?
 - Doxycycline (leptospirosis, tick/scrub typhus)
 - Azithromycin or ceftriaxone (enteric fever)



Eco-Challenge 2000 Multisport event

Fever
Abnormal liver tests
Mild meningitis



Diagnosis?

Leptospirosis

reports from
GeoSentinel & Idaho
& LA Depts Health

L. weilii



189/304 (62%)
athletes
contacted

80/189 (42%)
met case
definition

Leptospirosis

- Leptospira species
- Urine of rodents, cattle, buffaloes etc
- Swallowed/enter conjunctivae
- Febrile illness
- May be very mild
- More severe gives renal failure, hepatitis, meningoencephalitis
- Treatment doxycycline, penicillins, ceftriaxone

Leptospirosis

White water
rafting

Meningitis

Jaundice

Renal failure



**42 year old British
teacher with a sore leg
after travel to South
Africa**



Two week holiday with husband in South Africa

Fully immunised

Took Malarone

Visited towns & game parks

4 days after return sees family doctor with painful groin

Examination

Looks unwell

T 38.0°C, BP
105/70 HR 80

Left neck node +

Chest & throat
clear

Generalised rash



Fever and rash from South Africa



Diagnosis?

Further history

- Anaesthetist found lesion in hair
- Husband saw lesion under breast
- Patient found other lesions x 4
- **Typical African tick typhus**



Outcome

African tick typhus

- Treated with doxycycline
- Better within 2 days
- Fully recovered
- Fame in women's magazine



'My holiday of a lifetime turned into a nightmare'

When Jayne Culshaw, 44, and her husband, Stephen, went on a safari, she came back with more than a tan...

For as long as I can remember, I'd wanted to visit South Africa. So it was a dream come true when, in March 2003, my husband, Stephen, and I decided we'd go on a safari holiday to the Kruger National Park. We had a really fabulous time, saw loads of lions, elephants, giraffes, rhinos and zebras, the game lodge was luxurious and the food was delicious – it was a wonderful trip.

The funny thing was that I remember saying to Stephen one day that I was a bit nervous about a lion getting in and attacking us. He said, 'It's not the big things I worry about, it's the little things!' What he meant was the insects.

A few days before the end of our stay, we went on a bush walk. We were advised to wear long trousers, socks and trainers, and to take a shower later in case any insects had got into our clothing. I did exactly as we were told. The walk was fun and I thought nothing more of it.

We came home on a weekend and I went back to work on Monday. I felt really tired the first day. I knew it wasn't jet lag – there's no real time difference between the UK and South Africa – so I thought it was just getting back into the old rhythm again.

Then a few days later I felt a dull ache in my groin. As I undressed that night, Stephen noticed a dark patch

What is tick typhus?

- **Tick typhus** is the name given to a collection of diseases caused by **rickettsia ticks**
- Infection is via a **bite** from an infected tick – in **Africa** the ticks are usually associated with **game animals**
- Symptoms include **fever, headaches, rash** and **swollen lymph glands**. Incubation is usually about a week
- **African tick typhus** is **rarely fatal** but, if untreated, symptoms can be **unpleasant and severe**, and could last **two weeks** or more. In other parts of the world tick typhus can be **life-threatening**

on my back where my bra strap had been. It wasn't itchy or sore, and I didn't think for a minute it was a bite.

The next day I could feel an uncomfortable lump in my groin and I was feeling decidedly under the weather. By the following morning, when the lump was egg-sized and I could hardly walk upstairs, I went to my GP. She diagnosed a strangulated hernia, and I was admitted to hospital. They tried putting on ice packs, but it didn't go down, so the doctor said he was going to operate straight away.

When I came round from the anaesthetic, I was groggy, and in addition to a painful groin, I had a new pain in my neck. The surgeon



came over the next day to check my stitches. By now I was going downhill fast – I had a very high temperature and I was feeling terrible. I had a big lump in my neck where another lump had come up. The nurse told me to call in my GP, but I was feeling

anything like it. I felt so scared when I realised I had symptoms the GP had no idea how to treat. She referred me to the Tropical and Infectious Disease Unit at the Royal Liverpool University Hospital.

After a thorough examination, they found I'd been bitten in four places – my back, neck, knicker line and just below my bust. But they didn't know what had bitten me. I was taken to see consultant Dr Nick Beeching, who almost immediately said, 'I know exactly what's wrong with you. It's tick typhus.' He told me it would take a while for the tests to prove his diagnosis, but in the meantime I was admitted and given drugs. Within 48 hours I was feeling much better and was just grateful to be over the worst.

After a few days I was out of hospital and recovering at home. My family were relieved – they'd

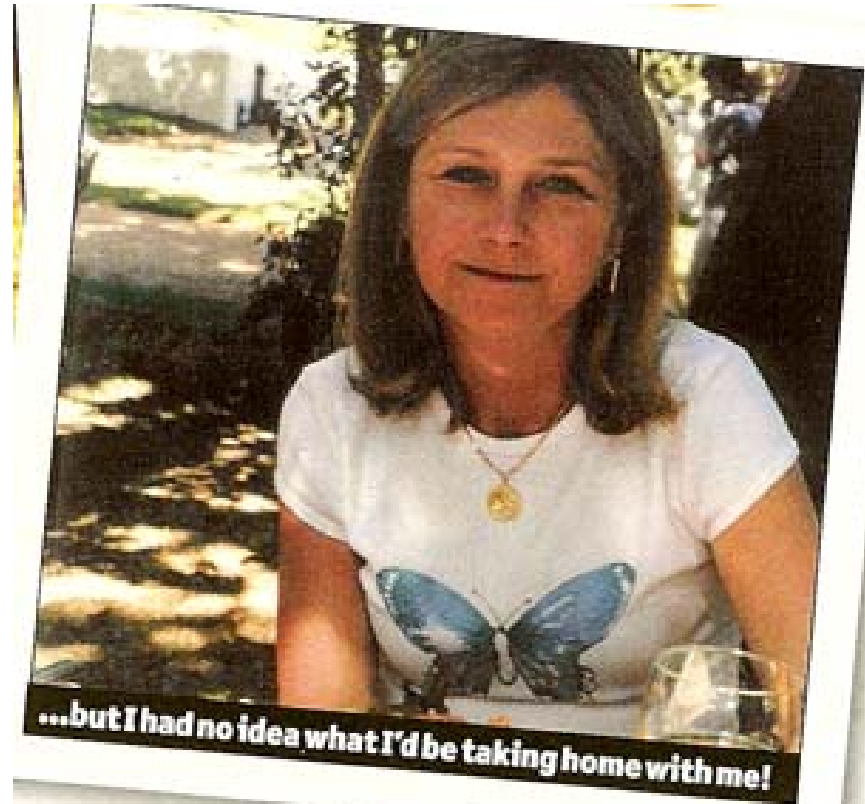
been terrified, too. The worst nightmare I had was that something had laid its eggs inside me and was infecting all my internal organs. That really spooked me!

Looking back now, I think I was just unlucky. I followed all the advice to cover up, but still the tick got inside my clothing.

I'd love to go back to South Africa. It's a beautiful country and I can't believe I'd be so unlucky again. But if I ever come back from a holiday with more strange symptoms, I'll go straight to the Tropical Disease Unit!

Information from MASTA (Medical Advisory Services for Travellers Abroad). For details, visit masta.org/tickalert.

Real health



'Had something laid eggs inside me and infected my organs?'

said they'd noticed a strange spot there, and also the one on my back, during the op, and did I know what they were? He also said he'd been wrong, it wasn't a hernia at all – they'd removed a very swollen lymph gland, but they had no idea why it was so swollen.

I was discharged a couple of days later, and the district nurse

so ill, I just didn't get round to it.

Next morning I woke to find my whole body covered in an awful rash. On my chest, back and legs it looked like the start of chickenpox. But over the next few hours and days, as the spots matured, they turned black. In a panic I went to my GP.

The look on her face spoke volumes – she'd never seen

Parasites lurk in many places, not just exotic locations. Check our guide...

AFRICA

Malawi, Tanzania, Kenya, etc

Schistosomiasis

Causes problems in lungs, bowel and bladder

How do you get it?

From larvae of parasitic worms in fresh water

Precautions

Avoid swimming or wading

Sleeping sickness

Affects the central nervous system

How do you get it?

Bite from tsetse fly

Precautions

Knock-down insecticide spray, repellent

INDIAN OCEAN ISLANDS

Mauritius, Reunion & the Seychelles

Chikungunya

Virus that causes flu-like illness with very painful joints

How do you get it?

From infected mosquitoes that bite during the day

Precautions

Strong mosquito repellent and covering up with long sleeves and trousers

ASIA

Thailand & Malaysia

Dengue fever

Virus that causes a flu-like illness with muscle pain and sometimes a rash. Can become life-threatening dengue haemorrhagic fever

How do you get it?

Bite from an infected mosquito

Precautions

Use a strong mosquito repellent – either lemon eucalyptus or Deet-based – and cover skin while walking in rural areas

EUROPE

Rural areas of Italy, Austria, Germany and France

Tick-borne encephalitis

Virus which can lead to inflammation of brain

How do you get it?

From infected ticks that live at the edge of forests

Precautions

Vaccine for travellers at high risk. Use repellent on exposed skin. Cover up with long sleeves and trousers.

Check daily for ticks and remove completely

THE UK

Exmoor, New Forest, South Downs, parts of Wiltshire & Berkshire, Thetford Forest, Lake District, Yorkshire Moors & Scottish Highlands

Lyme disease

Causes acute arthritis-like symptoms, lethargy. Can lead to lameness and neurological problems

How do you get it?

From infected ticks

Precautions

Daily removal of any tiny ticks. Use repellent, like Deet

Family Circle
Aug 2006

Tick borne rickettsiae eg *R africae*, *R conori*

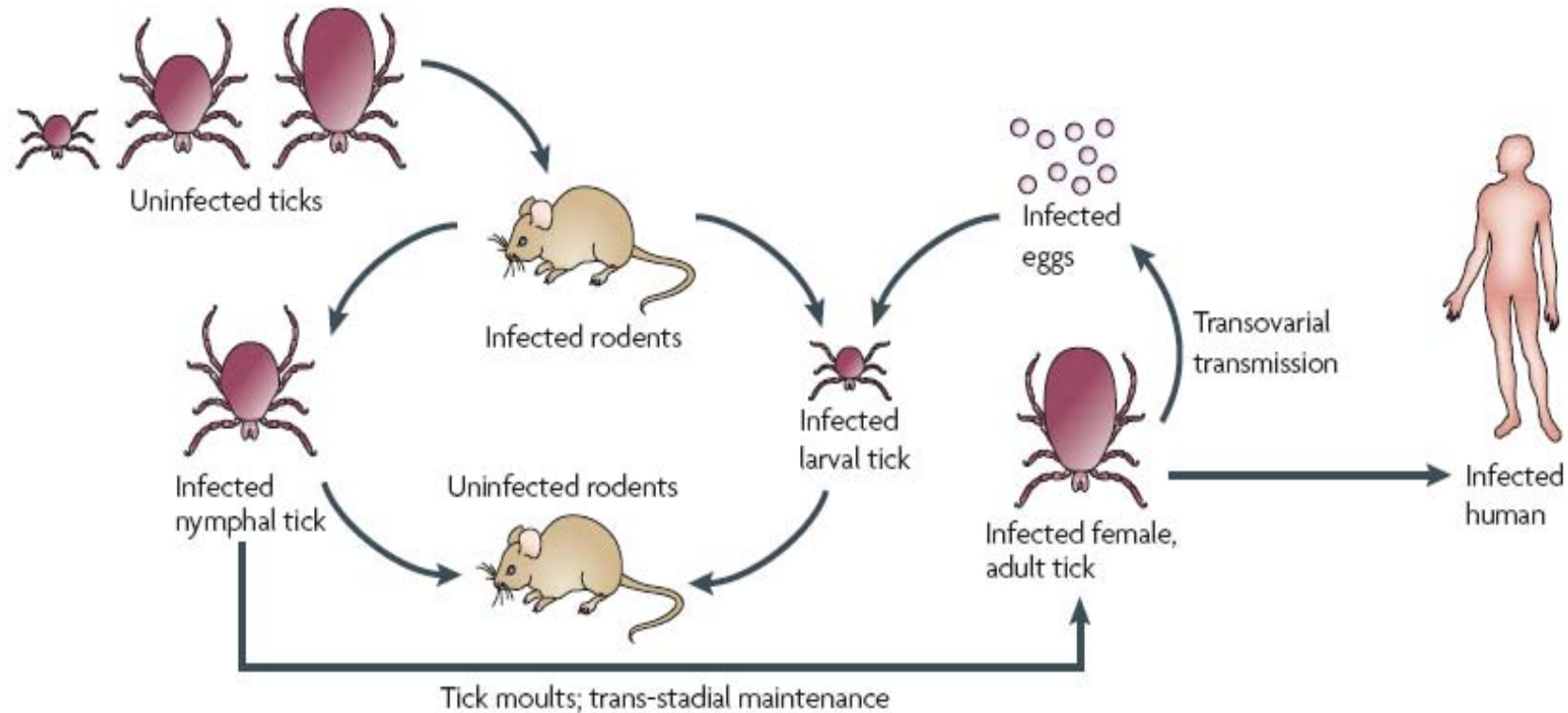


Figure 1 | **The life cycle of tick-borne rickettsiae.** Spotted-fever-group rickettsiae are maintained in nature by transovarial and trans-stadial transmission in ticks and horizontal transmission to uninfected ticks that feed on rickettsemic rodents and other animals.

Walker DH, Ismail N. *Nature Reviews* 2008

Clinical features: Tick typhus

Incubation period 2-14 days

Eschar (scalp, groin etc) may precede systemic symptoms

Similar syndrome to LBT

Generalised rash may be absent (*R. africae*)

Mortality highest in RMSF (~7%)



Features

Tick bite noticed by 8/13
(61.5%)

Eschar 100%

Adenopathy 100%

Rash 15%



Hers

Eschar under bra strap

Rash on legs



Tick bite fever

	Mediterranean	Africa
Rickettsia	<i>R conorii</i>	<i>R africae</i>
Affects tourists	Rare	Common
Fever	Yes	Yes
Rash	Common	Less
Eschar	Single	Multiple
Regional nodes	Yes	Common
Mortality	~2%	Rare

Diagnosis & management

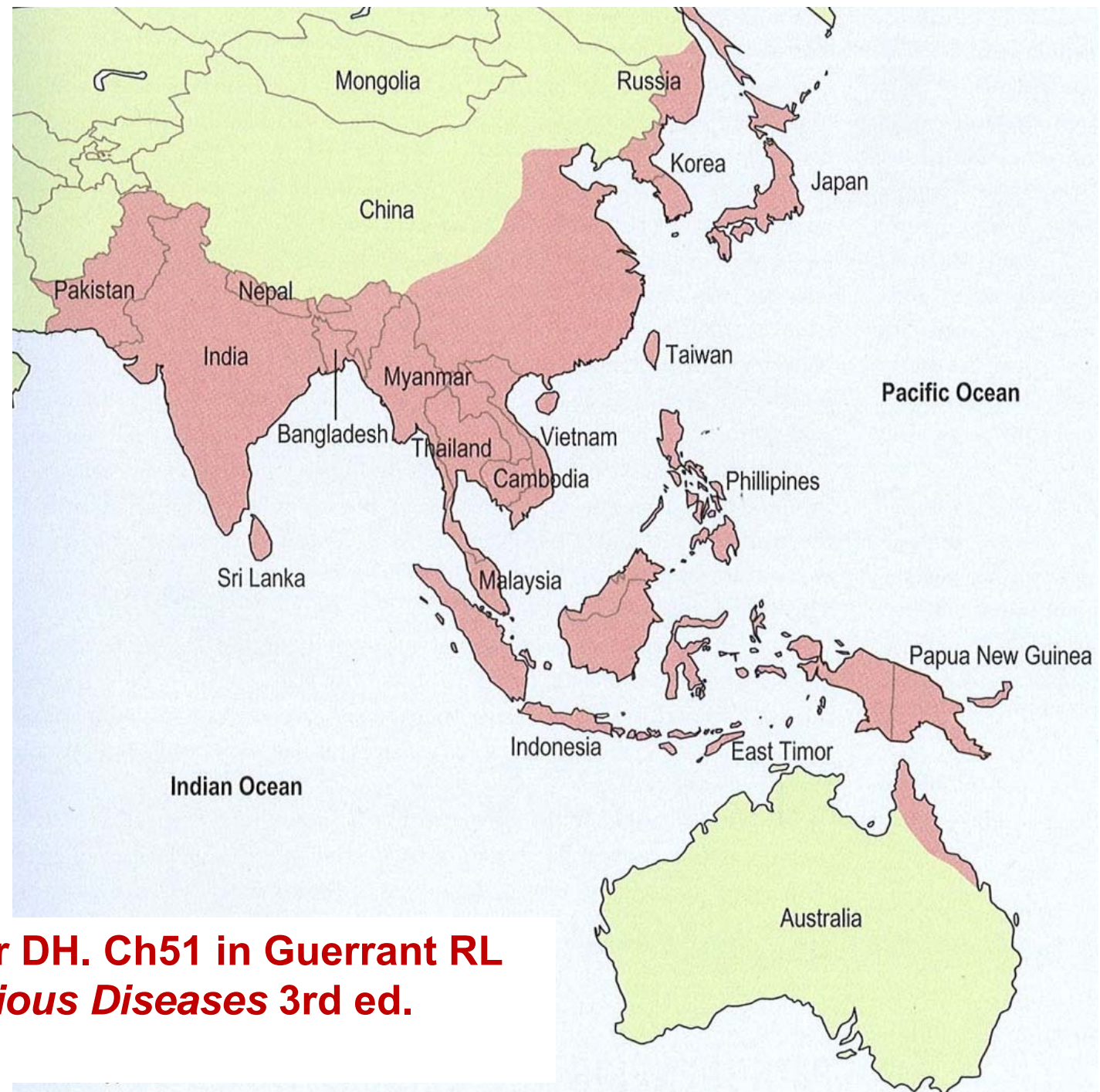
- History of tick exposure - ??
- Clinical - non specific symptoms
- **Serology - only positive after 7-10 days**
- Biochem/haem - non specific:
 - ↑acute phase, ↓Hb, ↓plt, WBC normal
 - ↑LFT, ↑LDH, ↑CK
- Culture - feasible, but not readily available
- **Immunohistology/PCR of skin biopsy (rash, eschar)**
- Treat on suspicion

Summary

- Consider African tick typhus in tourists with fever from Africa
- Symptoms non specific
- Headache often prominent
- Rash often absent
- Careful search for eschars eg hairline
- Lymph nodes
- Tick bites often not noticed
- Presumptive treatment with doxycycline

Jensenius M *et al.* Clin Inf Dis 2004; 39: 1493-9

Scrub typhus



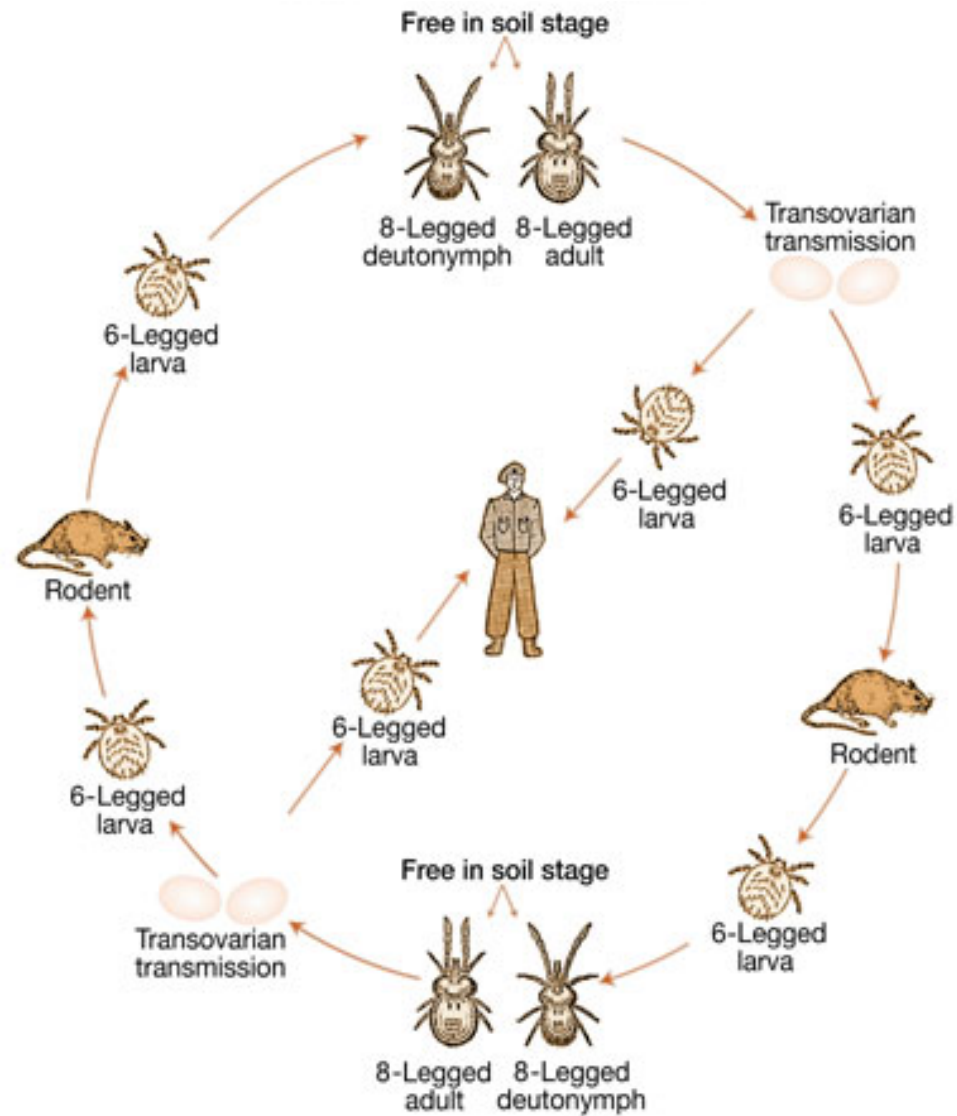
**Kim I-S, Walker DH. Ch51 in Guerrant RL
Tropical Infectious Diseases 3rd ed.
Elsevier 2011**

Scrub typhus *Orientia tsutsugamushi*



Leptotrombidium akamushi

Vector of *Orientia tsutsugamushi*



Scrub typhus transmission

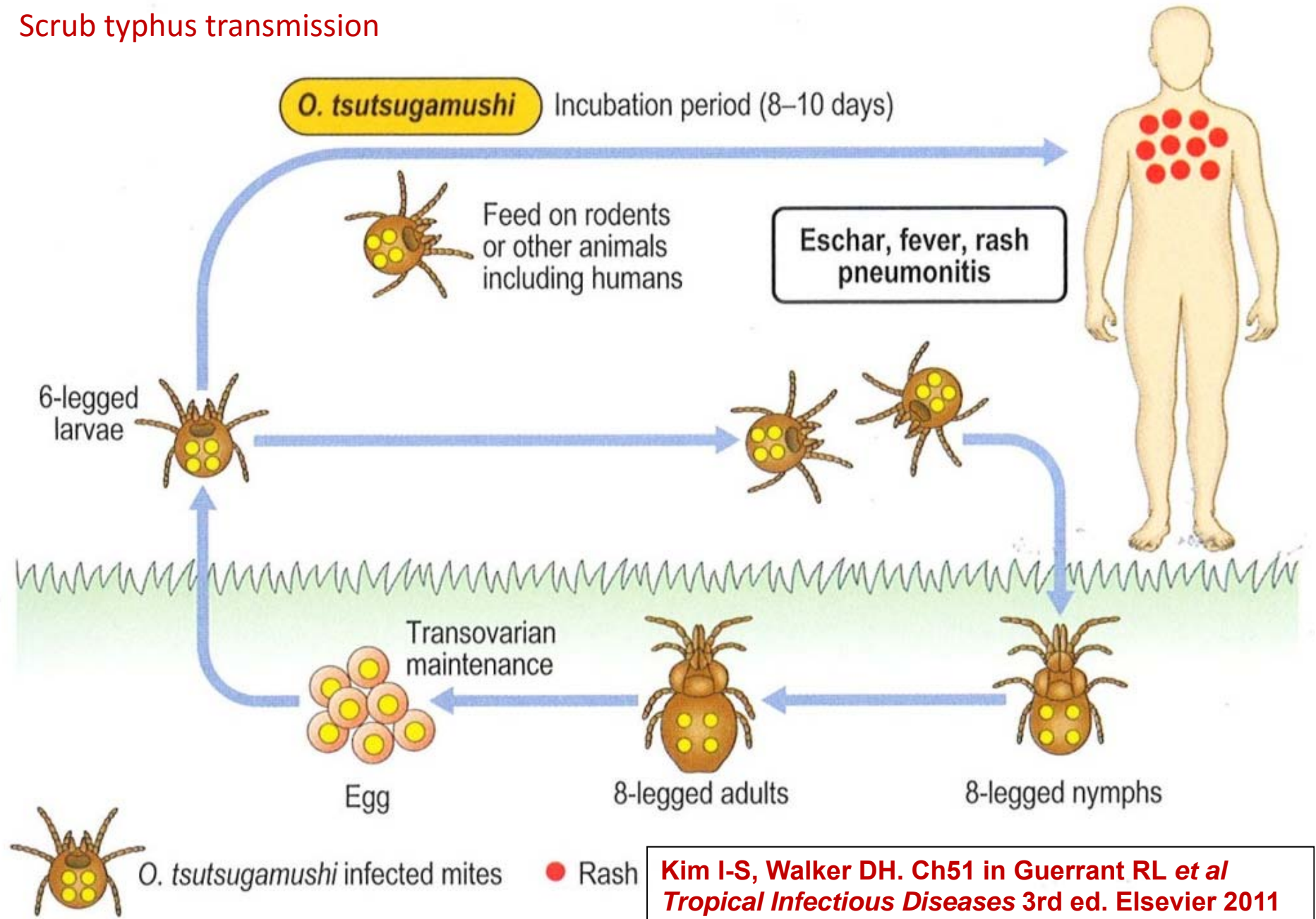


Figure 51.2 Transmission of *O. tsutsugamushi* to the human.

Clinical features: scrub typhus

Incubation 4-10 days

Eschar and possibly
multiple chigger bites

Rash delayed (day 6-7)
and not prominent

Complications unusual

Mortality <2%

Worse outcome in
pregnancy





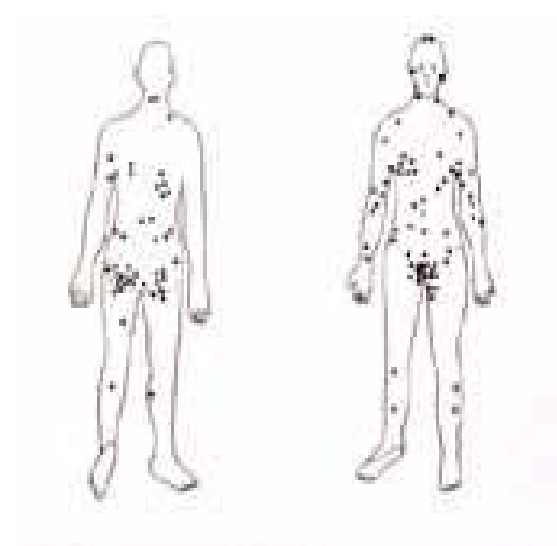
Maldives scrub typhus eschar (Female Age 16)

c/o John Suresh Christian DTM&H 2004

Eschar

Commoner in Scrub typhus, some SFG

rickettsial infections,
cutaneous anthrax, tularaemia,
necrotic arachnidism (brown recluse spider
bite),
rat bite fever (*Spirillum minus*),
staphylococcal or streptococcal ecthyma,
Bartonella henselae



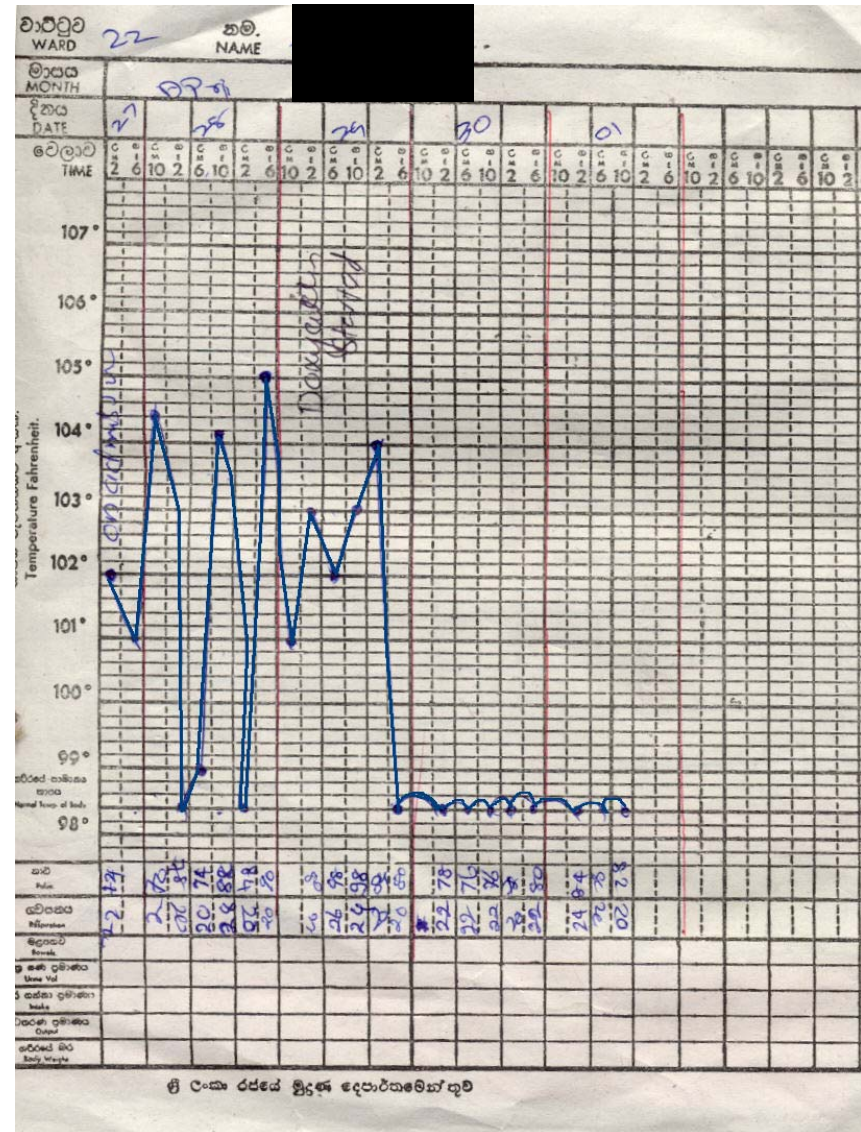
Presumptive diagnosis

Compatible clinical illness

Strong: eschar, rash

Rapid defervescence with anti-rickettsial antibiotics

c/ R Premaratna, Ragama



Treatment

Doxycycline 200 mg stat dose in epidemic situations of LBT

200 mg x2 effective in MSF

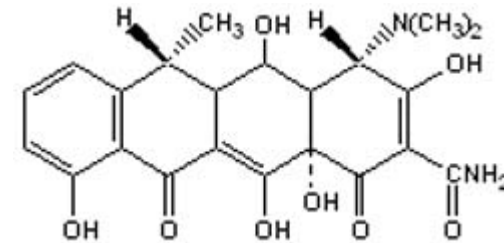
Otherwise at least 5 days for severe cases and in RMSF

Chloramphenicol 500 mg 6 hrly for 7 days an alternative

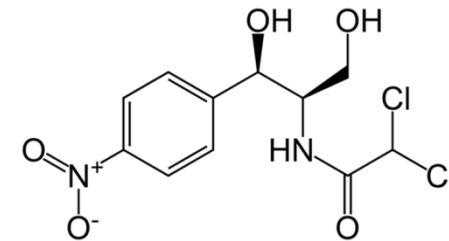
Ciprofloxacin may not perform as well in vivo as MICs suggest

Single dose azithromycin

Rifampicin in areas where TetR



Doxycycline



Chloramphenicol

Scrub typhus - Cochrane review

Data are limited because trials are small

There are no obvious differences between tetracycline, doxycycline, telithromycin, or azithromycin

Rifampicin may be better than tetracycline in areas where scrub typhus appears to respond poorly to standard anti-rickettsial drugs

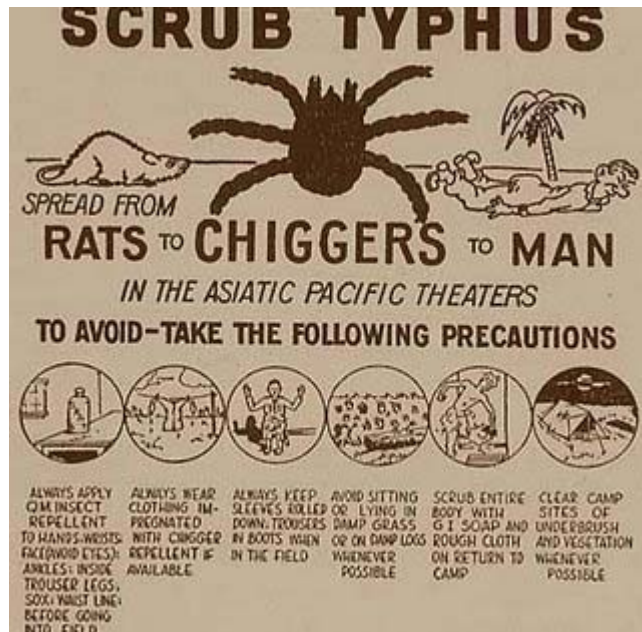
**Liu Q, Panpanich R. Antibiotics for treating scrub typhus.
Cochrane Database Syst Rev 2002, Issue 3: Art. No CD002150.
DOI: 10.1002/14651858.CD002150 (recertified 2010)**

Control measures

Avoid and promptly remove vectors

Wash victims and boil clothing

De-louse (DDT 10%, Permethrin 1%, Malathion 1%)



Summary - Diagnostic approach

- History
 - More history
 - Detail of geography, timing
 - Occupational and recreational exposures
 - Compliance with protection
 - Physical signs (rash, eschar etc)
 - Knowledge of prevailing infections
-
- Tests ordered and interpreted in light of
 - Pretest probability
 - Quality of tests

Don't forget

- Think malaria
- Exclude VHF
- Blood film – thrombocytopenia, eosinophilia
- Think about antimicrobial resistance
- If malaria is excluded, is empirical therapy indicated while awaiting results?
 - Doxycycline (leptospirosis, tick/scrub typhus)
 - Azithromycin or ceftriaxone (enteric fever)

Sources of information

- Textbooks etc
- NaTHNaC and CDC
- ProMED-Mail
- GeoSentinel
- Studies in military personnel



ProMed Mail www.promedmail.org/

Seroconversion for infectio x ProMED-mail x

← → ↺

www.promedmail.org/?p=2400:1000:


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09 Oct 2017 Undiagnosed disease, rice - India: (OR)

09 Oct 2017 Salmonellosis, st Dublin - USA (02): (WA) unpasteurized milk, comments

09 Oct 2017 West Nile virus - Europe (07): Portugal, equine, OIE

09 Oct 2017 MERS-CoV (63): Saudi Arabia (QS, TB), WHO

09 Oct 2017 Foot & mouth disease - Russia (14): (Bashkiria) serotype O, livestock, OIE

09 Oct 2017 Plague - Madagascar (15): fatal

09 Oct 2017 Anthrax - Namibia (02): (Bwabwata Natl Park) hippopotami

09 Oct 2017 Hepatitis A - USA (42): (CA, AZ)

09 Oct 2017 Vibrio vulnificus - USA (13): (FL)

09 Oct 2017 Zika virus (21): Americas, research, observations

09 Oct 2017 Monkeypox - Africa (07): Nigeria


09 Oct 2017 Plague - Madagascar (14): fatal





09 Oct 2017 Hepatitis A - USA (41): (MI)

09 Oct 2017 Undiagnosed die-off, fish - USA (05): shark, brain parasite susp

09 Oct 2017 Crimean-Congo hem. fever - Pakistan (17): (BA)

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Published Date: 2017-10-09 20:56:45

Subject: PRO/PL> Undiagnosed disease, rice - India: (OR)

Archive Number: 20171009.5369648

UNDIAGNOSED DISEASE, RICE - INDIA: (ODISHA)

A ProMED-mail post
<http://www.promedmail.org>
ProMED-mail is a program of the
International Society for Infectious Diseases
<http://www.isid.org>

Date: Sun 8 Oct 2017

Source: Odishatv [edited]
<http://odishatv.in/odisha/body-slider/cuttack-farmers-yield-hopes-ruined-as-unknown-disease-affects-crops-246840/>

Farmers in Cuttack district are in despair as their crops are affected by an unknown disease, posing a threat to a good yield available medicines on their paddy fields but it has failed to yield results. Hundreds of hectares of paddy are affected due

The district agriculture officer said that the department does not have any medicine for this disease. "Our village level was necessary measures to save the paddy after going through the report," he said.

National Travel Health Network and Centre (NaTHNaC)

The screenshot shows the TravelHealthPro website. At the top is a navigation bar with the NaTHNaC logo, links for 'ABOUT US', 'PRESS', and 'CONTACT US', and a search bar. Below this is a main menu with links: 'COUNTRY INFORMATION', 'LATEST NEWS', 'OUTBREAK SURVEILLANCE', 'DISEASES IN BRIEF', 'FACTSHEETS FROM A-Z', and 'WORLD OVERVIEW'. The 'TRAVEL HEALTH PRO' logo is on the left. A large box in the center contains the URL www.travelhealthpro.org.uk. To the right, a 'Factsheets' section dated '09 Oct 2017' features an image of keyboard keys with smiley, neutral, and frowny face icons, and a link to 'Navigating TravelHealthPro'. Below this is a 'Quick video guides' section. At the bottom left, there are two tabs: 'Featured news' (selected) and 'Latest disease outbreaks'. Social media icons for Twitter, Facebook, Google+, and YouTube are at the bottom right.

NaTHNaC ABOUT US | PRESS | CONTACT US SEARCH

TRAVEL HEALTH PRO

COUNTRY INFORMATION LATEST NEWS OUTBREAK SURVEILLANCE DISEASES IN BRIEF FACTSHEETS FROM A-Z WORLD OVERVIEW

www.travelhealthpro.org.uk

Featured news Latest disease outbreaks

Factsheets 09 Oct 2017
Navigating TravelHealthPro

Quick video guides to help you navigate the TravelHealthPro website

Read more

09 Oct 2017

**NEW RESOURCE ADDED:
NAVIGATING
TRAVELHEALTHPRO**



02 Oct 2017

**UPDATED GUIDELINES
FOR MALARIA
PREVENTION IN UK
TRAVELLERS COMING**

**Advice Line for
health professionals**

0845 602 6712 (local call rate)

Mornings

09 Oct 2017

NEW RESOURCE ADDED: NAVIGATING TRAVELHEALTHPRO



NaTHNaC have created new video guides to help you navigate the TravelHealthPro website

[Read more](#)



02 Oct 2017

BLOOD DONATION DEFERRAL DUE TO CHIKUNGUNYA OUTBREAK IN ITALY



02 Oct 2017

UPDATED GUIDELINES FOR MALARIA PREVENTION IN UK TRAVELLERS COMING SOON



Public Health England (PHE) Advisory Committee on Malaria Prevention (ACMP) will soon be publishing updated malaria guidelines

[Read more](#)



25 Sep 2017

MALARIA CASES IN EUROPE - SUMMER 2017



Information about malaria cases in Europe, Summer 2017, and advice on awareness and prevention

Advice Line for health professionals

0845 602 6712 (local call rate)

Mornings

- Mondays to Fridays 09:00 – 11:00

Afternoons

- Mondays and Fridays 13:00 – 14:00
- Tuesdays, Wednesdays and Thursdays 13:00 – 15:30

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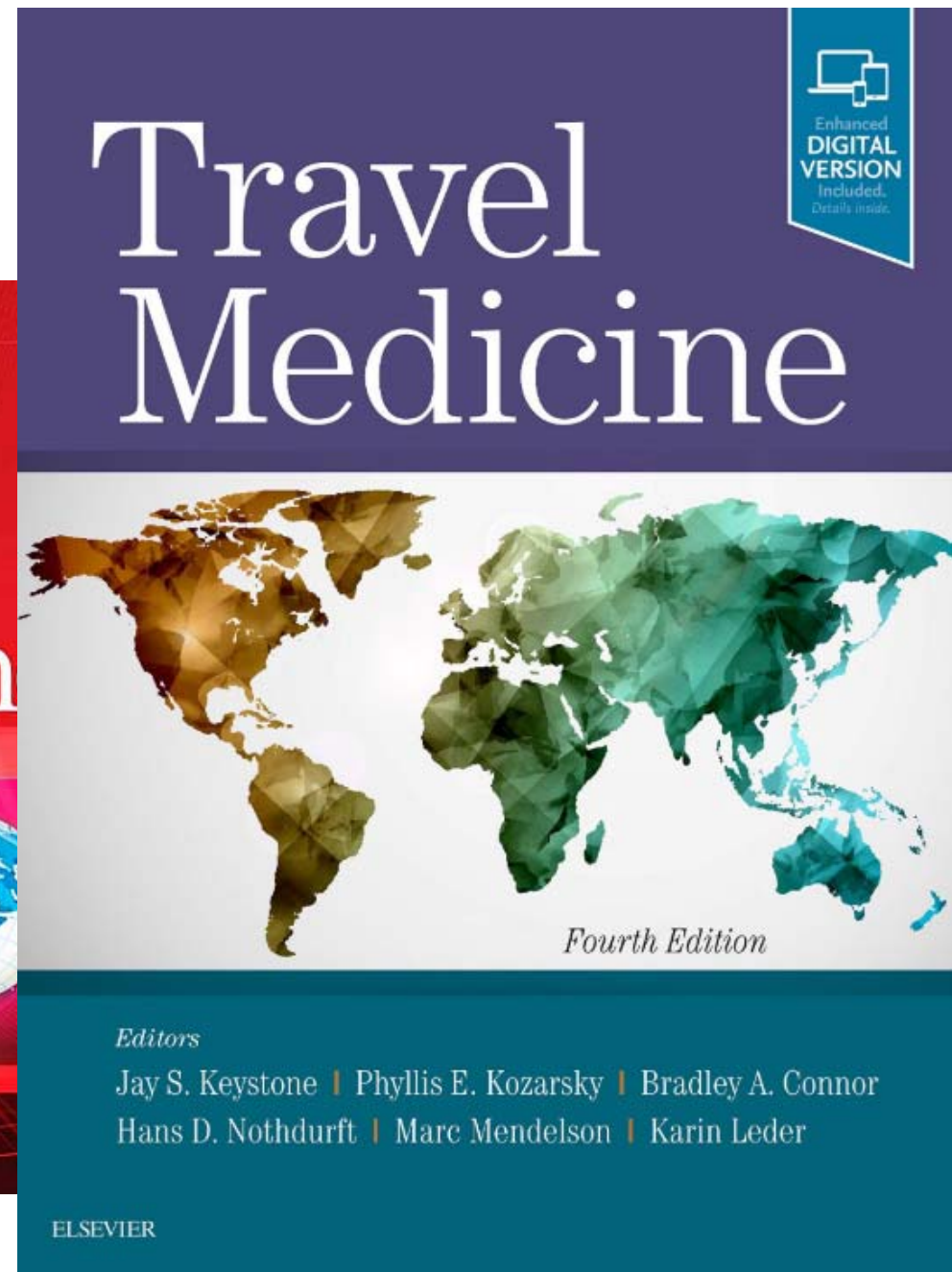
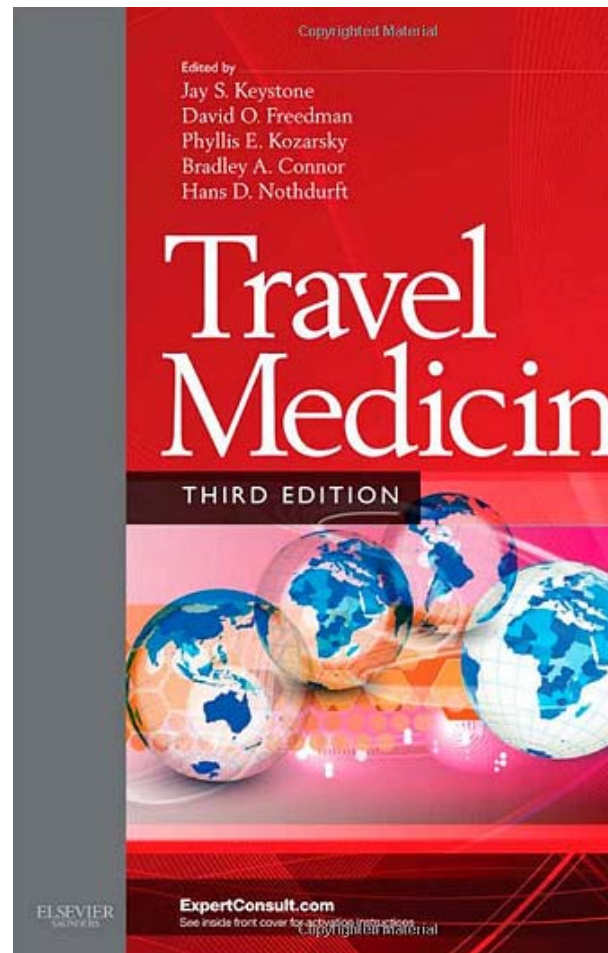
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Yellow Fever Vaccination Programme



Keystone JS et al
2012 Ed 4 2019



Shameless plugs

Tropical medicine

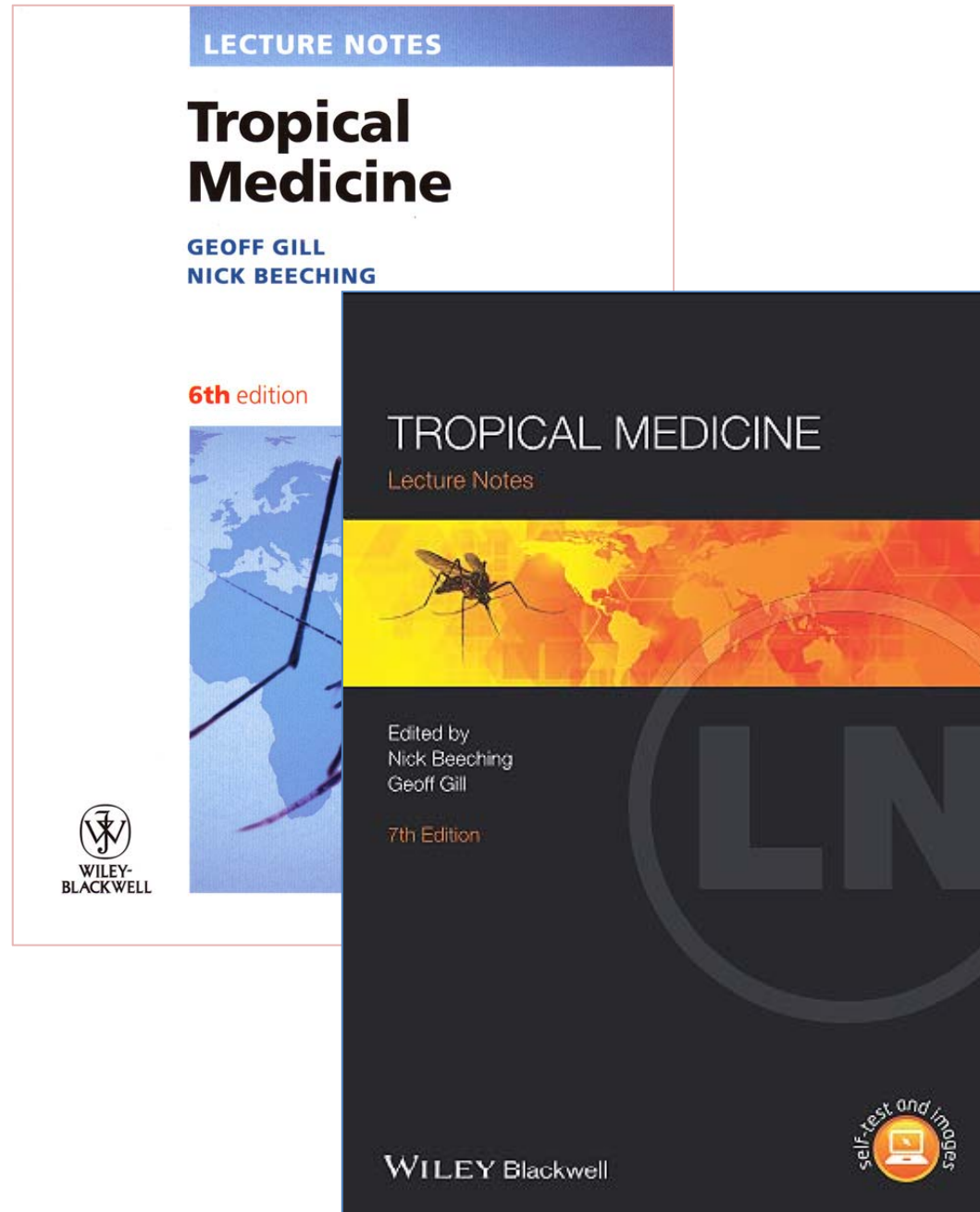
Your source of tropical knowledge

Written & edited by LSTM staff

6th 2009

7th 2014

8th 2020



Bugs, Bites and Parasites: Tropical Diseases Uncovered

- 6 one hour programmes
- Discovery Channel
- Late July 2013
- Repeating Often



GUIDE



Bugs, Bites & Parasites - Vliegenlarven



DiscoveryBenelux · 909 videos

Subscribe

4,687



TV programmes Discovery Channel

(Sky: 520 / Virgin: 250 / BT:322)

Thursday 6 July 2017

MOSQUITO Event day:

- 20:00 RIVER MONSTERS: Invisible Killers
with Jeremy Wade Series 8 Episode 6

<https://www.youtube.com/watch?v=JRL31aUBvoA>

- MOSQUITO (Feature documentary)
- 22:00 INFECTED ABROAD: MOSQUITO BITES

<https://www.youtube.com/watch?v=CvWjqBb9i2s>

Anthrax

British TV programme

“Who do you think you are?”

Summer 2018

Interview with Jonny Peacock, British
Olympic Paralympic athlete

<https://youtu.be/TIYN64cKBIM>