

Travel – a risk factor for disease and spread of antibiotic resistance

Martin Angelin

Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i sal A5, byggnad 6A, Norrlands universitetssjukhus, fredagen den 27 november, kl. 09:00.

Avhandlingen kommer att försvaras på engelska.

Fakultetsopponent: Professor, Anu Kantele,
Department of Clinical Medicine, University of Helsinki, Finland.



**Department of Clinical Microbiology
Infectious Diseases**
Umeå University
Umeå 2015

Organization
Umeå University
Clinical Microbiology
Infectious Diseases

Document type
Doctoral thesis

Date of publication
6 November 2015

Author
Martin Angelin

Title
Travel – a risk factor for disease and spread of antibiotic resistance

Abstract

As international travel is rapidly increasing, more people are being exposed to potentially more antibiotic resistant bacteria, a changed infectious disease epidemiology, and an increased risk of accidents and crime. Research-based advice is needed to adequately inform travellers about these risks. We studied travellers who sought advice from the Travel Medicine Clinic at the Department of Infectious Diseases, Umeå University Hospital, as well as university students from Umeå, Stockholm, and Gothenburg travelling abroad for study, research, and clinical exchange programs.

From retrospective data at the Travel Medicine Clinic, we found that pre-existing health problems were rare among travellers from Umeå seeking pre-travel health advice and vaccinations. In addition, we found that the travel destination and the sex of the traveller affected vaccination levels. Although hepatitis A is endemic to both Thailand and Turkey, compared to travellers to Thailand few travellers to Turkey visited the clinic for hepatitis A vaccination. The data also revealed that more women than men were vaccinated against Japanese encephalitis despite comparable trips.

A prospective survey study showed that travellers felt that the pre-travel health advice they received was helpful. Two-thirds of the travellers followed the advice given although they still fell ill to the same extent as those who were not compliant with the advice. Factors outside the control of travellers likely affect the travel-related morbidity. Compared to older travellers, younger travellers were less compliant with advice, fell ill to a greater extent, and took greater risks during travel.

In a prospective survey study, we found that healthcare students had higher illness rates and risk exposure when abroad compared to students from other disciplines. This difference was mainly due to the fact that healthcare students more often travelled to developing regions during their study period abroad. When abroad, half of all students increased their alcohol consumption and this was linked to an increased risk of theft and higher likelihood of meeting a new sex partner.

The healthcare students participating in the survey study also submitted stool samples before and after travel. These samples were tested for the presence of antibiotic resistance, both by selective culturing for ESBL-PE (Extended-Spectrum Beta-Lactamase Producing *Enterobacteriaceae*) as well as by metagenomic sequencing. About one-third (35%) of the students became colonised by ESBL-PE following their study abroad. The strongest risk factor for colonisation was travel destination; for example, 70% of students who had travelled to India became colonised. Antibiotic treatment during travel was also a significant risk factor for colonisation.

The stool samples from a subset of study subjects were analysed using metagenomic sequencing. From this we learned that although the majority of resistance genes in the gut microbiome remained unchanged following travel, several clinically important resistance genes increased, most prominently genes encoding resistance to sulphonamide, trimethoprim, and beta-lactams. Overall, taxonomic changes associated with travel were small but the proportion of Proteobacteria, which includes several clinically important bacteria (e.g., *Enterobacteriaceae*), increased in a majority of the study subjects.

Clearly, there are risks associated with international travel and these risks include outside factors as well as the personal behaviour of travellers. We believe our results can be used to develop better pre-travel advice for tourists as well as university students studying abroad resulting in safer travel.

Language
English

ISBN
978-91-7601-348-9

ISSN
0346-6612

Number of pages
66 + 5 papers