

This file is part of the following work:

Shaw, Marc (2009) *Health problems of travellers: an examination of GeoSentinel and expedition data*. Professional Doctorate (Research) Thesis, James Cook University.

Access to this file is available from:

Copyright © 2009 Marc Shaw

The author has certified to JCU that they have made a reasonable effort to gain permission and acknowledge the owners of any third party copyright material included in this document. If you believe that this is not the case, please email

researchonline@jcu.edu.au

JCU ePrints

This file is part of the following reference:

Shaw, Marc (2009) *Health problems of travellers: an examination of GeoSentinel and expedition data.*
Professional Doctorate (Research) thesis, James Cook University

Access to this file is available from:

<http://eprints.jcu.edu.au/5604>



Health problems of travellers:

An examination of GeoSentinel and expedition data

Marc T.M. SHAW: BMedSc, MB, ChB, FRGS,
DipTravMed, DipObst, DCH, FRNZCGP, FACTM,
FFTM ACTM, FFTM RCPSG

A thesis by portfolio of publications submitted in partial fulfilment of the requirements of the degree of Doctor of Public Health within the School of Public Health, Tropical Medicine and Rehabilitation Sciences, Faculty of Medicine, Health and Molecular Sciences, James Cook University, Townsville, Australia.

September 2009

STATEMENT OF ACCESS

I, the undersigned, author of this work, understand that James Cook University will make an extended abstract of this thesis available for the Australian Digital Theses network.

I understand that, as an unpublished work, a thesis has significant protection under the Copyright Act and;

I wish the following restrictions to be place on this work:

Reproduction of material in the Annexes is subject to copyright restrictions of the respective publishers of the journal articles.

30/11/2009

Signature

Date

STATEMENT OF SOURCES

DECLARATION

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Signature

1 September 2009

Date

STATEMENT OF THE CONTRIBUTION OF OTHERS

This is to certify that this thesis embodies original work undertaken by the candidate, except where the contribution of others has been acknowledged in the publications. None of the papers has been submitted in support of any other award of this or any other University or Institution.

Signature

1 September 2009

Date

DECLARATION ON ETHICS

The research presented and reported in this thesis was conducted within the guidelines for research ethics outlined in the *National Statement on Ethics Conduct in Research Involving Human* (1999), the *Joint NHMRC/AVCC Statement and Guidelines on Research Practice* (1997), the *James Cook University Policy on Experimentation Ethics. Standard Practices and Guidelines* (2001), and the *James Cook University Statement and Guidelines on Research Practice* (2001). The proposed research methodology received clearance from the James Cook University Human Research Ethics Committee (approval numbers H2193 and H2310).

Signature

1 September 2009

Date

Childhood memories recall the endeavours of famous travellers in time whose moments of great occasion were often wrecked by diseases encountered on deployment. Take Genghis Khan, whose most indirect, though by no means benign, gift to the 13th century was the plague. Originating in the jungles of southern China and Burma, bubonic plague travelled with Mongol armies and then from caravan to caravan till it reached the Crimea in 1347. From there it would take a third of all Europeans¹.

Take this example as one of the human spread of disease and extend it to global travel in the 21st century. It is so much easier now to spread disease as travel is quicker, easier and many more people are partaking in it. Short incubation periods indicate the potential to promulgate disease processes is so much greater, and indeed with more disastrous effect. In addition, as there are so many different communicable diseases, there is the very real risk of misdiagnosis with resultant dire consequences.

To focus energies on the prevention of traveller's diseases would be akin to guiding good health in a way that supports not just the traveller, but the region of travel as well. To spotlight certain dis-ease, and diseases, in order to give clear examples of the work that goes into preventing traveller-health unwellness became, for the author, a logical nidus for energy. The projected outcome of such a fixation would be a set of parameters within which safe travel is possible.

Whilst not wanting to stifle travel with such apparent 'rules', popular thinking in the speciality of travel medicine has it that 'guidelines for travel' contribute to safe and secure travel, and also to diseases' awareness with their resultant measures of prevention.

The stimulus to investigate illnesses that may affect travellers extended into those that may affect groups of people on collective journeys, and even those who were mounting expeditions to remote regions of the globe for venture or adventure. As it was not possible to be all encompassing with respect to the spectrum of travellers' health diseases, it was important to acquire primary sentinels upon which to base understanding of the disease processes and from them to make practical inference from the results.

This thesis thus centres on the general epidemiology of travel diseases and then seeks to investigate some focal aspects such as rabies immunisation, groups and expedition medicine, and incidental case studies to give clear example of the scope of this rather exciting field of medicine. From consideration of these examples, the development of policies on travel health management is a logical extension. Reviewing available data on outstanding issues such as: health of sportspeople at a major sporting event, vaccine preventable diseases and setting up a travel health clinic, is both exhilarating and intellectually challenging.

Enveloping all these aspects of travel medicine is personally energising and gives thought to clinical practice. It also gives energetic notice to want to pursue the field further in the future.

Methods

Methods of data collection and analysis were dependant upon the each of the three focus groups analysed. Firstly, those returning from their travels and who presented to travel health clinics in Auckland or Hamilton were assessed for illnesses acquired abroad. Secondly, those in the group targetted for either rabies pre-travel immunisation or port-travel rabies exposure were scoped in detail. Thirdly, the group that undertook remote travel by way of expeditions or premium travel tours were assessed for illnesses as they may have been obtained; viz, in the field. Some of these patients may have had a pre-travel consultation to anticipate overseas health issues from travel health professionals before they departed for overseas.

Global surveillance of emerging infections by way of a sentinel network enabled the collection of data for analysis of each of groups one and two, above. Being part of a expedition group, as the medical provider, guided the collection of information in group three. Group one was studied from 1997 until 2001. Group two from 1998 through until 2006. Finally, group three was studying from 2001 until 2004.

Recorded data for all patients presenting for travel-related illnesses, seen at the two sites in New Zealand, were extracted for analysis. Variables analysed included age, sex, pre-travel encounter, reason for travelling, patient classification (whether a New Zealander having returned from abroad, or a foreigner being assessed in New Zealand clinic) and a post-travel diagnosis. In addition, patients with a diagnosis of animal-related injury (mammal bites or scratches) were included for analysis as a separate disease focus within the greater spectrum of general global ill health following travel abroad.

Patients seeking care for rabies post-exposure prophylaxis were also included. Data was collected on the following: gender, country and world region where exposure occurred, age of subject exposed, animal related to the exposure, site of exposure on the body, the World Health Organization category of exposure to potential rabies, pre-exposure prophylaxis status, post-exposure immunoglobulin given, post-exposure vaccine given, type of post-exposure vaccination regime and whether it was an approved vaccine, and finally, the presence or absence of travel health insurance.

The third group for micro-focused study in this thesis involved those going to remote global regions. From the commencement of the Sir Peter Blake Expedition to Brazil and Venezuela in 2001, the author (as expedition physician) recorded all illnesses and injuries amongst the crew and also amongst the indigenous people encountered, whilst undertaking the expedition. Information recorded included age, sex, subjective and objective nature of the presenting illness, the assessment of the condition based on presenting information and the treatment employed. The outcome of each presentation was tracked and follow-up was continuously maintained wherever possible.

There continues to be a growing popularity of travellers wishing to go on premium tours or expeditions, and little is known or written on the illnesses and injuries that may occur whilst travelling. Studies on the injuries and illnesses of various group-travels to countries such as may be encountered on the Silk Route in Middle Asia, the Arctic Circle, and the Mongolian Gobi are presented. All seek to investigate the prevalence of health problems suffered by travellers on a premium, expedition or remote medicine

journey.

Results

Information on travel-related illnesses, when reported through a global reporting system, can be useful for the travel health adviser in identifying issues of current concern. Diarrhoeal disease was assessed as being the most common diagnosis of illness in the returning traveller, followed by animal bites, skin diseases and schistosomiasis. Other tropical diseases however, such as malaria, were uncommon diseases amongst returning travellers. GeoSentinel, a global surveillance network, makes a significant contribution to the assessing emerging and re-emerging infectious diseases through a network of individual sites in various countries including New Zealand. Such information can be used to help provide preventive advice for travellers as well as help in assessing illness in post-travel patients.

Animal-associated injuries are not uncommon among returned travellers presenting to GeoSentinel sites. The highest proportion of potential rabies-exposure injuries was recorded in travellers to Asia, mostly in regions which are endemic for rabies, and this had led to a requirement for Post Exposure Prophylaxis. There is an inadequacy in current practice for rabies-exposed injured travellers, who need to be adequately counselled about animal-associated injuries and rabies risk when visiting rabies-infected countries. Concern must be expressed for the small number of travellers who were immunised prior to their travel, of whom a quarter were bitten overseas and received initial post-exposure treatment consistent with the World Health Organization guidelines. The risk of rabies in children younger than 8 years, who are at particular risk for animal bites requires particular attention; especially as this group represented nearly twenty percent of cases in this study. It is thus important that travellers from New Zealand are made aware of the risks of developing rabies secondary to animal exposure in countries they travel to, and all travellers need to obtain adequate pre-travel health advice, on the

prevention of a disease that is virtually 100% fatal, from a qualified travellers' health source.

Intradermal rabies immunisation appears very effective when given according to the standard WHO protocol in a cohort of intending New Zealand travellers. Thus, intradermal rabies immunisation is highly recommended for those travelling to endemic areas for the risk of rabies, particularly where follow-up serology can be done before travel and where there are staff who are experienced in this form of immunisation administration.

Exploration and adventure travel are increasingly attractive to people of widely differing ages, experience, physical health and interests. Whilst there are significant health challenges to practitioners of expedition medicine, the aims remain to anticipate preventable medical problems, to maintain health throughout the expedition, to optimise achievement and enjoyment, whilst not stifling enthusiasm or ambition. The modern practice of expedition medicine is to minimise the risk of trauma and diseases by proper pre-travel planning involving risk assessment, preventive measures such as vaccinations, prophylactic drugs and medical equipment, knowledge of first aid, emergency and primary healthcare skills, communication skills, and an attitude of caring for both the anticipated team and the anticipated cultures of the expedition. This planning should cover all contingencies; from mild illnesses and disease to group health insurances, through to unforeseen events such as evacuating a seriously ill, injured or dead person.

The inclusion of an expedition physician on an expedition increased the independence of the travelling group on their journeying, yet decreased the reliance on local health services, a source which is often scarce or absent on more remote location expeditions.

Conclusions

Information changes quickly, and often dramatically. Anyone providing travel health information needs to be aware of the requirements of international travellers, for information on travel-related illnesses, when reported through a global reporting system,

can be useful for the travel health adviser in identifying geographical diseases of global concern. Whilst illnesses and injuries encountered by international travellers tended to centre on 'syndromic presentation' of diarrhoeal, respiratory or dermatological illness, the travel health professional needs to be knowledgeable on their presentation. In being so, the clinician is acting as a clinical sentinel for transmissible disease processes. Being part of such a sentinel group makes a global contribution to the surveillance of emerging and re-emerging infectious diseases through a network of individual sites in various countries including New Zealand. This information can be used to help provide preventive advice for travellers as well as help in assessing illness in post-travel patients. Such is the case with the disease of rabies. There is increased awareness in New Zealand to make travellers aware of the risks of developing rabies secondary to animal exposure in countries they travel to.

As there is no clear distinction between those who travel either as expedition team members or others who travel to 'wilderness' areas, there is considerable overlap between adventure travel and leisure travel. Exploration and adventure travel are increasingly attractive to people of widely differing ages, experience, physical health and interests and this tends to create new challenges to practitioners of expedition medicine although the aims remain to anticipate preventable medical problems, to maintain health throughout the expedition, to optimise achievement and enjoyment, but above all not to stifle enthusiasm or ambition of the journey!

Reference:

1. Howard Chua-Eoan. Genghis Khan. Time 1999. Available at: www.time.com/time/magazine/article/0,9171,993031-2,00.html
Accessed 31 Mar, 2009.

ACKNOWLEDGEMENTS

I wish to thank the Pro Vice Chancellor of the Faculty of Medicine, Health and Molecular Sciences, James Cook University, Professor Ian Wronski, for the opportunity to enrol and submit a thesis for the degree of Doctor of Public Health with the Faculty. I would like to thank my supervisor, Professor Peter A Leggat, Professor and Head of the School of Public Health, Tropical Medicine and Rehabilitation Sciences Faculty of Medicine, Health and Molecular Sciences, James Cook University, Townsville.

Peter has been a source of continuing motivation and inspiration to me as I have developed this thesis. His assurances and good counsel have been instrumental in guiding my work to its completion. I am forever thankful.

I would also wish to thank my wife, Lynne, and children Clare and Paul for their support. I just could not have completed such a huge mission without their support.

Acknowledgement is also given to the various agencies and organisations, which have helped to support this work, including James Cook University, the GeoSentinel Surveillance Network, and my Medical, Nursing and Business Colleagues at the Worldwise Travellers Health Centre, Auckland and Hamilton, New Zealand.

TABLE OF CONTENTS

Summary	(vi)
Acknowledgements	(xii)
Table of Contents	(xiii)
List of Tables	(xix)
List of Figures	(xx)
List of Abbreviations	(xxi)
Chapter 1: Introduction	1
1.1 Background	
1.2 Presentation of the research and the thesis	
1.3 Context	
1.4 References	
Chapter 2: Literature review	12
2.1 List of peer-reviewed and published papers presented in this chapter	
2.2 Background	
2.3 Health problems of returning travellers: GeoSentinel data from New Zealand	
2.4 Prevention of rabies in travellers from New Zealand to endemic rabies regions	
2.5 The medical preparation of expeditions	
2.6 Informing on preventative strategies	
2.7 Summary of findings	
2.8 References	
Chapter 3: Introduction to the Research	39
3.1 Objectives	
3.2 Setting for the research	
3.3 Permission, ethical approval and consent	
3.4 Limitations of the present research	

3.5 References

Chapter 4: Health problems of returning travellers: GeoSentinel Data from New Zealand 58

4.1 List of peer-reviewed and published papers presented in this chapter

4.2 Summary of findings

4.3 Key messages from this chapter

4.4 References

Chapter 5: Prevention of rabies in travellers from New Zealanders 67

5.1 List of peer-reviewed and published papers presented in this chapter

5.2 Summary of findings

5.3 Key messages from this chapter

5.4 References

Chapter 6: Expedition Health 74

6.1 List of peer-reviewed and published papers presented in this chapter

6.2 Summary of findings

6.3 Key messages from this chapter

6.4 References

Chapter 7: Informing on Preventative Strategies 85

7.1 List of peer-reviewed and published papers presented in this chapter

7.2 Summary of findings

7.3 Key messages from this chapter

7.4 References

Chapter 8: Summary and integration

97

8.1 Summary of the major findings and additions to the body of knowledge

8.2 Recommendations

Annexes

109

Annex 1. Papers presented in Chapter 2

109

Chapter

1. **Shaw M, Toovey S.** Ch. 3. Travel vaccine requirements and recommendations. In. Zuckerman JN. *Principles and Practice of Travel Medicine*. 2nd edn. Wiley. (in press)

Review

2. **Shaw MTM, Dallimore J.** The medical preparation of expeditions: the role of the Medical Officer. *Travel Medicine and Infectious Disease*. 2005; 3: 213–23.

Annex 2. Papers presented in Chapter 4

112

Reviews

1. **Shaw MTM, Leggat PA.** Deep Vein thrombosis after air travel. *The South African Journal of Continuing Medical Education*. 2005; 23: 130-132.

Research papers

2. **Shaw MTM, Leggat PA, Weld LH, Williams ML, Cetron MS.** Illness in returned travellers presenting at GeoSentinal sites in New Zealand. *Australian and New Zealand Journal of Public Health*. 2003; 27: 82-86.

3. Gautret P, Schwartz E, **Shaw M** et al. Animal associated injuries and related diseases among returned travellers: A review of the GeoSentinel Surveillance Network. *Vaccine*. 2007; 25: 2656-2663.
4. **Shaw MTM**, Leggat PA. A Case of exposure to Bancroftian Filariasis in a Traveler to Thailand". *Travel Medicine and Infectious Disease*. 2006; 4: 290-293.
5. **Shaw MTM**, Leggat PA, Huggard P. Bilateral calf (Tibial) deep venous thrombosis after air travel. *Travel Medicine and Infectious Disease*. 2003; 1: 193-196

Annex 3. Papers presented in Chapter 5

118

Research papers

1. **Shaw MTM**, Leggat PA, Williams ML. Intra-dermal Pre-exposure Rabies Immunisation in New Zealand. *Travel Medicine and Infectious Disease*. 2006; 4: 29-33.
2. Gautret P, **Shaw MTM**, Gazin P, et al. Rabies post-exposure prophylaxis in returned injured travellers from France, Australia, and New Zealand: A retrospective study. *Journal of Travel Medicine*. 2008; 15: 25-30.
3. **Shaw MTM**, O'Brien B, Leggat PA. Rabies post-exposure management of travellers presenting to travel health clinics in Auckland and Hamilton, New Zealand. *Journal of Travel Medicine*. 2009; 16: 13-17.

Annex 4. Papers presented in Chapter 6

122

Research papers

1. **Shaw MTM**, Leggat PA. Life and death on the Amazon: Illness and injury to travelers on a South American expedition. *Journal of Travel Medicine*. 2003; 10: 268-271.
2. **Shaw MTM**, Leggat PA. Illness and injury to travellers on a premium expedition to Iceland. *Travel Medicine and Infectious Disease*. 2008; 6: 148-151.

3. **Shaw MTM**, Leggat PA. Illness and injury to travellers on a premium expedition along the Asian Silk Route. *Travel Medicine and Infectious Disease*. 2008; 6: 292-295.
4. **Shaw MTM**, Leggat PA. Illness and injury to travellers and access to dental care on a research expedition to Mongolia. *Journal of Travel Medicine*. (in press)

Annex 4. Papers presented in Chapter 7

127

Reviews

1. Milne C, **Shaw M**, Steinweg J. Medical issues relating to the Sydney Olympic Games. *Sports Medicine*. 1999; 28: 287-298.
2. **Shaw M**, Leggat PA. Traveling to Australia for the Sydney 2000 Olympic and Paralympic Games. *Journal of Travel Medicine*. 2000; 7: 200-204.
3. Leggat PA, **Shaw MTM**. Editorial: From Sydney to Athens: Preparing for the Olympic and Paralympic Games. *Travel Medicine and Infectious Disease*. 2003; 1: 201-203.
4. Leggat PA, **Shaw MT**. Editorial: Travelling to the Commonwealth Games, Melbourne, Australia. *Travel Medicine and Infectious Disease*. 2006; 4: 1-3.
5. **Shaw MTM**, Leggat PA, Borwein S. Travelling to China for the Beijing 2008 Olympic and Paralympic Games. *Travel Medicine and Infectious Disease*. 2007; 5: 365-373.
6. Milne CJ, **Shaw MTM**. Travelling to China for the Beijing 2008 Olympic Games. *British Journal of Sports Medicine*. 2008; 42: 321-326.

Appendices	135
Appendix 1. Instructions for authors	135
1.1 Australian and New Zealand Journal of Public Health	
1.2 British Journal of Sports Medicine	
1.3 Journal of Travel Medicine	
1.4 South African Journal of Continuing Medical Education	
1.5 Sports Medicine	
1.6 Travel Medicine and Infectious Disease	
1.7 Vaccine	
Appendix 2. Ethics clearances	143
2.1 H2193-James Cook University Human Research Ethics Committee	
2.2 H2310-James Cook University Human Research Ethics Committee	
Appendix 3. GeoSentinel Version 2.6 Data Entry System Form	146
3 GeoSentinel Questionnaire	
Appendix 4. Photographs: ‘The Author and the work’	148
Appendix 5. Centres for Disease Control and Prevention Travel Medicine Websites - Olympics and Paralympics	149
5.1 Sydney 2000 CDC Olympics and Paralympics Website	
5.2 Beijing 2008 CDC Olympics and Paralympics Website	

LIST OF TABLES

Table 1.1.	Bibliographic data for chapters and papers presented in thesis	3
Table 4.1.	Potential risk factors for DVT/VTE.	61
Table 5.1	World Health Organization (WHO) categories of rabies exposure	70
Table 6.1	Adding Value, as a Medical Officer (MO) to an Expedition	78
Table 7.1	Hazards to Outback Visitors	90

LIST OF FIGURES

- | | | |
|-------------|---|----|
| Figure 2.1. | Incidence rate/month of health problems during a stay in developing countries | 14 |
| Figure 2.2. | Incidence rate of health problems per month during a stay in developing countries | 17 |

LIST OF ABBREVIATIONS

CDC	Centres for Disease Control and Prevention
DEET	Diethyl methyl toluamide
DVT	Deep Venous Thrombosis
EIA	Enzyme Immuno-Assay
ERIG	Equine Rabies immune globulin
GPs	General practitioners
HDCV	Human diploid cell vaccine
HRIG	Human Rabies immune globulin
ICT	Immunochromatographic test
ID	Intradermal
IM	Intramuscular
ISTM	International Society of Travel Medicine
LF	Lymphatic filariasis
MO	Medical officer
PCEC	Purified chick embryo cell
PCECV	Purified chick embryo cell vaccine
PEP	Post-exposure prophylaxis
RIG	Rabies immune globulin
SC	Subcutaneous
VTE	Venous Thromboembolism
WHO	World Health Organization
WTHC	Worldwise Travellers' Health Centres