

FC1 All About Malaria

FC1.1

Malaria Knowledge and Use of Malaria Prevention in the UK Population and in UK Passengers Departing to Malaria Endemic Areas

R.H. Behrens¹, N. Alexander²

¹London School of Hygiene and Tropical Medicine, Department of Clinical Research, London, United Kingdom, ²London School of Hygiene and Tropical Medicine, Department of Infectious Disease Epidemiology, London, United Kingdom

Background: The impact of previous and current travel on knowledge and use of preventative measures is unknown, as is malaria knowledge in the general population. The study was designed to compare and identify the differences in malaria knowledge and practices of departing passengers and those held by a representative sample of the general UK population and factors that might improve knowledge.

Methods: Adults' knowledge of malaria, and utilisation of anti-malarials was assessed using a single questionnaire in 1) a representative random sample of British adults in a survey whose sampling was designed and executed by MORI and 2) in passengers in departure areas of Heathrow airport bound for malaria endemic areas, undertaken by the Civil Aviation authority (CAA).

Results: A total of 1991 adults were interviewed in the MORI survey of whom 548 (27%) had previously visited a malaria endemic country.

Of the 500 departing passengers, 42% had destination in West Africa and 40% S.E Asia; 80% travelled for leisure of which 61% were travelling to visit friends and relatives. 51% were Caucasian and 39% were black African. 60% declared taking chemoprophylaxis for their journey the lowest compliance seen in Nigerians (48%) and highest by Ghanians' (81%). A knowledge score (max 100) was calculated based on respondents' understanding of transmission, symptoms, seriousness and curability of malaria. In the MORI survey the mean knowledge score, by use of chemoprophylaxis was very similar (62 v 65) and lower than the CAA survey (72 v 70). A second score summarized the source and quality of travel advice received. Surprisingly the source of advice was not associated with improved passengers' malaria knowledge (quality source 70 v poor source 73) or MORI (64 v 62). We will present adjusted analyses.

Conclusion: Comparing departing passengers and the general population by both experience of travel and source of professional advice there was little difference in knowledge of malaria and its transmission. Level of knowledge on malaria and its prevention was generally high. The data suggest that professional advice adds little to existing knowledge of travellers. Use of chemoprophylaxis in departing passengers was variable and Nigerian travellers had lowest utilisation whilst Ghanians are compliant to chemoprophylaxis regimes.

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FC1.2

Eye Disorders Reported with the Use of Mefloquine Chemoprophylaxis - a Drug Safety Database Analysis

M. Adamcova¹, M.T. Schaerer¹, I. Bercaru¹, I. Cockburn¹, H.-G. Rhein¹, P. Schlagenhauf²
¹F. Hoffmann-La Roche, Basel, Switzerland, ²University of Zürich, Centre for Travel Medicine, Zürich, Switzerland

Background: There are few data on eye disorders associated with the use of mefloquine chemoprophylaxis.

Objectives: Characterization of the risk and nature of eye disorders occurring during the use of malaria chemoprophylaxis is relevant information needed for travel medicine advisors. To provide this information, a drug safety data base analysis on eye disorder adverse events reported for mefloquine (as Lariam®) was performed and in parallel, an extensive literature search on this topic was conducted.

Methods: All spontaneous reports of adverse events concerning mefloquine chemoprophylaxis (as Lariam®) and all serious adverse events from clinical trials are entered into the F. Hoffmann-La Roche global drug safety database. A multi-axial, cumulative search under MedDRA version 14.0 for the period February 1984- January 18th, 2011 was carried out using the System Organ Class (SOC): Eye disorder. The analysis focused on 3 categories of eye disorders (category 1: visual acuity; category 2: anatomical parts of the eye and category 3: neuro-ophthalmic events. These three main categories were subdivided into a total of 11 groups. Reports were evaluated for risk factors such as relevant medical history, co-medication and associated conditions. The temporal relationship to the use of mefloquine chemoprophylaxis was ascertained where possible

Results: The manufacturer's drug safety database search identified a total of 591 cases with 695 events assigned to the "eye disorder" SOC in individuals exposed to mefloquine chemoprophylaxis. The cases were reported mainly in women (55.8 %) and 82.4% were adult users. In total, 92.9% of these events were reported spontaneously, mainly by health professionals (51.5%) and regulatory authorities (24%), and from consumers (14.5%). Other sources of case reporting included studies (7.0%).

The highest number of events (n=493) was in Category 1 (focused on visual acuity), followed by Category 3 neuro-ophthalmic events (n=124).

Conclusions: Prescribers of mefloquine and other anti-malarials should inform travellers regarding potential ocular side effects. Users of chemoprophylaxis who experience visual disorders should be referred to a physician.

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FC1.3

Acute Malaria Infections despite a Complete or Abbreviated Chemoprophylactic Regimen of Atovaquone-Proguanil

P.M. Arguin¹, K.A. Cullen¹

¹Centers for Disease Control and Prevention, Center for Global Health, Atlanta, United States

Background: Atovaquone proguanil (AP) is a widely recommended and used chemoprophylactic regimen for the prevention of malaria among travelers. The standard course starts the day before travel, daily while in the endemic area, and for 7 days after leaving. Deye, *et al.* reported results from a randomized controlled clinical trial in which malaria infections were prevented among 6/6 persons who received a single dose of AP the day before exposure; suggesting that abbreviated chemoprophylaxis regimens might be possible. Subsequently, Leshem, *et al.* reported that 0/371 patients who stopped taking AP 1 day after exiting a malaria-endemic area developed malaria. Additionally, their malaria surveillance data for 2005-2007 showed no malaria cases who reported using AP for malaria chemoprophylaxis.

Objective: Describe malaria cases that occurred among persons who used complete or abbreviated courses of AP.

Methods: Cases of malaria reported to the United States' National Malaria Surveillance System from 2006-2010 were reviewed. Cases were selected if a full or partial course of AP for malaria chemoprophylaxis was reported. Cases were summarized using descriptive statistics.

Results: 129 malaria cases were identified for whom it was reported that a complete or partial course of AP was used for prevention. Based on the dates of travel and onset of symptom as well as the species of malaria, 38 cases were characterized as relapses of *Plasmodium vivax* or *P. ovale*, which would not be expected to have been prevented by primary chemoprophylaxis. 62 cases were acute malaria infections and 29 cases could not be characterized based on the available data. The 62 cases included persons who reported missing no doses, missing doses while in the endemic area, and stopping before completing 7 daily doses after leaving the endemic area.

Conclusion: Despite the optimism surrounding the potential alternative dosing strategies for AP, these data demonstrate that acute cases of malaria can occur after complete or abbreviated courses of AP. While the results of the earlier small studies appear promising, there is still insufficient data to recommend changes to preventive guidelines. Larger trials are needed to demonstrate the effectiveness of alternative regimens and better characterize how AP should be used.

FC1.4

How Did Travellers Use during their Trip Rapid Diagnostic Test for Malaria Provided by a Travel-clinic?

D. Berthod^{1,2}, J. Rochat¹, R. Voumard¹, B. Genton^{1,2,3}, V. D'Acremont^{1,3,4}

¹Travel Clinic, Department of Ambulatory Care and Community Medicine, University Hospital, Lausanne, Switzerland, ²Division of Infectious Diseases, University Hospital, Lausanne, Switzerland, ³Swiss Tropical and Public Health Institute, Basel, Switzerland, ⁴Global Malaria Program, World Health Organisation, Geneva, Switzerland

Background: Highly performing and easy to use Rapid Diagnostic Tests (RDT) for malaria are available. Several studies have now shown that community workers with no medical background are able to perform RDT reliably. RDTs could thus be provided to travellers for self-diagnosis (or by a health worker on site) during their trip to an endemic country.

Objective: to assess how travellers used during their trip RDTs for malaria provided with training and written instructions during a pre-travel consultation

Methods: During the consultation, provision of malaria RDTs was proposed to certain pre-defined categories of travellers. Their ability to perform the test on themselves in presence of the health provider was assessed. If this dry run was done correctly, they were given the written procedure on how to perform the test and act upon its result, and proposed to buy a kit including 2 RDTs and related material. Travellers were then contacted after their return to know if and how they had used the tests.

Results: 80 travellers have been recruited since February 2012 so far. The 28 travellers who already returned (preliminary results) were provided RDTs because of travel to remote places (14), health care profession (9), humanitarian work (5), long-term travelling (> 3months) (3), refusing prophylaxis although recommended (1), other (pregnancy) (2). 21 were travelling to a low (stand-by treatment recommended) and 7 to a high risk area (prophylaxis recommended). 2/28 used one RDT, one during and one after coming back to Switzerland, because of occurrence of fever. Both test results were negative. One traveller consulted a health center afterwards because of persisting fever, diarrhea and vomiting and received antibiotics. Both found the test easy to use. None of them repeated the test after 24h because fever had stopped and because of alternate diagnosis. 25/28 travellers would take again RDTs for a next similar trip because they found it reassuring, especially when travelling with children. 3 would not because they found that health infrastructures were good enough on site. None of the 26 travellers who did not use the RDTs got sick during travel.

Conclusion: Travellers provided with malaria RDTs used them according to the oral and written instructions given during the pre-travel consultation. Carrying RDTs made them feel more secure, especially when travelling with children, and has the advantage to avoid overdiagnosis and inappropriate treatment for malaria on site.

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FC1.5

Artemether-Lumefantrine Compared to Atovaquone-Proguanil as a Treatment for *Plasmodium falciparum* Malaria in Travelers

S. Grynberg¹, E. Kopel¹, T. Lachish², E. Schwartz¹

¹Sheba Medical Center, The Center for Geographic Medicine and Tropical Diseases, Tel-Aviv, Israel, ²Shaare-Zedek Medical Center, The Infectious Diseases Unit, Jerusalem, Israel

Background: *Plasmodium falciparum* is the major cause of severe malaria and its treatment is complicated by the emergence of resistant strains. In the last decade two new drugs have become available for treating *P.falciparum* malaria in Western countries, atovaquone - proguanil (AP) and artemether - lumefantrine (AL). Both drugs are considered to be safe and effective and indicated for uncomplicated *falciparum* malaria, but to date, no study has been conducted comparing the effectiveness of these two drugs. In this study we compared the effectiveness of these drugs in non-immune Israeli travelers infected by *P. falciparum* malaria.

Methods: A retrospective analysis comparing the outcome of patients treated with AP vs. AL in our center. Included were patients with *P. falciparum* who were treated by either AL or AP as a single drug, during the years 2001 to 2012. Exclusion criteria - Patients with severe malaria that received IV medication, immigrants from malaria endemic countries and patients who did not receive their treatment in Israel.

The major end-points were treatment failure (recrudescence) and fever clearance time.

Results: In total, 63 patients were included, 45 in the AP group and 18 in the AL group. 59 of the patients acquired the disease in Africa (93% in AP vs. 94% in AL group). Almost all were males (93%). The patients mean age was 43 years (42 in the AP and 47 in the AL).

Outcome: Treatment failure was observed in 6 of the 45 (13%) of the AP group, 5 cases were from West Africa (17% from the West Africa infection in the AP group). No treatment failures were recorded in the AL group. Furthermore, the average fever clearance time was significantly lower in the AL group compared to the AP group, 46 ± 20.0 vs. 81.2 ± 27.1 hours ($P < 0.001$).

Conclusion: Our results showed that AL is more effective than AP in treating *P.falciparum* in a traveler population. The high failure rate of AP treatment (especially in West Africa) is alarming. AL should probably be the drug of choice for treating this population.

FC1.6

Safety of Antimalarials in the Treatment of Severe Imported Malaria - a Single-Centre Retrospective Study

T. Rolling^{1,2}, D. Wichmann³, S. Schmiedel¹, G.D. Burchard^{1,2}, S. Kluge³, J.P. Cramer^{1,2}

¹University Medical Center Hamburg-Eppendorf (UKE), I. Department of Internal Medicine, Section Tropical Medicine, Hamburg, Germany, ²Bernhard Nocht Institute for Tropical Medicine, Section Clinical Research, Hamburg, Germany, ³University Medical Center Hamburg-Eppendorf (UKE), Department of Intensive Care, Hamburg, Germany

Background: Artesunate is the first-line treatment for severe imported malaria due to its superior efficacy. Data on adverse events, however, are scarce. Recently, delayed haemolysis has been reported in hyperparasitaemic travellers treated with parenteral artesunate. It is not known whether this complication occurs after treatment with quinine as well. The aim of this retrospective study was to comparatively assess adverse events after treatment with either quinine or artesunate for severe imported malaria - focussing on delayed haemolysis.

Methods: All adult patients treated for severe *P. falciparum* malaria in the University Medical Center Hamburg-Eppendorf between 2006 and 2012 were included. The outcome measure was the proportion of patients with adverse events during antimalarial medication. To specifically detect delayed haemolysis, a case definition of a decrease in median haemoglobin in combination with a rise in median LDH between weeks 2 (days 7 to 13) and 3 (days 14 to 20) was selected.

Results: We included 36 patients in our analysis; 31 (86%) received quinine and 5 (14%) artesunate, 5 patients in the quinine group had received intrarectal artesunate as an adjunct treatment. Data necessary to assess delayed haemolysis were available in 16 patients (12 in the quinine group and 4 in the artesunate group). A total of five cases with delayed haemolysis could be detected - two in patients treated with quinine and three in patients treated with artesunate. Noteworthy, both patients with haemolysis in the quinine group had received additional intrarectal artesunate. In patients treated with quinine, common adverse events observed were hypoglycaemia in 10 patients (32%), hearing disturbances in 12 (37%), deterioration in renal function in 8 (25%) and cardiotoxicity in 3 patients (14%).

Conclusion: Clinically relevant delayed haemolysis seems to be an adverse event associated with the use of intravenous artesunate but not with the use of quinine alone. Apart from haemolysis, quinine has a comparatively unfavourable safety profile compared to artesunate. Regular haematological surveillance after treatment with parenteral artesunate should be mandatory.

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FC2 Special Needs (Mental Health and Immunosuppression)

FC2.1

Mental Health and Study Abroad: Incidence and Mitigation Strategies

R.L. Quigley¹, R. Copeland¹

¹*International SOS Assistance, Inc., Medical Assistance, Trevoze, United States*

Background: The transition from high school to college/university is associated with a variety of developmental challenges which can impact student mental health. Students traveling and studying overseas in a foreign environment with different cultures and customs can only serve to heighten this impact.

Objective: In this report we quantify the incidence of study abroad student repatriations, qualify the common underlying clinical (behavioral) diagnoses, and propose mitigation strategies for students and institutions alike.

Methods: Between 01/01/2010 and 01/01/2012 we compared the repatriation rate of students to that seen with American corporate business travelers/expatriates. Using the coding system of the International Classification of Diseases (ICD-9) we identified the closing behavioral diagnosis of each student repatriation.

Results: The incidence of student repatriation for behavioral health events was 23 times higher than that documented for American corporate business travelers/expatriates. The clinical diagnosis in >80% of the student cases was either a personality disorder or intellectual disability with contributing psychosocial/environmental factors. Major mental/learning disorders and substance abuse accounted for < 20%.

Conclusion: The success of study abroad is predicated on a preemptive, transparent, supportive and confidential environment (at home and abroad) established by the institution in the spirit of scholastic duty of care. Incorporation of e-learning tools as a component of the mandatory pre-trip health evaluation/education can further limit exposure for all. Although this study is limited to American students traveling overseas, behavioral health is an issue with students globally. Any institution, around the world, hosting foreign students should therefore reevaluate their existing domestic resources to accommodate the psychological needs of their visiting students.

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FC2.2

Japanese Encephalitis Vaccine Administration Practices among U.S. Travel Medicine Practices in Global TravEpiNet

R.C. LaRocque¹, B.R. Desphande², S.R. Rao^{3,4}, G.W. Brunette⁵, M.D. Gershman⁵, E.S. Jentes⁵, S.L. Hills⁶, M. Fisher⁶, E.T. Ryan¹, Global TravEpiNet Consortium

¹Massachusetts General Hospital, Division of Infectious Diseases, Boston, United States,

²Tufts University, Medford, United States, ³University of Massachusetts Medical School, Department of Quantitative Health Sciences, Worcester, United States, ⁴Bedford VA Medical Center, Center for Health Quality, Outcomes, and Economics Research, Bedford, United States, ⁵Centers for Disease Control and Prevention, Division of Global Migration and Quarantine, National Center for Emerging and Zoonotic Infectious Diseases, Atlanta, United States, ⁶Centers for Disease Control and Prevention, Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, Fort Collins, United States

Background: There are limited data on the use of Japanese encephalitis (JE) vaccine in travelers to Asia.

Objective: To characterize the demographics, destinations, and health care of travelers to JE-endemic regions, and to identify areas in which the pre-travel care of this population could be improved.

Methods: Global TravEpiNet (GTEN) is a consortium of 25 U.S. practices that provide pre-travel health care. We analyzed data on GTEN travelers aged ≥ 17 years who were: 1) traveling to JE-endemic countries for ≥ 30 days during peak transmission season (higher JE risk travelers) or 2) traveling outside the transmission season, visiting only urban areas, or traveling < 30 days (lower JE risk travelers). All travelers were seen from September 2009 - August 2012, when the JE vaccine IXIARO was in use. We performed multivariable logistic regression analyses to examine the effect of variables on the likelihood of a clinician not offering the JE vaccine to a traveler.

Results: We included 671 higher JE risk travelers and 7,587 lower JE risk travelers. Compared with lower JE risk travelers, higher JE risk travelers were younger (median age 29 vs. 40 years, $p < 0.001$) and were more likely to be traveling to visit friends and relatives (VFR) (16% vs. 9%, $p = 0.002$), for humanitarian service work (12% vs. 7%, $p = 0.003$), or for research/education (13% vs. 5%, $p < 0.001$). Only 187 (28%) higher JE risk travelers received a JE vaccine or were previously vaccinated against JE. For 272 (41%) higher JE risk travelers, the clinician noted that the vaccine was not indicated. In multivariable analysis, being a VFR traveler and traveling to India were independent predictors of the clinician indicating that the JE vaccine was not indicated for higher JE risk travelers.

Conclusions: GTEN clinicians frequently did not offer JE vaccine to higher JE risk travelers and were particularly likely to not vaccinate VFR travelers and travelers to India. The rationale behind these clinical decisions is unknown, but these practices are discordant with current recommendations of the U.S. Advisory Committee on Immunization Practices. An enhanced understanding of clinical decision-making around JE vaccine in U.S. travel medicine practices is needed.

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FC2.3

The Traveling-Travel Clinic: Improving Access for Visiting Friends and Relative Travelers, Hajj Clinic Pilot Project

G. Carlson¹, B. Thielen¹, J. Alpern¹, T. Waldron^{1,2}, C. Bowron¹, W. Stauffer^{1,2}

¹University of Minnesota Medical School, Minneapolis, United States, ²HealthPartners Tropical & Travel Medicine Center, St. Paul, United States

Background: Visiting friends and relative (VFR) travelers seeking pre-travel services face challenges including accessibility, financial, language and cultural barriers - creating a “disenfranchised traveler”. The “traveling-travel clinic” concept is an innovative model bringing culturally competent and affordable travel services to the community. Hajj travelers from the Twin Cities East African community were chosen to pilot this model. Unlike traditional travelers, the American Hajj traveler tends to be more socioeconomically diverse, older with more comorbidities and limited English proficiency.

Objective: To increase awareness of and access to culturally competent and affordable pre-travel services for VFR travelers using a unique pilot clinic model.

Method: Volunteer health care professionals, medical trainees, and travel clinic staff organized the clinics. To overcome barriers identified by community leaders, clinics were held in a predominantly East African neighborhood, with trained interpreters, at a reduced clinic rate, and Ramadan friendly walk-in appointments. Each appointment included an interactive group education session and an individual consultation. Before and after travel, patients were surveyed regarding their knowledge, attitudes and practices (KAP) about travel health and their health during travel.

Results: Despite heavy community engagement, only 19 patients attended three Hajj clinics. The majority lived within two miles of the clinic and were referred by travel agents. Separating the general education and individualized visit created a more productive model. Anticipated challenges of providing offsite care included scheduling, vaccine storage, providing culturally competent interpreters, and providing affordable care. Unanticipated challenges included gaining community trust, medical billing at an off-site address, aligning scheduling needs, timing the clinics to meet visa and Ramadan demands.

Conclusions: Albeit challenging, the “traveling-travel clinic” is an achievable and innovative model for increasing access to travel medicine services for disenfranchised populations. Areas for improvement include: partnerships with travel agents, fostering trust amongst the community, and providing affordable care. Our experience can inform further investigation on extending travel services to disenfranchised populations such as VFR's who frequently suffer the greatest travel-related morbidity.

FC2.4

Immune Response to Combined Hepatitis A and B Vaccine in HIV-Infected Children or Children on Immunosuppressive Medication in Juvenile Idiopathic Arthritis in Contrast to Healthy Children: A Substantial Proportion Not Immune for Hepatitis A after First Vaccination

S.-M. Belderok^{1,2}, G. Sonder^{1,2,3}, M. van Rossum^{4,5}, A. van Dijk-Hummelman⁶, N. Hartwig⁷, H. Scherpbier⁴, S. Geelen⁸, A. Speksnijder⁹, G. Baaten¹⁰, A. van den Hoek^{1,2}

¹Public Health Service (GGD), Infectious Diseases, Amsterdam, Netherlands, ²Academic Medical Center, Internal Medicine, Division of Infectious Diseases, Tropical Medicine and AIDS, Amsterdam, Netherlands, ³National Coordination Centre for Traveller's Health Advice (LCR), Amsterdam, Netherlands, ⁴Emma Children's Hospital, Academic Medical Centre, Pediatric Immunology, Haematology and Infectious Diseases, Amsterdam, Netherlands, ⁵Reade Location Jan van Breemen, Rheumatology, Amsterdam, Netherlands, ⁶Sophia Children's Hospital, Erasmus Medical Centre, Rheumatology, Rotterdam, Netherlands, ⁷Sophia Children's Hospital, Erasmus Medical Centre, Immunology and Infectious Diseases, Rotterdam, Netherlands, ⁸Wilhelmina Children's Hospital, University Medical Centre, Immunology, Infectious Diseases and Rheumatology, Utrecht, Netherlands, ⁹Public Health Service (GGD), Medical Microbiology Laboratory, Amsterdam, Netherlands, ¹⁰General Practitioner Trainee, Academic Medical Centre, Amsterdam, Netherlands

Objective: We conducted a phase IV interventional study with a combined hepatitis A and B vaccine in HIV-infected children and children using immunosuppressive medication for treatment of juvenile idiopathic arthritis (JIA) to evaluate their immune response.

Methods: Children in both study groups (1 up to 16 years of age) received the combined (inactivated) hepatitis A and hepatitis B vaccine Ambirix® at month 0 and 6. Serum samples were taken four times and tested for anti-HAV and anti-HBs antibodies. An anti-HAV titer ≥ 20 mIU/mL or an anti-HBs titer ≥ 10 mIU/mL were considered protective. Seropositivity percentages were calculated, and Geometric Mean Titers (GMT's) were compared by using a non-parametric Mann-Whitney U-test or Kruskal-Wallis one-way analysis of variance.

Results: 80 HIV-infected children completed the study, of whom 67 were HAV-susceptible and 68 HBV-susceptible. 79 JIA- children completed the study, of whom 65 HAV-susceptible and 73 HBV-susceptible. The immune response to hepatitis A after the first vaccination in both study groups was low: 71% and 55% respectively responded, whereas after second vaccination the immune response was 99% and 100% respectively. The immune response to hepatitis B after the first vaccination was also low in both study groups: 27% and 17% respectively responded; however, after the second vaccination the immune response was 97% and 93% respectively. A larger proportion of children on c-ART and of children with a viral load < 50 copies/mL were responders to hepatitis B, and also showed a significantly higher GMT.

Conclusions: The immune response after a full series of combined hepatitis A and B vaccine in both study groups is excellent and comparable to healthy children. A substantial proportion of both study groups are not protected for hepatitis A after the first vaccination. Especially in travel health and post exposure prophylactic treatment for hepatitis A this has implications: HIV-infected children and children on immunosuppressive medication for JIA should be serologically tested for anti-HAV prior to travel to ensure protection if there is no time to await the second vaccination. Children who cannot be protected before travel, and those who need post exposure prophylactic treatment for hepatitis A, should receive immunoglobulines.

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FC2.5

International Travel Patterns and Travel Risks of Stem Cell Transplant Recipients

T. Mikati¹, K. Griffin², M. Matasar³, M.B. Terry⁴, D. Lane⁵, M. Shah¹

¹Memorial Sloan-Kettering Cancer Center, Weill-Cornell Medical College, Infectious Disease Service, Department of Medicine, New York, United States, ²Department of Public Health, Weill-Cornell Medical College, New York, United States, ³Lymphoma and Adult BMT Services, Department of Medicine, Memorial Sloan-Kettering Cancer Center, Weill-Cornell Medical College, New York, United States, ⁴Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, United States, ⁵Weill-Cornell Medical College, New York, United States

Background: Immunocompromised international travelers are at a higher risk of travel related illnesses. Stem cell transplantation (SCT) is increasingly utilized for multiple medical illnesses. Stem cell transplant recipients (SCTR) are typically immunocompromised during the first two years post SCT. There is limited knowledge about international travel patterns and travel related illnesses of SCTR.

Objectives: Primary aims of this study were to calculate the incidence of early international travel post SCT and the incidence of travel-related illnesses. Variables associated with each of the primary outcomes were identified. A secondary aim of this study was to profile the travelers with respect to their pre-travel health preparations.

Methods: A mailed survey was conducted among 979 SCTR at MSKCC who received SCT between January 1, 2005 and Dec 31, 2010 using a standardized and validated questionnaire.

Results: Five hundred sixteen (55%) SCTR responded among which 40% had allogeneic SCT. The incidence of international travel was 32% (95% CI 28-36) within two years after SCT. Using multivariable Cox regression analysis, variables significantly associated with increased rate of early international travel were history of international travel prior to SCT (HR=5.3, 95%CI 2.3-12.0), autologous SCT (HR=2.6, 95%CI 1.6-2.9), foreign birth (HR=2.3, 95%CI 1.5-3.3), and high socioeconomic status (HR=2.0, 95%CI 1.8-3.7). During their first trip, sixty-four travelers (28%) traveled to destinations that required vaccination or malaria chemoprophylaxis; only 56% reported seeking pre-travel health advice. Around 25% of SCTR frequented destinations where Hepatitis A and/or typhoid is endemic; only 7% reported receiving hepatitis A vaccine and 1.4% reported receiving typhoid vaccine. Among those who traveled, sixteen travelers (7%) became ill enough to require medical attention during their first trip after SCT. The incidence of travel related illnesses was higher among those who traveled to high-risk areas (14% vs. 4%, p= 0.005) and who visited friends and relatives (20% vs. 3%, p< . 0001). Ill travelers had longer mean trip duration (24 vs. 12 days, p= 0.0002).

Conclusions: International travel is common among SCTR within two years after SCT. The incidence of travel related illnesses was higher among certain subgroups of travelers. Pre-travel health counseling and interventions were suboptimal.

FC2.6

Epidemiology and Treatment of Hydatid Cyst in the AMC

C. Stijnis¹, M. van Vugt¹, P.P.A.M. van Thiel¹, A. Goorhuis¹, R.W. Wieten¹, J.S. Lameris², M.P. Grobusch¹

¹Academic Medical Center/ University of Amsterdam, Center of Tropical and Travel Medicine, Department of Infectious Diseases, Division of Internal Medicine, Amsterdam, Netherlands,

²Academic Medical Center/ University of Amsterdam, Department of Radiology, Amsterdam, Netherlands

Background: *Echinococcus granulosus*, also referred to as hydatid cyst, is an emerging imported disease in the Netherlands. It is caused by a tapeworm that normally uses cattle as intermediate host and dogs as a definite host. In this lifecycle, cysts are formed in the viscera of the intermediate host. Humans can become intermediate hosts themselves, with cysts growing for many years by the formation of so called daughter cysts that may disseminate, either by spontaneous rupture or iatrogenic perforation. Left untreated, this infection can lead to serious morbidity and mortality, although spontaneous regression is not uncommon.

Historically, the permanent treatment of hydatid disease has been surgical removal of the cyst. In the last decade of the 20th century percutaneous techniques were developed. In our hospital, JSL developed the PEVAC (Percutaneous EVACuation) technique to aspirate the cyst, thus removing the helminth content as definite as possible. This treatment is preceded by at least 6 weeks, and followed up by 6 months of albendazol treatment.

Objective: To analyse echinococcosis cases and treatment in the AMC from 2002 to 2012.

Results: In the last decade, 127 patients (56% female, 44% male) with hydatid cysts have been followed-up in our department of Tropical Disease and Travel Medicine. In the Netherlands, hydatid disease is most frequently seen in immigrants from Morocco (58) and Turkey (39), usually from small communities where cattle and dogs live in close contact with humans. The majority of hydatid cysts are unilocular and located in the liver (76%). Other affected organs are the lungs (8%), spleen (4%) and muscle/soft tissue (3%). 45% of our patients underwent percutaneous treatment. Although complications were frequent in the early years of PEVAC treatment, this technique has proven very safe over the last years. Hospital stay is often limited to 3 days and there is little relapse.

Conclusion: Hydatid cyst is predominantly seen in immigrants. In the AMC treatment experience has developed, with PEVAC playing a central role. In the near future, these results will be compared to those of other referral centers worldwide, where surgery is still the prevailing treatment.

FC3 Health Problems in Returning Travellers

FC3.1

Health Problems during and after Travel among Boston-Area International Travelers

L.H. Chen^{1,2}, P. Han³, E.S. Jentes³, M.E. Wilson⁴, C. Benoit⁵, W. Macleod^{6,7}, R. Stoney³, W.W. Ooi⁸, D.H. Hamer^{6,7,9}, E.D. Barnett⁵, Boston Area Travel Medicine Network
¹Mount Auburn Hospital, Travel Medicine Center, Cambridge, United States, ²Harvard Medical School, Boston, United States, ³Centers for Disease Control and Prevention, Division of Global Migration and Quarantine, Atlanta, United States, ⁴Harvard School of Public Health, Global Health and Migration, Boston, United States, ⁵Boston Medical Center, Maxwell Finland Laboratory for Infectious Diseases, Boston, United States, ⁶Boston University, Center for Global Health and Development, Boston, United States, ⁷Boston University School of Public Health, International Health, Boston, United States, ⁸Lahey Clinic Medical Center, Tropical and Travel Medicine, Burlington, United States, ⁹Boston University School of Medicine, Infectious Diseases, Boston, United States

Objective: To assess the types, frequency, and effect of health problems occurring during and after travel among Boston-area international travelers.

Methods: Surveys were conducted from 2009-2011 among travelers ≥18 years attending 3 travel clinics for pre-travel consultations in the Boston area. Travelers were asked to complete a pre-travel survey, at least one weekly during-travel survey, and a post-travel survey within 2-4 weeks after return. A health problem was defined as ³¹ reported symptom in a patient. Traveler demographics, trip characteristics, health problems during and after travel, and effect of illness were evaluated by Wilcoxon rank sum test for continuous variables.

Results: Of 987 participants, 628 (64%) completed all 3 surveys and were analyzed. More travelers were male (59%), tourists (67%), and US-born (82%). Median age was 47 years (range, 19-83) and median trip duration was 12 days (range, 3-207). Top destinations were India (12%), South Africa (5%), and Tanzania (5%). Of the 628 travelers, 64% reported experiencing a health problem during and/or after travel. During travel, 305 (49%) of 628 experienced a health problem. Among those 305, 18% stopped their planned activities, 7% saw a doctor, and 1% were hospitalized. The most frequent symptoms experienced during travel were diarrhea (27%), headache (12%), and fatigue (12%). Three percent experienced an injury. After travel, 249 (40%) of 628 reported a health problem. Among those 249, 21% stopped planned activities, 13% saw a primary care provider, and 1 person was hospitalized. The most frequent symptoms experienced after travel were runny/stuffy nose (15%), diarrhea (12%), and cough (11%). Bivariate analysis showed that only longer trip duration was associated with becoming sick during and/or after travel (median 13 vs. 11 days for ill vs. well travelers, respectively; p=0.0003).

Conclusions: A high proportion of travelers report health problems during or after travel; illness was more common than injuries. Approximately 1 in 5 travelers who reported health problems altered activities, although a relatively low percentage sought medical care, especially during travel. Travelers experienced more gastrointestinal symptoms during travel and more respiratory symptoms after travel. In spite of patients seeking pretravel care at travel medicine clinics, the high prevalence of health problems indicates that new strategies are needed to address these trip-interrupting events.

FC3.2

Travel Acquired Infections and Illnesses in Canadians: Surveillance Report from CanTravNet Surveillance Data, 2009—2011

A.K. Boggild^{1,2}, J. Geduld³, M. Libman⁴, A. McCarthy⁵, P. Doyle⁶, W. Ghesquiere⁷, J. Vincelette⁸, S. Kuhn⁹, D.O. Freedman¹⁰, K.C. Kain¹¹

¹Tropical Disease Unit, Division of Infectious Diseases, Department of Medicine, University Health Network and the University of Toronto, Toronto, Canada, ²Public Health Ontario Laboratories, Public Health Ontario, Toronto, Canada, ³Public Health Agency of Canada, Travel and Migration Health Division, Infectious Disease Prevention and Control Branch, Ottawa, Canada, ⁴McGill University Health Centre, Division of Infectious Diseases, Department of Microbiology, Montreal, Canada, ⁵Ottawa Hospital and the University of Ottawa, Tropical Medicine and International Health Clinic, Division of Infectious Diseases, Ottawa, Canada, ⁶University of British Columbia, Division of Medical Microbiology and Infection Control, Vancouver General Hospital, Vancouver, Canada, ⁷University of British Columbia, Infectious Diseases, Vancouver Island Health Authority, Department of Medicine, Victoria, Canada, ⁸Hôpital Saint-Luc du CHUM, Montreal, Canada, ⁹Alberta Children's Hospital and the University of Calgary, Division of Pediatric Infectious Diseases, Departments of Pediatrics and Medicine, Calgary, Canada, ¹⁰University of Alabama at Birmingham, Center for Geographic Medicine, Department of Medicine, Birmingham, United States, ¹¹SAR Laboratories, Sandra Rotman Centre for Global Health, Toronto, Canada

Background: Important knowledge gaps exist in our understanding of migration medicine practice and the impact of imported pathogens by Canadian travellers. We herein provide a comprehensive, Canada-specific surveillance summary of illness in a cohort of returned Canadian travellers and new immigrants.

Methods: Data on ill returned Canadian travellers and new immigrants presenting to a CanTravNet site between September 2009 and September 2011 were extracted and analyzed.

Results: During the study period, 4365 travellers and immigrants presented to a CanTravNet site, 90% of whom were assigned a travel-related diagnosis. Latent tuberculosis (6.9%), chronic hepatitis B virus (4.4%), strongyloidiasis (2.5%), giardiasis (2.2%), and malaria (2.2%) were the most common specific etiologic diagnoses issued. Other potentially serious infections such as dengue fever and enteric fever (due to *Salmonella enterica* serotype Typhi or Paratyphi) were common, occurring in 61 and 36 travellers, respectively. Individuals travelling for the purpose of "visiting friends and relatives" (VFR) were over-represented among those diagnosed with malaria and enteric fever ($p < 0.001$). Malaria was also over-represented among business travellers and males ($p < 0.001$). Malaria was most likely acquired in Sub-Saharan Africa ($p < 0.001$), while dengue was most likely imported from the Caribbean and southeast Asia ($p = 0.003$), and enteric fever from South Central Asia ($p < 0.001$).

Conclusions: Our analysis of surveillance data on ill returned Canadian travellers has detailed the spectrum of imported illness among this cohort and provides an epidemiologic framework for Canadian practitioners encountering ill returned travellers. We confirmed that VFR travel confers particularly high risks, underscoring the need to improve pre-travel intervention. Potentially serious and fatal illnesses such as malaria and enteric fever were common, as were illnesses of public health importance such as tuberculosis and hepatitis B.

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FC3.3

High Acquisition Rates of Extended Spectrum β -Lactamase Producing Enterobacteriaceae among Dutch Travelers

J.A. Vlot¹, S. Paltansing², M.E.M. Kraakman², R. Mesman², M.L. Bruijning¹, A.T. Bernards², K.-E. Veldkamp², L.G. Visser¹

¹Leiden University Medical Center, Infectious Diseases, Travel Clinic, Leiden, Netherlands,

²Leiden University Medical Center, Medical Microbiology, Leiden, Netherlands

Background: In recent years, multidrug resistant Enterobacteriaceae (MDR-E) through extended spectrum β -lactamase (ESBL) or carbapenemase production (CP) have become an increasing public health threat worldwide. The impact of international travel on the spread of MDR-E is becoming more evident.

Objectives: To investigate acquisition and persistence of carriage of ESBL- and CP-producing Enterobacteriaceae after foreign travel and associated risk factors among Dutch travelers.

To document the occurrence of transmission of these acquired strains to household contacts.

Methods: Prospective cohort study. 521 adults who had the intention to travel for < 3 months to areas outside Europe, Northern America and Australia were invited to participate. 370 travelers were included for analysis. Rectal swabs were taken before, upon return from and, if appropriate, six months after the trip and questionnaires were filled in concurrently. Eleven household contacts of 4 travelers with prolonged carriage of an ESBL-E after six months agreed to provide a rectal swab and questionnaire. ESBLs were characterized using a micro-array (Checkpoints). Multi-locus sequence typing (MLST) was performed on E. coli isolates.

Results: ESBL-E acquisition among Dutch travelers was high (33%). No CPE were found. Of 370 travelers, 32 were colonized with ESBL-E before the trip, 113 acquired ESBL-E during the trip, and 26 of them were still colonized after 6 months. Co-resistance to other antibiotic classes was common. Independent risk factors for ESBL-E acquisition were travel to South (OR 3.9; 1.8 - 8.7) and Eastern (OR 5.1; 2 - 12.9) Asia. CTX-M enzymes were the predominant ESBLs. MLST showed extensive genetic diversity among E. coli. Transmission among household contacts could not be demonstrated.

Conclusion: Based on the results of this study, active surveillance of CP-E and ESBL-E and at least temporary contact isolation precautions may be recommended for patients on admission to hospitals, who traveled to Asia in the last 6 months.

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FC3.4

The Changing Epidemiology of Human African Trypanosomiasis among Patients from Non-endemic Countries, 1902-2012

A. Neuberger¹, E. Meltzer², E. Leshem², Y. Dickstein³, S. Stienlauf², E. Schwartz²

¹Rambam Medical Center, Unit of Infectious Diseases, Department of Medicine B, Haifa, Israel, ²The Center for Geographic Medicine and Department of Medicine C, Ramat Gan, Israel, ³Department of Medicine A, Rambam Medical Center, Haifa, Israel

Background: Although human African trypanosomiasis (HAT) is considered rare among patients from non-endemic countries (NEC), there has been an increase in the number of cases reported in recent years.

Objectives: To describe the changes in the epidemiology of HAT in patients from NEC between 1902 and 2012.

Methods: A systematic review of the literature was performed. All HAT cases diagnosed in patients from NEC were included. Data regarding the number of travelers were obtained from the United Nations World Tourism Organization. We compared the epidemiologic data of patients during and after the colonial period (using 1966 as a cutoff), and analyzed the relationship between the number of tourists and the number of HAT cases.

Results: Between 1902 and 2012, HAT was reported in 244 patients. In the colonial era most cases were reported between 1902 and 1920, while in the postcolonial era a sharp increase occurred after the year 2000. In the colonial era the average age of patients was lower (32.5±7.8 vs. 43.0±16.1 years, $p < 0.001$). The proportion of females was 10% vs. 23.8% in the colonial and postcolonial eras, respectively ($p < 0.001$).

In the colonial era most HAT cases were diagnosed in expatriates, missionaries and soldiers (74%), and Gambian trypanosomiasis accounted for 84/109 (77.1%) of cases. In the post-colonial era most patients (72.8%) were tourists to East-African game parks (mainly in Tanzania); Rhodesian trypanosomiasis accounted for 94/123 (76.4%) of cases. Between 1995 and 2010 there has been a constant, nearly linear, increase in the number of incoming tourists to Africa. During the same time more HAT cases were reported, occurring in small outbreaks, rather than following a similar linear pattern.

Conclusions: The epidemiology of HAT among patients from NEC has changed. In recent decades patients are older, more likely to be tourists, and to have acquired the disease while visiting game-parks. Rhodesiense trypanosomiasis, which is an acute febrile disease, now accounts for the majority of HAT cases. Any febrile patient with a compatible travel history and without an alternative diagnosis should be evaluated for HAT. Cases among returning travellers may serve as sentinels for disease "hot spots" in Africa.

FC3.5

Acute Hepatitis in Israeli Travelers

T. Lachish¹, E. Schwartz²

¹Shaare-Zedek Medical Center, The Infectious Diseases Unit, Jerusalem, Israel, ²Sheba Medical Center, The Center for Geographic Medicine and Tropical Diseases, Tel-Aviv, Israel

Background: Acute hepatitis is a well described cause of morbidity and sporadic mortality in travelers. Data regarding the epidemiology of hepatitis in travelers are lacking. The aim of this study is to describe the epidemiology of acute viral hepatitis among travelers returning from tropical countries, with particular attention to enterically-transmitted hepatitis.

Methods: This study is a prospective observational study of ill-returned travelers who presented at two travel medicine clinics in Israel between the years 1997 to 2012. Data of patients with acute hepatitis were summarized. Only travelers were included, immigrants and foreign workers were excluded.

Results: Among 4970 Israeli travelers who were seen during this period, 49 (1 %) were diagnosed with acute hepatitis. Among them, hepatitis E virus (HEV) was the etiology in 19 (39%) cases and Hepatitis A virus (HAV) was the etiology in 13(27%) cases, demonstrating that 65 % of all cases were due to enterically-transmitted hepatitis. Acquiring acute hepatitis B (2 cases) or acute hepatitis C (1 case) were uncommon (6.1%). In 27% percent of the cases, no diagnosis was determined. Fifty five percent of all cases were imported from the Indian subcontinent, with a predominance of HEV infection (84%). A significant male predominance was seen in all groups regardless of etiology. Pretravel consultation was documented in only 7% of those with vaccine preventable hepatitis (hepatitis A &B) compared to 89% in those with Hepatitis E.

Conclusion: Enterically-transmitted hepatitis is the main causes of viral hepatitis among travelers. Hepatitis E virus is an emerging disease and has become the most common hepatitis among Israeli travelers. Although an efficacious vaccine has been developed, no licensed HEV vaccine is yet available. Although hepatitis A vaccine is highly efficacious, safe and easily available, there is a steady prevalence of HAV cases. Further follow-up is needed to determine whether the Israeli national program for HAV vaccination in infancy will affect the epidemiology of hepatitis among travelers.

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FC3.6

Different Etiologies of Creeping Dermatitis in 70 Consecutive Patients

C. Vanhaecke¹, A. Perignon¹, S. Regnier¹, G. Monsel¹, L. Paris², E. Caumes¹

¹Hopital Pitié Salpêtrière, Service de Maladies Infectieuses et Tropicales, Paris, France,

²Hopital Pitié Salpêtrière, Service de Parasitologie-Mycologie, Paris, France

Background: Creeping dermatitis is a common cause of consultation in returning travellers. This is a cutaneous sign defined as a linear or serpiginous mobile track. Creeping dermatitis and cutaneous larva migrans (CLM) have been used to term the disease hookworm related cutaneous larva migrans (HrCLM). However other diseases can be revealed by creeping dermatitis.

Objective : The aim of this study was to report the different etiologies of creeping dermatitis in the setting of a tropical diseases unit.

Method: All the consecutive patients with creeping dermatitis presenting to our unit in Pitié Salpêtrière Hospital in Paris between 1st March 2008 and 31 March 2012 were included. We reported the different etiologies. The diagnoses were based on microscopic data when possible (hookworm folliculitis, strongyloidiasis) or the association of epidemiological, clinical and biological features as well as good outcome after specific treatment (HrCLM, loiasis, gnathostomiasis,...).

Results: Seventy patients were included. 66 patients (94%) presented with HrCLM, all had traveled in tropical countries with the exception of one returning from Greece. South America was the most frequently visited continent (40%), followed by Africa (30%), South Asia (17%) and Caribbean's (12%). All presented with creeping dermatitis. The mean duration of symptom was 25 ±31 days. Seven of these 66 patients (11%) also presented with hookworm folliculitis. Skin scrapings from follicular skin lesions lead to the identification of a hookworm larva by microscopic examination in 3 cases and of *Ancylostoma braziliensis* by molecular techniques (PCR) in 1 case. Two patients (3%) presented with cutaneous gnathostomiasis, after returning from Bali and Japan, respectively. One patient (1.5%) native from Cameroun and living in France for more than 20 years presented with loiasis whereas a non-traveling patient (1.5%) presented with "creeping hair", a rare cause of creeping dermatitis.

Conclusion: We showed that HrCLM is the cause of more than 90% of the cases of creeping dermatitis but other diseases such as gnathostomiasis, loiasis and cutaneous pili migrans can also give rise to this cutaneous sign. They can be distinguished on epidemiological, clinical and biological backgrounds and sometimes confirmed by more specific microbiological tests.

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FC4 Pre Travel Practice

FC4.1

Knowledge, Attitudes and Practices of U.S. Practitioners Who Provide Pre-travel Advice: Differences between Primary Care Providers and Travel Medicine Specialists

D.H. Hamer^{1,2,3}, E.D. Barnett⁴, L. Kogelman⁵, E.S. Jentes⁶, E. Quinn⁷, E. Yanni⁶, M.E. Wilson⁸, L.H. Chen^{9,10}, Boston Area Travel Medicine Group

¹Boston University, Center for Global Health and Development, Boston, United States,

²Boston University School of Public Health, International Health, Boston, United States,

³Boston University School of Medicine, Infectious Diseases, Boston, United States, ⁴Boston Medical Center, Maxwell Finland Laboratory for Infectious Diseases, Boston, United States,

⁵Tufts Medical Center, Infectious Diseases, Boston, United States, ⁶Centers for Disease Control and Prevention, Division of Global Migration and Quarantine, Atlanta, United States,

⁷Boston University School of Public Health, Data Coordinating Center, Boston, United States,

⁸Harvard School of Public Health, Global Health and Population, Boston, United States,

⁹Mount Auburn Hospital, Cambridge, United States, ¹⁰Harvard Medical School, Medicine, Boston, United States

Background: As international travel increases, many US healthcare practitioners are asked to provide pre-travel advice but may not be adequately trained for this.

Objective: To assess how often US primary care practitioners (PCPs) provide pre-travel advice and compare their understanding, delivery of itinerary-specific advice, and training with that of travel medicine (TM) specialists.

Methods: We conducted an anonymous e-mail survey among randomly selected PCPs from the pmiCME database and US-based TM specialists from the International Society of Travel Medicine (ISTM) and American Society of Tropical Medicine and Hygiene (ASTMH). Analyses were done by using t-tests to compare continuous and chi-square tests to compare categorical outcomes.

Results: Of 14,932 e-mails, 902 (6%) yielded complete or partially completed surveys. Eighty percent of respondents personally provided pre-travel consultations: 95% of TM specialists and 73% of PCPs. Most PCPs (68%) providing pre-travel consultations saw < 50 travelers/year, whereas 30% of TM specialists saw < 50/year; 59% of TM specialists saw >500/year vs. 18% of PCPs (p< 0.001).

TM specialists, compared with PCPs, reported being very familiar with yellow fever vaccine (94% vs. 19%; p< 0.0001), Japanese encephalitis vaccine (74% vs. 10%; p< 0.001), mefloquine side effects (84% vs. 22%; p< 0.0001), and chloroquine-resistant areas (84% vs. 17%; p< 0.0001), and provided more educational materials (91% vs. 64%; p< 0.0001). TM specialists were more likely than PCPs to hold ASTMH CTropMed® (28% vs. 1%; p< 0.0001) or ISTM CTH® (72% vs. 3%; p< 0.0001) certificates. Most PCPs (94%) indicated interest in a short TM course. Knowledge scores based on brief pre-travel scenarios were significantly lower in PCPs than TM specialists (score ≥3: 52% for PCP vs. 89% for TM specialist, p< 0.0001).

Most PCPs (248/358, 69%) knew of TM specialists, to whom they referred 22% of their traveling patients; top referral reasons were lack of vaccines in their office (74%), need for yellow fever vaccine (68%), complex itineraries (61%), and travelers with underlying medical co-morbidities (56.7%).

Conclusions: PCPs provided pre-travel advice, but most saw few travelers. TM specialists reported greater understanding and delivery of itinerary-specific advice, and had higher scores in knowledge of travel vaccines and malaria. An easily accessible TM education program for US PCPs is needed to improve management of travelers.

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FC4.2

Malaria: Are Pharmacists Sufficiently Prepared to Assess and Manage Prevention Strategies?

A. Willcox¹, H. Chera¹

¹Health Team Ltd., Birmingham, United Kingdom

Background: Queries relating to travel health increased for pharmacists working in a small independent high street pharmacy chain. A review of the literature revealed the potential for pharmacists to contribute to this specialised area of health promotion and disease prevention.¹

Objective: To assess the current level of knowledge and to inform the future development of in-pharmacy travel health services.

Method: The total population of pharmacists were surveyed using a case study of a family travelling to Gambia, with questions designed to elicit knowledge and actions on managing the family's malaria prevention within the pharmacy. Analysis was undertaken using descriptive statistics and constant comparative techniques. Responses were compared with Health Protection Agency guidelines.²

Results: The response rate was 80% (n.12). 92% correctly identified the malaria risk. 75% correctly identified suitable chemoprophylaxis. 58% referred client to their family doctor for prescription; 8% were able to prescribe for the client. Of those pharmacists who assessed clients, all questions were appropriate but no pharmacist asked all the questions necessary to provide comprehensive clinical decision-making on anti-bite strategies or chemoprophylaxis. A wide range of resources were used to check for information with 25% directly using Health Protection Agency or official resources. 83% said the average time spent dealing with a travel-related query in pharmacy was 10 minutes or less.

Q	Pharmacists' responses	%
1	Correctly identified a risk of malaria	92
2a 2b	Would initiate discussion on malaria risk. Would refer patient elsewhere.	83 8
3	Of those pharmacists who discussed malaria, what questions were asked? All questions were appropriate but no pharmacist asked all the questions necessary to provide comprehensive clinical decision-making on anti-bite strategies or chemoprophylaxis.	
4	Correctly identified chemoprophylaxis for the destination.	75
5a 5b 5c 5d	Prescribed Referred to GP Referred to private travel clinic Referred to specialist hospital service	8 58 8 8
6	Resources used to answer malaria questions: NPA malaria guide 58%; BNF 33%; Leaflet from supplier 25%; evidence-based resources for the UK 25%; Other 50%	
7	75% self-rated their expertise in travel health as moderate/competent; 0% considered themselves expert.	
8	Average time spent dealing with a travel-related query in pharmacy was under 10 minutes.	83
9	Opinions on increasing role pharmacists have in travel health: Keen to continue and expand: Only provide advice on holiday medicines:	92 8

[Pharmacists' responses]

Conclusions: Pharmacists' ability to risk-assess is stronger than their ability to manage that risk. There is a need for easier, quicker, more expedient access to UK-recognised evidence-based guidance. Pharmacists are keen to offer a comprehensive malaria-prevention service and expand to provide a 'one-stop shop' for travellers, which would require additional specific training. Therefore the next phase of development for this pharmacy chain is to act on these research findings by trialling an innovative online tool to aid safe and effective clinical decision-making.

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FC4.3

Pre-travel Health Care of Immigrants Returning Home to Visit Friends and Relatives

R.C. LaRocque¹, B.R. Desphande², S.R. Rao^{3,4}, G.W. Brunette⁵, M.J. Sotir⁵, E.S. Jentes⁵, E.T. Ryan¹, Global TravEpiNet Consortium

¹Massachusetts General Hospital, Division of Infectious Diseases, Boston, United States,

²Tufts University, Medford, United States, ³University of Massachusetts Medical School, Department of Quantitative Health Sciences, Worcester, United States, ⁴Bedford VA Medical Center, Center for Health Quality, Outcomes, and Economics Research, Bedford, United States, ⁵Centers for Disease Control and Prevention, Division of Global Migration and Quarantine, National Center for Emerging and Zoonotic Infectious Diseases, Atlanta, United States

Background: Immigrants returning home to visit friends and relatives (“VFR” travelers) are at higher risk of travel-associated illness than other international travelers.

Objective: To evaluate the demographics, itineraries, and pre-travel health care of VFR travelers who sought pre-travel health advice, and to identify areas in which the care of this population could be improved.

Method(s): Global TravEpiNet is a U.S. CDC-sponsored consortium of U.S. practices that provide pre-travel health advice. We analyzed data on all travelers going to resource-poor destinations seen for pre-travel consultation at participating sites from January 2009 through December 2011. We used Kruskal-Wallis equality of proportions test, Somers' *D* test, and separate random intercept logistic regressions with clinical site as the random effect to evaluate measures of association and statistical significance in the data. We also performed multivariable logistic regression analyses to examine the effect of individual variables on the likelihood of declining a vaccine.

Results: We included 3,707 VFR and 17,507 non-VFR travelers in our analysis. VFR travelers more commonly visited urban destinations than non-VFR travelers (42% vs. 30%, $p < 0.0001$). Fifty-four percent of VFR travelers were female, and 18% of VFR travelers were under six years old. VFR travelers sought health advice closer to their departure than non-VFR travelers (median days before departure 17 vs. 26, $p < 0.0001$). In multivariable analysis, being a VFR traveler was an independent predictor of declining a recommended vaccine.

Conclusions: Declining of recommended vaccines was remarkably common among VFR travelers in this cohort, especially considering that these individuals had sought pre-travel health care. This declination of vaccines may relate to cost, concerns about vaccine safety, the delayed timing of the pre-travel visit, or lack of perceived risk. Making pre-travel health care available in primary care settings may be one means of improving the timing of pre-travel health care and increasing the acceptance of vaccines. Our findings, in conjunction with geographic data from the U.S. census, could help target these efforts to appropriate immigrant communities.

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FC4.4

Characteristics, Preferences and Decision Needs of Travelers to Countries with Risk of Yellow Fever: Implications for Healthcare Providers

B.A. Lown¹, L.H. Chen¹, P.V. Han², E.S. Jentes², M.E. Wilson³, C.M. Benoit⁴, K. Avery⁵, W. Ooi⁶, D.H. Hamer⁷, E.D. Barnett⁴, BATMN (Boston Area Travel Medicine Network)

¹Mount Auburn Hospital, Harvard Medical School, Department of Medicine, Cambridge, United States, ²Division of Global Migration and Quarantine, Travelers' Health Branch, Centers for Disease Control and Prevention, Atlanta, United States, ³Department of Global Health and Population, Harvard School of Public Health, Cambridge, United States, ⁴Maxwell Finland Laboratory for Infectious Diseases, Boston Medical Center, Boston, United States, ⁵Mount Auburn Hospital, Travel Resource Center, Cambridge, United States, ⁶Lahey Clinic Medical Center, Division of Infectious Diseases, Burlington, United States, ⁷Department of International Health, Boston University School of Public Health, Center for Global Health and Development, Boston University, Department of Medicine, Section of Infectious Diseases, Boston, United States

Objectives: To assess (1) the reason for this pre-travel health consultation, (2) information travelers considered important regarding yellow fever (YF) disease and vaccination, (3) whether travelers recalled receiving this information and (4) were involved in YF vaccine decision-making to their desired extent.

Methods: Travelers ≥ 18 years were surveyed after consultations at three Boston-area travel clinics; those making YF vaccination decisions were included for analyses. Bivariate analyses were performed using the chi-square and McNemar tests. A p-value < 0.05 was considered statistically significant.

Results: Of 831 travelers completing the survey, 589 (70%) indicated the travel clinic visit included a need to address YF immunization. Fifty eight percent (347/589) attended the clinic because they perceived that they were required to receive a vaccine. Of the 589, peak age groups were 21-29 years and >60 years (20% each), and 82% had college/graduate education. Most were traveling for tourism (55%).

Travel medicine providers reportedly recommended YF vaccination to 91% (537/589), of whom 92% (494/537) received vaccine. Age ≥ 50 years was associated with decline of recommended YF vaccine compared with < 50 years (68% versus 32%, $p < 0.01$). Of 589 travelers, most (83%) agreed they needed to understand YF risk at their destination and 88% YF vaccine risks; 87% felt they were involved in making YF vaccine decisions. Absence of an influence of cost on decisions to receive YF vaccine was associated with older age ($p=0.02$) and post-graduate education ($p=0.03$). More participants were inclined to accept providers' recommendations about vaccines than they were to accept recommendations about general health choices (57% versus 44%, $p < 0.01$). A minority of travelers recalled discussing opinions and priorities about risks and benefits of YF vaccine (32%) or YF vaccine concerns (42%) with the provider.

Conclusion: Perception of requirement for vaccination was the most common reason for this pre-travel consultation. Most of these predominately well-educated travelers sought YF disease and vaccine risk information, and wanted to be involved in decision-making, but less than half recalled discussing their opinions and concerns. Providers should be aware that many travelers would welcome a more detailed discussion about their personal risk perceptions and vaccine concerns.

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FC4.5

Evaluation of Vaccination Coverage in Travelers to a Yellow Fever Endemic Area (Senegal) for a Stay

C. Rapp^{1,2,3}, K.B. Fall⁴, A. Tall⁵, R. Michel⁶, P. Royon², J.P. Leroy², L. de Gentile², E. Caumes², O. Bouchaud²

¹Begin Military Hospital, Infectious and Tropical Diseases, Saint-Mandé, France, ²SMV, Paris, France, ³Ecole du Val de Grâce, Paris, France, ⁴Hopital Principal, Dakar, Senegal, ⁵Institut Pasteur, Dakar, Senegal, ⁶CESPA, Marseille, France

Background: Data quantifying the proportion of travelers going to yellow fever (YF) risk areas without vaccination are lacking.

Objectives:

- Evaluate YF vaccination coverage among French travelers living in France and potentially exposed to YF risk in Senegal.
- Determine factors associated with vaccination coverage

Methods: A prospective study was conducted between August 2011 and May 2012 in Dakar international airport. French travelers returning to France from Dakar were asked about their attitudes towards YF and whether they had received YF immunization on this or previous trips. Adequate YF immunization was evaluated by a valid vaccination certificate. A multivariate analysis was used to determine factors associated with vaccination coverage.

Results: Overall, 10298 questionnaires were completed. Sixty percent of travelers were male. Mean age was 48 years. Seventy six percent were traveling to tropical areas for the first time. The main reason for traveling was tourism (52%), business (22%) and visiting friends and relatives (15 %). 65 % looked for information, of which 57 % and 24% were respectively advised by a general practitioner (GP) or travel clinic. 47 % of travelers had adapted knowledge regarding YF transmission. The reported YF vaccination coverage was estimated at 88 %. The substantiated YF vaccination coverage (according to valid certificate) was 39.3 %. In multivariate analysis, appropriate YF immunization was statistically associated with the first trip to a tropical area (OR 1.8), business trip (OR 1.8, 95% CI 1.2 to 2), GP advice (OR 1.2), good awareness of YF (OR 1.2), and adequate risk perception of YF lethality

Conclusion: More than 60% of travelers to Senegal did not receive YF vaccination before the trip. YF vaccination coverage was influenced by the level of knowledge and risk perception about YF as well as the type of counseling before travel.

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FC4.6

Malaria and Yellow Fever Prevention Advice Provided by Travel Agency Employees in Cusco - Peru

M.M. Cabada^{1,2}, P.G. Villanueva-Meyer³, C.A. Garcia-Jasso³, C.A. Springer³, J. Lane³, B.S. Su³, I.S. Hidalgo³, M.R. Goodrich³, A.C. White²

¹UPCH-UTMB Collaborative Research Center, Cusco, Peru, ²University of Texas Medical Branch, Infectious Diseases Division, Galveston, United States, ³University of Texas Medical Branch, School of Medicine, Galveston, United States

Background: Risk assessment and advice for malaria and yellow fever prevention is an important part of travel medicine consultation. Nonetheless, few travelers seek pre-travel medical consultation. Travel agencies play a significant role in informing and referring travelers to health services. Little is known about the role of travel agencies in traveler's health advice at destination countries.

Objective: Describe the advice on malaria and yellow fever prevention provided by travel agency employees in Cusco.

Methods: Travel agencies in Cusco - Peru, registered in the city's Chamber of Commerce, with verifiable addresses, and offering trips to the South Peruvian jungle were surveyed during May - June 2012. Medical students posed as travelers interested in booking trips to Tambopata or Manu rain forest. They conducted structured encounters with agency employees at the front desk without disclosing their identities. Encounters started with an open question to record any spontaneously provided advice, directed questions explored knowledge in specific topics.

Results: 163 travel agencies were included. Most (56.4%) had visible jungle trip advertisement, median duration of trips was 7 days (IQR 5-8 days), median minimum group size was 4 travelers (IQR 3-7 travelers), and median trip cost was 805 USD (IQR 580-1095 USD). The median minimum time to departure was 3 days (IQR 1-7 days). Risk for at least one illness in the jungle was mentioned by 44.8%, while 41.7% did not mention risk for any illness, 10.4% mention one illness but referred travelers to another person for advice, and 3.1% did not mention an illness and/or referred travelers to another person. From 90 (55.2%) subjects who mentioned risk for illnesses, 18.9% mentioned malaria and 84.4% mentioned yellow fever spontaneously. An extra 15.5% acknowledge some malaria risk when asked directly, but 65.5% denied malaria risk in the area. Another 11.1% acknowledge some yellow fever risk in the area when asked directly and 4.4% denied the risk for yellow fever. Recommendations for preventing malaria and yellow fever provided by the subjects are shown in the table.

Conclusions: Few travel agency employees were able to provide information on malaria and yellow fever prevention. More subjects knew about the yellow fever risk than about malaria risk in the Southern Peruvian jungle. Nonetheless, time to departure would not allow proper yellow fever protection in unvaccinated travelers.

FC5 Chronic Infections in Migrants

FC5.1

Barriers to the Provision of Pre-travel Preventative Health Advice in Primary Care to Australian Travellers Visiting Friends and Relatives

B.L. Forssman¹, H. Seale¹, A.E. Heywood¹, N. Zwar¹

¹University of New South Wales, School of Public Health and Community Medicine, Randwick, Australia

Background: Travellers visiting friends and relatives (VFRs) are at greater risk of infectious diseases than others for a number of underlying reasons. Although general practitioners (GPs) are an important source of pre-travel medical advice, few studies have been published investigating provider-related barriers to the provision of pre-travel medical care to VFRs.

Objectives: To understand the knowledge, attitudes and practices of travel medicine of Australian GPs, particularly their perception of risk for VFRs, and to investigate the barriers preventing GPs from providing pre-travel preventative care to VFRs.

Methods: 2000 questionnaires were sent to a random sample of GPs practicing in areas with large migrant populations in Sydney, Australia, in November-December 2012. Chi-square, t-test, ANOVA and Kruskal-Wallis test were used for univariate analysis, and multivariate logistic regression analysis was undertaken.

Results: Of 538 returned questionnaires (response rate 26.9%), 521 were at least partially completed and included in the analysis. Overall, 59% of respondents were males, with a mean age of 52.7 years, with males significantly older ($p < 0.001$) with a longer time in practice ($p < 0.001$) than females. GPs saw a median of 150 patients and three travel patients per week. Three-quarters (392/517, 75.8%) of GPs spoke a language other than English (LOTE). Only 39% (203/517) of respondents stated that the overall risk for VFRs is higher than for holiday travellers with 40% reporting no difference in risk and 21% stating that VFRs had a lower risk. The belief that VFRs have the same or lower risk than holiday travellers was associated with older age ($p = 0.013$), LOTE ($p = 0.001$), longer time in practice ($p = 0.015$) and higher number of patients seen per week ($p = 0.006$). Only LOTE remained significant on multivariate analysis (adjusted OR 2.1, 95%CI 1.3-3.3). The most common stated barriers to providing pre-travel care to VFRs were late presentation by VFRs (90%), low perception of risk by VFRs (84%), and cost of vaccines (82%).

Conclusions: VFRs are reportedly more likely to see GPs from their own cultural background, however our results demonstrate that these GPs are less likely to consider VFRs at greater risk of infectious diseases. In addition to the need to raise awareness in VFRs, targeted education of GPs from culturally diverse backgrounds is required to reduce the overall risk of disease in this unique group of travellers.

FC5.2

Situational Analysis of HIV Travel Restrictions for Migrants

A. Wilder-Smith¹, H. Pyrterch², R. Nesbitt³, F. Chang³

¹University of Heidelberg, Institute of Public Health, Heidelberg, Germany, ²University of Heidelberg, Heidelberg, Germany, ³University of Heidelberg, Heidelberg, Germany

Introduction: Increasingly, HIV seropositive individuals cross international borders. Country imposed HIV related restrictions on entry, stay and residence have important consequences for this mobile population. Our aim was to describe the geographical distribution of countries with restrictions and to examine the trends and characteristics of countries with such restrictions.

Methods: In 2011 information from UNAIDS was used to establish a list of countries with and without HIV restrictions on entry, stay and residence and to describe their geographical distribution. Relevant indicators were chosen using data from the Joint United Nations Programme on HIV/AIDS (UNAIDS), United Nations Development Programme (UNDP), United Nations Department of Economic and Social Affairs (UNDESA), World Health Organization (WHO), World Bank, International Labour Organization (ILO), Transparency International and Ministries of Health. We performed uni-and multivariable analysis to identify factors associated with countries that have implemented such HIV restrictions for travelers and migrants.

Results: HIV related restrictions exist in 45 of 193 WHO countries (23%) in all regions of the world. We found that the Eastern Mediterranean and Western Pacific Regions have the highest proportions of countries with these restrictions. Countries with restrictions tend to have smaller populations, higher proportions of migrants in the population, lower HIV prevalence rates and lack legislation protecting people living with HIV from screening for employment purposes, than countries without restrictions. Higher proportion of international migrants and lower HIV prevalence were associated with HIV related restrictions in multivariable analysis.

Discussion: Despite international pressure to remove travel restrictions, many countries continue to implement these restrictions for HIV positive individuals on entry and stay. Countries with a high proportion of international migrants tend to have travel restrictions - a finding that is relevant to migrant populations and travel medicine providers alike. Since 2010, the USA and China have engaged in high profile removals. This may be indicative of an increasing trend, facilitated by factors including international advocacy and the setting of a UNAIDS goal to halve the number of countries with restrictions by 2015.

FC5.3

Clinical and Epidemiological Profile of HIV Infection among Migrant vs Italian Patients in Seven Italian Centers between 2000 and 2011

G. Sulis¹, I. El Hamad², M. Fabiani³, G. Parainfo¹, G. Bozzi⁴, M. Galli⁴, C. Broglia⁵, G. Guaraldi⁵, C. Bernardini⁶, F. Maggiolo⁶, G. Rizzardini⁷, V. Vullo⁸, A. Saracino⁹, F. Castelli¹
¹University of Brescia, Institute for Infectious and Tropical Diseases, Brescia, Italy, ²Spedali Civili General Hospital, Department of Infectious Diseases, Brescia, Italy, ³Italian National Institute of Health, Rome, Italy, ⁴University of Milan, Institute for Infectious and Tropical Diseases, Milan, Italy, ⁵University of Modena and Reggio Emilia, Institute for Infectious and Tropical Diseases, Modena, Italy, ⁶Riuniti Hospital, Infectious Diseases Unit, Bergamo, Italy, ⁷Sacco Hospital, Infectious Diseases Unit, Milan, Italy, ⁸University of Rome La Sapienza, Institute for Infectious and Tropical Diseases, Rome, Italy, ⁹University of Foggia, Institute for Infectious and Tropical Diseases, Foggia, Italy

Background: The prevalence of foreigners varies widely throughout Italy with an average percentage of 8.2% according to the most recent estimates referring to regular migrants. Immigration status has a notable impact on healthcare access as well as on preventive strategies thus influencing HIV/AIDS burden.

Objective: We investigated the socio-demographical, clinical and epidemiological features of HIV-infected migrants over an 11 years period to establish the main differences with Italians.

Method: We conducted an observational retrospective study on 1506 migrants and 4230 Italians over 18 who have been followed for HIV/AIDS in seven Italian collaborating centers between 01/01/2000 and 31/12/2011. Statistical analysis was performed at the Italian National Institute of Health through SPSS Statistics 17.0 software.

Results: Patients lost to follow-up within 12 months since admission were excluded from analysis because of imbalance. Among included patients, 37.1% of migrants and 41.8% of Italians were enrolled in Brescia (where the highest immigration rate is registered). Males strongly predominated in the Italian cohort (M:F=3.6:1) while almost no gender iniquity was found among migrants. The latter were generally younger than the indigenous ones (37.1% aged 18-29) and nearly half of them came from Sub-Saharan Africa. HIV infection was usually acquired through heterosexual contacts. IDUs were considerably more frequent among Italians (26% vs 3.5%). A high proportion of patients from both cohorts were severely immunocompromised at baseline (41.1% of migrants and 36.9% of Italians were classified as late presenters). Migrants showed lower adherence to care program with a median follow-up of 53 months (IQR:30-83) vs 66 [IQR:38-96 (P< 0.001)]. Syphilis (either active or formerly acquired) was more likely in migrants (~50% homo/bisexuals); among Latin Americans 52.7% were TPHA+ and 34.8% VDRL+. No relevant differences emerged for HBV infection, while HCV was significantly more frequent among Italians (23.4% vs 5.2%). Most patients received HAART with comparable efficacy in both cohorts. However the foreign-born showed a higher propensity to treatment discontinuation (20.1% vs 13%).

Conclusion: Important socio-demographical and clinical differences emerged between migrant and Italian HIV-infected patients. Our findings highlight the need to strengthen educational and preventive strategies towards at risk populations to reduce the burden of late presenters.

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FC5.4

Prevalence of Chronic Hepatitis B Virus Infection in African Immigrants Seen At a U.S. Urban Travel Health Center

S.A. Shah¹, M. Purswani¹, S. Hagmann¹

¹Albert Einstein College of Medicine, Bronx-Lebanon Hospital Center, Bronx Center for Travel and International Health, Bronx, United States

Background: Chronic hepatitis B virus (HBV) infection is the most common worldwide cause of chronic liver disease accounting for up to half of all cases of cirrhosis and hepatocellular carcinoma. The majority of cases occur in regions of Asia and Africa where the virus is endemic. There is a lack of public health awareness of the burden of disease in the African immigrant population living in the United States.

Objectives: To examine the prevalence of chronic HBV infection among African immigrants attending a travel clinic in the Bronx, New York.

Methods: Retrospective electronic medical record review and analysis of demographic and HBV serologic data of travelers born in Africa who presented for a pre-travel consultation between Jan. 2010 and Nov. 2012. Chronic HBV infection was defined as one-time identification of hepatitis B surface antigen (HBsAg+) in serum in the absence of any clinical data suggesting acute hepatitis. Demographic and travel characteristics between HBsAg+ and HBsAg- travelers were compared by bivariate analysis.

Summary of results: Among 258 travelers born in Africa (43% male, mean age [SD] of 38 [12] years), West Africa was the predominant region of origin (n=241 [93%]). Most (n=232 [90%]) prepared for travel to Africa to visit friends and relatives. HBV serologic data was available for 196 (76%) travelers. Almost half (84/196 [43%]) had serologic evidence of prior exposure to HBV (anti-HBcAb+). Chronic HBV infection (HBsAg+), resolved HBV infection (anti-HBcAb+, anti-HBsAb+), and the isolated anti-HBcAb+ profile were noted in 37/196 (19%), 32/196 (16%), and 15/196 (8%) travelers, respectively. Vaccine-induced immunity (anti-HBcAb-, anti-HBsAb+) was found in 88/196 (45%) travelers, and 24/196 (9%) were susceptible (anti-HBcAb-, anti-HBsAb-). HBV vaccine was initiated in 13/24 (54%) susceptible travelers. HBsAg+ travelers (17/37 [46%] male) were mostly from Ghana, Guinea and Cote d'Ivoire (22/37 [60%]). Compared to HBsAg- travelers, HBsAg+ travelers were older (mean age [SD] of 41 [9] years vs 37 [13] years, $p < 0.05$).

Conclusions: Prevalence rate of chronic HBV infection among African immigrants living in the Bronx is similar to reported rates in Africa. Pre-travel clinic encounters present a unique opportunity to screen, identify, educate and link to care African immigrants in the Bronx unaware of their chronic HBV infection, and provide vaccination to those found to be still susceptible.

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FC5.5

Hepatitis B and Migrants: Should We Do Better?

M. Jaboyedoff¹, B. Genton^{2,3}, E. Masserey⁴, P. Bodenmann², R. Rimaz², S. De Vallière²
¹University of Lausanne, Lausanne, Switzerland, ²Lausanne University Hospital, Department of Ambulatory Care and Community Medicine, Lausanne, Switzerland, ³Lausanne University Hospital, Division of Infectious Diseases, Lausanne, Switzerland, ⁴Public Health Service, Canton of Vaud, Lausanne, Switzerland

Background: More than 5% of the world's population lives with chronic hepatitis B (CHB), and is at risk for liver cirrhosis and hepatocellular carcinoma. In Switzerland, asylum seekers are mostly from endemic regions but no systematic screening is proposed to them. In a resolution of 2010, the WHO encouraged not only vaccination but also screening of people at risk.

Objectives: 1) To investigate the screening policies for CHB of Swiss cantons and Western countries in the migrant population, 2) To estimate the prevalence of CHB among asylum seekers in the canton of Vaud, Switzerland, 3) To discuss possible screening strategies in this population.

Method: Public health services of the Swiss cantons and some Western countries were contacted to enquire about policies regarding screening of migrants for CHB. To assess the prevalence of anti-HBc Ab among asylum seekers, a retrospective review of health charts was conducted among 501 adult asylum seekers (canton of Vaud, 2009 - 2011). Prevalence of HBsAg was estimated by testing for HBsAg 115 anti-HBc positive adult asylum seekers (canton of Vaud, 2012). Based on these data, we developed CHB screening strategies.

Results: None of the contacted Western countries or Swiss cantons offers migrants a systematic screening of CHB, although some recommend it. 42% of asylum seekers had positive anti-HBc Ab, indicating they were or had been infected by the hepatitis B virus. 7,8% had positive HBsAg, indicating they were infected. We developed two HBsAg screening strategies that could be performed during the initial health screening: 1) Anti-HBc Ab testing, followed by vaccination when negative, by HBsAg testing when positive. 2) Rapid anti-HBs testing, followed by rapid HBsAg testing when negative, and by vaccination when negative HBsAg.

Conclusion: Knowing the high prevalence of hepatitis B in migrants, systematic screening is needed to give infected migrants access to medical care. Simple and reasonably priced screening strategies are possible. Their implementation would lower the rate of complications, as well as the transmission of the virus between migrants and to the local population. It would respond to the call of the WHO for wider implementation of screening and management of CHB.

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FC5.6

Screening for Chagas Disease in Switzerland: "One Size Fits All"?

C. Demaurex¹, M.T. Cárdenas Núñez¹, H. Aparicio², P. Bodenmann¹, B. Genton^{1,3}, V. D'Acremont^{1,3}

¹University hospital of Lausanne, Department of Ambulatory Care and Community Medicine, Lausanne, Switzerland, ²Hopital de Lavaux, Cully, Switzerland, ³Swiss Tropical and Public Health Institute, Epidemiology and Public Health, Basel, Switzerland

Background: Migration and travel has spread Chagas disease to most of the countries in the world. This led WHO to recommend screening of Latin-American migrants living in non-endemic countries to reduce morbidity and mortality and increase the chance for eradicating the disease.

Objectives: To assess the feasibility and acceptability of a screening strategy for Chagas disease for Latin-Americans living in Canton de Vaud; to estimate the number needed to test according to demographic and clinical characteristics.

Methods: From 2011 to 2012, Latin-American attending 5 outpatient facilities were proposed a rapid diagnostic test for Chagas disease, if they were or their mother was of Latin-American origin. At the blood donation center, persons who had traveled for ≥ 1 year to Latin-America were tested in addition. People were also tested in the community at events gathering Latin-Americans, in particular Bolivians. Age, sex, country of origin/travel, screening criteria, 9 symptoms/signs predictive of symptomatic Chagas disease and test result were collected prospectively.

Results: 887 persons were tested for Chagas disease: 24%, 9% and 67% in outpatient facilities, community and blood center respectively. 53%, 15% and 29% respectively were Latin-American, had a Latino-American mother and were travelers. The global prevalence of Chagas disease was 1.7% (2.5% among migrants, none of the travellers being affected) but as high as 15.5% in the community. It was 18.7%, 0.5% and 0% among Bolivians, Brazilians and other countries respectively. The 2 positive cases coming for a consultation had symptoms of Chagas disease. Testing rates at 3 of 5 facilities were only 15%, 11% and 6%.

Conclusions: The 1.7% global prevalence found was lower than that of other European countries, mostly because the proportion of Bolivians was only 10% in our study. The prevalence among Bolivians (19%) was very high which means that all of them should be tested. Regarding people from other countries, to have a symptom/sign predictive of Chagas disease could be added as criteria to decrease the number needed to test. Most of the positive cases were found in the community where efforts should thus be deployed. Strategies should also be put in place to improve testing rates, such as better targeting of people at risk, selection of people for testing by receptionists, and sensitization meetings to explain health staff the importance of Chagas disease screening, especially in pregnant women.

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FC6 Immunizations: Safety, Immunogenicity and Availability

FC6.1

Safety and Efficacy of a Patch Containing Heat-labile Toxin from *Enterotoxigenic Escherichia coli* (ETEC) against Diarrhoea in Traveler's to Mexico / Guatemala: A Randomized, Double-Blind, Placebo-Controlled Phase 3 Trial

R.H. Behrens¹, J. Cramer², T. Jelinek³, F. von Sonnenburg⁴, N. Bagul⁵, H. Shaw⁶, R. Samiento⁷, T. Weinke⁸, R. Ellahbadi⁹, D.J. Bell¹⁰, E. Asturias¹¹, M.J.L. Ruano¹², H.L.E. Pauwells¹³, R. Maxwell¹⁴, S. Dewasthaly¹⁵, D.M. Stablein¹⁶, J. Zhi-Dong¹⁷, H.L. DuPont¹⁸
¹Hospital for Tropical Diseases, Travel medicine, London, United Kingdom, ²Tropical Medicine and Bernhard-Nocht Ints, Hamburg, Germany, ³Berliner Centrum Reise & Tropenmedizin, Berlin, Germany, ⁴Ludwig-Maximilians-Universität, Abt. für Infektions- und Tropenmedizin, Munich, Germany, ⁵Synexus Lancashire Clinical Research Center, Chorley, United Kingdom, ⁶Synexus Thames Valley Clinical Research Center, London, United Kingdom, ⁷Synexus Midlands Clinical Research Center, Birmingham, United Kingdom, ⁸Klinik für Gastroenterologie & Infektiologie, Potsdam, Germany, ⁹Synexus Scotland Clinical Research Center, Glasgow, United Kingdom, ¹⁰Bio-Kinetic Europe Ltd, Belfast, United Kingdom, ¹¹Private Office, Quetzaltenango, Guatemala, ¹²Isthmian Medical Research, Guatemala City, Guatemala, ¹³IMIC Durango, Roma, Mexico, ¹⁴Insurgentes, Guanajuato, Mexico, ¹⁵Intercell AG., Vienna, Austria, ¹⁶Emmes Corp, Rockville, United States, ¹⁷University of Texas, School of Public Health, Houston, United States, ¹⁸University of Texas, School of Public Health, Houston, United States

Background: A novel dermal antigen delivery system delivering LT toxin has been developed to elicit immunity against ETEC and other causes of travellers diarrhoea (TD). Phase 2 studies suggested the system was effective at preventing TD.

Objectives: A randomized, double-blind, placebo controlled study was conducted in 20 sites, 11 in Germany and the remainder in the UK on subjects travelling to Mexico and Guatemala for a week or longer.

Primary outcome was the efficacy in preventing moderate to severe ETEC diarrhoea and secondary outcomes included identifying aetiology of and assessing the safety, tolerability, and severity of diarrhoea.

Methods: 2034 European travellers to Mexico or Guatemala were vaccinated with either 37.5 µg of heat-labile toxin from *E. coli* (LT) or a placebo patch in a 1:1 ratio. A second patch was administered 14 days later. In the destination country, subjects tracked stool output and adverse events in diaries and provided stool samples if diarrhoea occurred which were analysed for the presence of pathogens and parasites. The subjects were followed for 6 months after return. The primary end point was moderate/severe (≥4 unformed stools) diarrhoea in which LT, LT and ST or ST toxins (ETEC) were detected from diarrhoeal stool samples.

Results: Moderate/severe ETEC diarrhoea was very low in treatment and placebo arms, (all cause 12.4% & 12.3%, mod/severe ETEC 3.7% & 5.6%). The vaccine efficacy was -1.24% against all cause moderate/severe diarrhoea, 34.6% against ETEC diarrhoea and 61% (p=0.04) against LT+ alone secreting ETEC. Of the secondary endpoints, significant differences were seen in stool frequency (2.2 episodes p=0.037) and duration (days) of all-cause diarrhoeal episodes 0.8 days (p=0.008). Overall, local adverse reactions occurred in 93% of vaccine and 56% of placebo recipients. Rash and erythema (80%) and pruritus (68.5%) were the most common reactions. Hyperpigmentation persisted in 23% of the LT group at 6 month review.

Conclusion: There was a surprisingly low attack rate of TD in the cohort. Despite good immunogenicity, the vaccine failed to protect travellers against ETEC and all cause TD but some impact against LT+ ETEC diarrhoea, with a small but significant reduction in stool frequency and duration of TD from 3 days to 2.2 days. The dermal LT antigen delivery resulted in frequent local rash with some local events persisting for up to 6 months.

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FC6.2

Tick-borne Encephalitis: Long-Term Follow-up and Effect of Immunity against Japanese Encephalitis and Yellow Fever

H. Kollaritsch¹, M. Kundi², B. Laaber¹, N. Brodtraeger¹, C. Seidl-Friedrich¹, B. Schmidle-Loss¹, I. Zwazl¹, U. Wiedermann¹, M. Paulke-Korinek¹

¹Medical University Vienna, Department of Specific Prophylaxis and Tropical Medicine, Vienna, Austria, ²Medical University Vienna, Institute of Environmental Health, Center for Public Health, Vienna, Austria

Background: In the present study, long-term immunogenicity in terms of antibody titers against tick-borne encephalitis (TBE) is evaluated up to ten years after the last TBE booster dose. Furthermore, the question is addressed whether contact to any flaviviral antigen other than TBE, for example vaccination against Japanese Encephalitis of Yellow Fever, has an impact on levels of TBE antibody titers.

Methods: In 2002, 430 subjects were re-vaccinated with a single booster dose of Encepur®. The volunteers had a documented basic immunization against TBE consisting of three doses, and the interval to the last booster dose was a minimum of three years. Antibody titers were measured via neutralization test. Titers of 10 were assumed as a surrogate parameter of safe protection. Blood samples were drawn at years two, three, four, five, six, eight and ten after the TBE booster dose. In a separate analysis, antibody levels were evaluated in subjects with and without exposure to flaviviral antigen other than TBE (i.e. vaccination against Japanese Encephalitis, Yellow fever). Volunteers with antibody levels below the protective level ten years post-booster received a single booster dose against TBE.

Results: Antibody titers were measured in 178 volunteers at year 8 and cumulative seroprotection rates were 86.8%. At year ten, 183 subjects returned for blood draws and cumulative seroprotection rates were 77.3%. Antibody titers were significantly higher in subjects below 50 years of age. In volunteers with antibody levels below the protective level a single booster dose against TBE re-established protective antibody titers. Antibody levels were not influenced by previous exposure to any flaviviral antigen other than TBE.

Conclusion: Between year eight and ten, the decline of seroprotection rates against TBE was disproportionately high. However, in subjects with low antibody titers, a single TBE booster dose is highly effective. Vaccination against Japanese Encephalitis or Yellow Fever did not influence levels of antibody titers.

FC6.3

Immunity after Yellow Fever Vaccination in Travelers Using Immunosuppressive Medication

R.W. Wieten¹, G.J. de Bree¹, E.F.F. Jonker², E.M.M. van Leeuwen³, M.C. van Aalderen³, M. van Vugt¹, C. Stijnis¹, P.P.A.M. van Thiel¹, A. Goorhuis¹, L.G. Visser², M.P. Grobusch¹
¹Academic Medical Center/ University of Amsterdam, Center of Tropical and Travel Medicine, Department of Infectious Diseases, Division of Internal Medicine, Amsterdam, Netherlands,
²Leiden University Medical Center, Department of Infectious Diseases, Leiden, Netherlands,
³Academic Medical Center/ University of Amsterdam, Department of Experimental Immunology, Amsterdam, Netherlands

Background: The 17D-Yellow Fever vaccine is a live attenuated vaccine. The vaccine has been proven safe and effective; however, current guidelines advise against the vaccination of immune-compromised patients due to potential severe adverse events (SAEs). In spite of current guidelines, the 17D yellow fever vaccine is sometimes administered to individuals using immune-suppressive medication. In these patients, apart from the risk of SAEs, the immune response following yellow fever vaccinations may be suboptimal. Possibly, this population has a less durable and lower immunologic response compared to healthy controls, and more frequent revaccination might be required.

Objectives: To compare the rates of adverse events reported by immune-compromised and healthy volunteers. To compare the height and duration of antibody presence using the plaque reduction neutralization test (PRNT) and the presence and functionality of yellow fever specific T cells in peripheral blood mononuclear cells (PBMCs) in patients using various types of immune suppressive medication.

Method: Patients who had been vaccinated while using immunosuppressive medication and vaccinated healthy controls were included. We asked all volunteers about adverse events during or after yellow fever vaccination. We measured virus neutralizing antibodies in sera 1-3 months after vaccination in patients, and collected sera and harvested PBMC's after inclusion in all volunteers for T cell analysis.

Results: Fifteen immune-compromised and 36 healthy persons (38.5% male, median age 45, interquartile range 32-58) vaccinated with the 17D yellow fever vaccine were included. Forty-four volunteers (86.2%) were primo vaccinees. Out of 15 immune-compromised vaccinees, 10 (66.7%) were using methotrexate, 2 (13.3%) were using azathioprine, and 3 (20%) were using other immunosuppressive medication.

All immune-compromised vaccinees had neutralising antibodies 1-3 months after vaccination. Mild adverse events were reported in 4/15 (26.7%) of patients and in 4/36 (11.1%) of healthy controls (OR 2.9, 95%CI [0.6-13.7], $p=0.23$). The events did not cause any limitation to daily activities.

Conclusion: The 17D yellow fever vaccine was administered without any severe adverse events in our group of 51 persons that included 15 immune-compromised patients. The immune response following vaccination in patients using immunosuppressive medication may be hampered, therefore alterations in guidelines should be considered.

FC6.4

Seroconversion after Fendrix Hepatitis B Vaccination in 60 Non-responders

R.W. Wieten¹, J.W.J. Kalule-Dusseldorp¹, B.J. Visser¹, M. van Vugt¹, C. Stijnis¹, A. Goorhuis¹, M.P. Grobusch¹, P.P.A.M. van Thiel¹

¹*Academisch Medisch Centrum, Center of Tropical and Travel Medicine, Department of Infectious Diseases, Division of Internal Medicine, Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands*

Background: Risk groups for infection with hepatitis B are, amongst others, those at risk through sexual exposure, haemodialysis patients, drug users and those travelling to endemic regions.

For these groups, an effective recombinant DNA hepatitis B vaccine is available. However, 4 to 10 percent of the vaccinees do not respond with an antibody titer above the threshold of protection (anti-HBs \geq 10 IU/ml). Known risk groups for non-response are elderly vaccinees and those with an immune compromising condition. Previously it has been shown that in these non-responders, conventional hepatitis B revaccination series with Engerix® leads to seroconversion in around 50%. This demands alternative revaccination schemes. Recently, Fendrix®, a vaccine with an immune enhancer, has been described to be effective in healthy individuals and haemodialysis patients not responding to initial hepatitis B vaccination schemes. Therefore, in 2008, our department started vaccination with Fendrix® in non-responders.

Objectives: Analysis of the results of a maximum of three Fendrix® vaccinations in those who did not respond to conventional hepatitis B vaccination series in the AMC.

Method: Collection of clinical and demographic data of 77 non-responders, with and without immune-compromising conditions, vaccinated from 2008 to 2012 in the AMC department of tropical and travel medicine.

Results: Sixty individuals vaccinated with Fendrix®, who had a documented antibody response were included. Twenty-nine (48.3%) were HIV positive; four (6.7%) had another immune-compromising condition.

Seroconversion after 1 Fendrix® vaccination occurred in 22/25 (88.0%) healthy and 12/32 (37.5%) immune-compromised persons ($p < 0.001$). In 3 individuals the response was not measured. In 17 of these non-responders, second Fendrix® administration led to seroconversion in 5/7 (71.4%) healthy and 5/10 (50.0%) immune-compromised persons ($p=0.48$). Of 6 remaining non-responders (2 healthy, 4 immune-compromised) 1 healthy seroconverted (16.7%) after a third gift. Additional (>3) vaccinations did not result in seroconversion in 3 tested vaccinees.

Conclusion: Overall, the seroconversion rate after vaccination with Fendrix® was higher in healthy vaccinees compared to immune-compromised vaccinees. In those with an immune-compromising condition one Fendrix® vaccination gave protection in at least one third. Administration of Fendrix® needs to be considered in every non-responder.

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FC6.5

Initial Neutralising Antibody Response on Day 35 after Two Different Intradermal Rabies Pre-exposure Vaccination Schedules: Preliminary Unpooled Data of a Large Prospective Clinical Trial on Rabies Boostability

P. Soentjens^{1,2}, P. Andries¹, B. Damanet¹, A. Wauters¹, K. De Koninck¹, W. Heuinckx¹, L. Rémy³, E. Dooms¹, S. Van Gucht⁴, M. De Crop⁵, R. Ravinetto⁵, A. Van Gompel⁵, A. Aerssens¹

¹Military Hospital Queen Astrid, Polyclinic Department, Brussels, Belgium, ²Institute of Tropical Medicine, Clinical Sciences, Antwerp, Belgium, ³Military Hospital Queen Astrid, Hospital Pharmacy, Brussels, Belgium, ⁴Wetenschappelijk Instituut Volksgezondheid, Brussels, Belgium, ⁵Institute of Tropical Medicine, Department of Clinical Sciences, Antwerp, Belgium

Background: Rabies, a viral infection endemic in several resource-limited settings, causes almost invariably fatal encephalitis.

Objective: To investigate the serological response after primary vaccination on day 35 with 2 different intradermal rabies HDCV vaccination schedules.

Method: Belgian soldiers needing rabies vaccination pre-deployment were recruited if giving informed consent to participate. Subjects were randomized into 2 groups: a classical 28-days intradermal schedule (day 0: 1 x 0.1 ml, day 7: 1 x 0,1 ml, day 28: 1 x 0,1 ml) or an abbreviated 7-days intradermal schedule (day 0: 2 x 0.1 ml, day 7: 2 x 0,1 ml). Boostability on day 7 after intradermal booster vaccination (0,1 ml) was defined as the primary endpoint of the clinical trial (analysed at the end of the trial in 2016). Neutralizing antibody titers Rapid Fluorescent Focus Inhibition Test (RFFIT) against rabies were tested on day 0 and 35 days after the first vaccination in both groups. A titer $\geq 0,5$ IU/ml is considered to be protective. A titer > 10 IU/ml is considered to give long-lasting immunity. This open-label study is registered at clinicaltrials.gov NCT 013889885 and EUDRACT 2011-001612-62.

Results: 411 subjects, out of 480 planned, are recruited so far. Preliminary results of 285 subjects are available (age range: 18-47 yrs, gender: 95 % male, N = 285) from October 2011 until December 2012. Preliminary Unpooled Data on day 35 showed:

- 285 of 285 subjects (100%) have RFFIT above 0,5 IU/ml;
- 216/285 subjects (76%) have a long-lasting immunity with RFFIT above 10 IU/ml;
- 65/285 subjects (23%) have a RFFIT between 3.0 IU/ml and 10 IU/ml;
- 4/285 subjects (1%) have a RFFIT between 0.5 IU/ml and 2,9 IU/ml.

Conclusion: Preliminary Unpooled Data show that 100% of subjects had a sufficient initial antibody response on day 35: a surrogate marker for rabies protection. We hypothesize after evaluation of preliminary unpooled data that both intradermal regimens could have a similar effect on the Initial Neutralising Antibody Response on day 35.

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FC6.6

The Global Availability of Rabies Immune Globulin and Rabies Vaccine: A Survey of U.S. Embassy Medical Personnel

E.S. Jentes¹, J. Blanton², K. Johnson¹, B. Petersen², M. Lamias³, K. Robertson², R. Franka², D. Muhm⁴, C. Rupprecht², N. Marano¹, G.W. Brunette¹

¹Centers for Disease Control and Prevention, Division of Global Migration and Quarantine, Atlanta, United States, ²Centers for Disease Control and Prevention, Division of High-Consequence Pathogens and Pathology, Atlanta, United States, ³Centers for Disease Control and Prevention, Office of Informatics, National Center for Emerging and Zoonotic Infectious Diseases, Atlanta, United States, ⁴US Department of State, Office of Medical Services, Washington, United States

Background and Objective: Rabies is globally endemic and poses a risk to international travelers. To better advise travelers, we assessed the global availability of rabies vaccine (RV) and rabies immune globulin (RIG) by querying medical personnel at U.S. embassies worldwide.

Methods: We distributed a 20-question online survey to approximately 200 U.S. Embassy medical personnel from February 1 to March 30, 2011. Respondents were asked to provide information for 2010, and results were compiled by region.

Results: One hundred twelve responses were analyzed; responses primarily came from West, Central, and East Africa (23%), Eastern Europe/Northern Asia (16%), East/Southeast Asia (14%), and Western Europe (13%). The average annual number of traveler inquiries to responding embassies for any health issue was 99; however, the average number for rabies-specific inquiries was 2. Rabies-specific inquiries varied by region [e.g., Mexico/Central America/Caribbean responses ranged from 0 to 35 and West, Central, and East Africa from 0 to 12]. RIG was reported as often/always accessible for 7 (70%) of 10 respondents in Eastern Europe/Northern Asia, 7 (58%) of 12 in East/Southeast Asia, and 1 (8%) of 12 in West, Central, and East Africa. Of 66 total respondents, 37 (56%) reported human RIG, 8 (12%) reported equine RIG, and 23 (35%) did not know the type of RIG used locally. RV was often/always accessible for 11 (73%) of 15 respondents in Eastern Europe/Northern Asia, 9 (75%) of 12 in East/Southeast Asia, 5 (83%) of 6 in Middle East/North Africa, and 8 (42%) of 19 in West, Central, and East Africa. The most commonly reported RV was Vero cell (30%), followed by purified chick embryo cell (28%) and human diploid cell (24%).

Conclusions: U.S. Embassy medical staff report that availability of RV and RIG for travelers potentially exposed to rabies varied by geographic region. All travelers should be informed that RIG and RV might not be readily available at their destination and that they should purchase travel medical evacuation insurance before departure. Travelers should be educated to avoid animals; clean all animal bites, licks, and scratches thoroughly with soap and water; and seek medical care immediately, even if overseas.

FC7 Airline, Altitude and Study Methods

FC7.1

In-flight Medical Incidents, Deaths and Flight Diversions of South African Airways Flights from 2009 till 2011

S. Parker¹, T.S. Nkwanyana²

¹South African Society of Travel Medicine (SASTM), Johannesburg, South Africa, ²South African Airways, Medical Services, Johannesburg, South Africa

Aim: Modern aircrafts can carry up to 800 passengers and fly more than 18 hours. The travel industry projects 3.3 billion air travellers by 2014, of whom 1.3 billion will undertake international journeys. In-flight emergencies are reported to occur in 1:10 000 to 1:40 000 passengers, which equates to 25-100 per million passengers, though figures of up to 867/million have been reported. Diversions are costly and extremely inconvenient. Appropriate measures can be undertaken when the nature of emergencies and causes of diversions are known.

Methods: The data of South African Airways (SAA), the country's national carrier, for the three year period 2009-2011 was reviewed. Comparisons with other airlines were problematic as data was either not obtainable or differently presented. It was noted that SAA has well stocked emergency medical kits and well automated external defibrillators on all its aircrafts.

Results: In-flight medical events were documented as: 139 events/million passengers (1008 cases) for 2009; 159/million (1130) for 2010 and 165/million (1141) for 2011, averaging 154/million per year. Cathay Pacific had figures of 163/million for 2005 and an Oceania airline documented 159/million for the period 1996-2004.

Cardiovascular cases accounted for 1124 (34%) of cases, followed by 727 (22%) gastrointestinal, 302 (9%) musculo-skeletal, 223 (7%) respiratory, 202 (6%) central nervous system and 98 (3%) metabolic of the 3279 cases encountered on SAA flights 2009-2011.

SAA cabin crew handled 74% of incidents. Medical passenger volunteers assisted in 26% of cases in 2009 and 2010, and in 22% of cases in 2011.

One medical diversion occurs per 20 000 flights globally, with 40% being unjustified. SAA had one flight per 33 313 flights rerouted for the three year period. Five of the 3279 medical incidents on SAA flights for the three years led to diversions (0.15%); Cathay Pacific had 0.35% of events leading to diversions in 2005, with other airlines reporting figures of between 2.8% to 13%.

There were 3 deaths on SAA flights in 2009 (0.55/million passengers), 2 in 2010 (0.56/million) and one in 2011 (0.14/million). Cathay Pacific had figures of 0.24/million and 0.58/million for 2002 and 2005 respectively.

Conclusion: Medical emergencies are rare events and the vast majority are competently handled by cabin crews. SAA avails its medical kit to volunteer medical passengers who assist in a quarter of medical events.

FC7.2

Incidence of Serious Altitude Sickness in Travelers who Consulted a Pre-travel Clinic

M. Croughs^{1,2}, A. Van Gompel², J. Van den Ende²

¹GGD Hart voor Brabant, Travel Clinic, 's-Hertogenbosch, Netherlands, ²Institute of Tropical Medicine, Department of Clinical Sciences, Antwerp, Belgium

Background: In a previous study was found that 25% of clients of a travel clinic, who climbed $\geq 2500\text{m}$, suffered from acute mountain sickness. But it was unknown which part of them suffer from serious forms of altitude sickness. In the same study it appeared that not more than half of these travelers adhered to the received advice regarding altitude sickness. Following the results of this study the national guidelines regarding altitude advice in Belgium and The Netherlands were revised. For instance the advised preventive dosage was increased to 250 mg two times a day (or 7 mg/kg/day).

Objective: We intended to study the incidence of serious altitude sickness and its relation with the adherence to the current preventive and curative advice.

Method: Travelers who consulted a pre-travel clinic from November 2011 until December 2012 and who planned to stay at an altitude of 3000 meter or more were asked to keep a diary at altitude. Serious altitude sickness was defined as serious acute mountain sickness with a score ≥ 6 and/or high altitude cerebral edema according to the Lake Louis Consensus and/or threatening high altitude pulmonary edema. The latter was defined as the presence of dyspnoea at rest and cough or weakness.

Results: In the preliminary analysis of the first 101 diaries the incidence of serious acute mountain sickness with a score ≥ 6 was 19%, of high altitude cerebral edema 20% and of threatening high altitude pulmonary edema 5%. In total 31% of these travelers suffered from serious altitude sickness. The final analysis on incidence of serious altitude sickness and its relation with the adherence to our travel advice will be performed in April 2013 when the sample will have enough power.

Conclusion: Serious altitude sickness is a very common problem in travelers who consult a pre-travel clinic. Its relation with the adherence of pre-travel advice, including the use of acetazolamide, will be analyzed in April 2013.

FC7.3

The Diagnosis of Juvenile Acute Mountain Sickness (AMS)

T. Shinozuka¹, Japanese Society of Travel Medicine

¹*Japanese Society of Travel Medicine, Shibuya-ku, Japan*

Few surveys on Acute Mountain Sickness (AMS) in children have been conducted. This paper reports on a recent survey of AMS conducted in the field in August 2012 on 113 children who were attempting to climb to the summit of Mt. Fuji, 3,776.24 meters above sea level. The children, ranging in age from 5 to 12, had just completed a hiking trip on Mt. Fuji and were surveyed for symptoms of AMS using a Lake Louise Consensus Scoring System. The relationship between the children's sleeping points (altitude) before attempting to reach the summit and the incidence of AMS was also studied. From the test group of 113 children, 55 children (49%) surveyed tested positive for AMS. Relatively high percent of the investigated children who stayed at high altitude reported varying degrees of sleep disorder. Furthermore, the results of the survey indicated that the occurrence of AMS rates among the 113 children varied according to their sleeping points (altitude), peaking at 2,305m, 2,750m and 3,350m with an AMS rate of 9%, 25% and 56% respectively. From the survey we can conclude 1) there is a relationship between the relatively low percentage of children reaching the summit and incidence of AMS, and 2) the sleeping point (altitude) played a significant role in the incidence of AMS.

Abstracts - Free Communication Sessions

FC7.4

The Role of Travelers from South East Asia on Dengue Activity in Singapore

E. Massad¹, J. Rocklov², A. Wilder-Smith³

¹University of Sao Paulo, Sao Paulo, Brazil, ²University of Umea, Umea, Sweden, ³National University of Singapore, Singapore, Singapore

Background: Singapore, an island state in South East Asia with a population of about 5 million, is endemic for dengue. This country experienced a pronounced series of dengue outbreaks from 2002 to the present, the worst of which was in 2005 with more than 14,000 cases. Singapore receives about 10 million visitors per year, of which about 3 million come from South East Asia countries, a highly endemic dengue area. Despite good vector control in Singapore, dengue outbreaks are increasing in size and frequency. Climate change/global warming is often blamed for the rise in dengue activity. We investigated the association between the annual incidence of dengue in Singapore and weather factors as well as incoming travelers.

Method: We used a Poisson Regression Model that considered the annual number of dengue cases as dependent variable and premisses index, rainfall, mean, maximum and minimum temperature, and the number of visitors from Southeast Asia as independent variables. The univariate Poisson Regression Model (PRM) were based on the following model: where, is the dependent variable, represents the range of the independent variables and and are estimated coefficients. The period of time analysed was from 1974 until 2011.

Results: The only variable significantly associated with the annual incidence of dengue was the number of visitors from South East Asia countries.

Conclusion: Climate change/weather does not play a significant role in Singapore, at least not in the last decade. The number of visitors from dengue endemic South East Asia countries is associated with dengue activity which suggest that at least a fraction of the incidence of dengue can be due to the continuous introduction of imported viruses strains from endemic countries.

Abstracts - Free Communication Sessions

FC7.5

Analyzing GeoSentinel Surveillance Data: A Comparison of Methods to Explore Acute Gastrointestinal Illness among International Travelers

K.E. Mues¹, D.H. Esposito², P.V. Han², E.S. Jentes², M.J. Sotir², C. Brown²

¹Emory University, Epidemiology, Atlanta, United States, ²Centers for Disease Control and Prevention, Travelers' Health Branch, Division of Global Migration and Quarantine, Atlanta, United States

Background: GeoSentinel is a provider-based network of travel medicine clinics that conducts global morbidity surveillance among ill international travelers. Because of the lack of a proper denominator, GeoSentinel analyses have relied on proportionate morbidity (PM) calculations, but PM cannot estimate disease risk and is prone to distortion by the numerator's influence on the denominator. Furthermore, the proportionate morbidity ratio (PMR) requires stringent assumptions to be an estimate of the risk ratio (RR). Using a case-control design to analyze GeoSentinel surveillance data and to calculate the reporting odds ratio (ROR) may have advantages over past approaches.

Objective: To compare case-control and PM analysis methods of GeoSentinel surveillance data.

Methods: A matched case-control design was used to calculate the ROR exploring associations between regions of travel and acute gastrointestinal illness (AGI) among international travelers who visited a GeoSentinel site during 1997 to 2011. To represent the base population's exposure distribution, controls were sampled from other ill persons who were in one of the following 3 syndrome groups: respiratory illness, febrile illness, and dermatologic conditions. Cases were matched to controls by GeoSentinel site and diagnosis date. The PM analysis used all GeoSentinel diagnoses in the denominator who met inclusion criteria.

Results: There were 9,847 AGI case-patients and 33,516 non-AGI patients. Our control definition resulted in 17,521 controls. Matching resulted in 8,486 pairs. All analyses found that the association with AGI diagnoses was greatest among those who traveled to middle-income regions (matched ROR=3.38 [2.94, 3.88], PMR =2.30 [2.10, 2.52]) compared with high-income regions. The association was highest among those who traveled to North Africa (matched ROR=7.89 [6.19, 10.06], PMR=3.23 [2.82, 3.69]) and South Central Asia (matched ROR=6.06 [4.95, 7.42], PMR=3.02 [2.66, 3.42]) compared with North America and Western Europe.

Conclusions: RORs from the matched case-control analyses were farther from the null than PMRs, suggesting the PMRs may underestimate the measure of association. Steps are needed to define the base population, with controls selected to best represent the exposure distribution in the base population. We conclude that matched case-control RORs offer advantages and may be preferred for single-disease analytical studies using GeoSentinel surveillance data.

FC7.6

Pilot Randomised Controlled Trial to Testing Facemasks Effectiveness in Preventing Influenza-like Illness Transmission among Hajj Pilgrims

O. Barasheed¹, H. Rashid¹, I. Ridda^{1,2}, L. Heron¹, E. Haworth³, D. Dwyer^{2,4,5}, R. Booy^{2,4,6}, Hajj Research Team

¹National Centre for Immunisation Research and Surveillance, Westmead, Australia, ²The University of Sydney, Sydney Medical School, Sydney, Australia, ³Oxford University, The Department of Public Health, Oxford, United Kingdom, ⁴The University of Sydney, Sydney Emerging Infections and Biosecurity Institute, Sydney, Australia, ⁵Westmead Hospital, Centre for Infectious Diseases and Microbiology Laboratory Services, Westmead, Australia, ⁶National Centre for Immunisation Research and Surveillance, Clinical Research, Westmead, Australia

Background: Trials using facemasks to prevent influenza have been inconclusive because of small sample sizes. The Hajj pilgrimage in Mecca provides an excellent opportunity to test the effectiveness of masks against laboratory-proven influenza and other viruses, where the incidence of these infections is high.

Objectives: To assess the effectiveness of face masks in the prevention of transmission of influenza-like illness (ILI) among Australian Hajj pilgrims a pilot trial was conducted at the Hajj 2011.

Methods: During the first day of Hajj (4 November 2011), tents were randomly assigned to 'mask' or 'control' (no mask). Pilgrims who developed symptoms of ILI for ≤ 3 days were recruited as 'index cases'; healthy pilgrims who slept closely to them were recruited as 'close contacts'. Simple surgical facemasks were provided to the index cases and their close contacts in the 'mask' tents, whereas no masks were provided to the 'control tents'. Pilgrims in both groups were provided diaries to record their respiratory symptoms. Nasal or pharyngeal swabs were collected from the index cases and close contacts who developed symptoms suggestive of ILI for point-of-care and molecular tests.

Results: Twenty two tents were randomized to 'mask' (n=12) or 'control' (n=10). A total of 164 pilgrims were recruited: 75 in 'mask' and 89 in 'control' group. In the 'mask' group 25 (33.3%) were males with the median age being 48 (range 19-80) years. In the 'control' tents 46 (51.7%) were males with the median age being 42 (range 17-72) years. Mask use compliance was 76% in the 'mask' group and 12.4% in the 'control' group. Based on ILI criteria, less number of contacts were symptomatic in the 'mask' tents compared to the 'control' tents (13.9% [5/36] versus 32.15% [17/53], p= 0.07). However, laboratory results show that only 4 contacts in 'mask' tents had proven viral infection (rhinovirus in 3, both influenza and rhinovirus in one) while only 2 contacts in 'control' tents had viral infection (rhinovirus in both).

Conclusion: Not surprisingly, the result of this pilot trial is inconclusive, but it shows that a large trial to assess the effectiveness of mask use at Hajj is feasible.

Late Breaker Special Session: Updates on JE Vaccines and Ongoing Outbreak of Sarcocystosis

LBS1.4

A Family Cluster of Sarcocystosis in Travelers Returning from Tioman Island, Malaysia, Including a Histologically Proven Case with Results of Treatment

L. Epelboin^{1,2}, A. Pérignon¹, F. Caby¹, T. Maisonobe³, F. Bricaire^{1,2}, E. Caumes^{1,2}

¹Groupe Hospitalier Pitié-Salpêtrière, Infectious and Tropical Diseases Department, Paris, France, ²Université Paris 6, Faculté de Médecine, Paris, France, ³Groupe Hospitalier Pitié-Salpêtrière, Neuropathology Department, Paris, France

Background: Sarcocystosis is mainly described in travelers returning from Tioman Island, Malaysia. However reports are scarce or poorly documented without clear proof of the diagnosis or idea about the response to treatment.

Objective: We describe a cluster of 3 travelers including a case proven by muscular biopsy and describe the response to various antiparasitic treatments.

Cases report: Two brothers, 1 sister-in-law and 2 sisters (23 to 37 years old) travelled for 3 weeks in Malaysia in June 2012. The journey on Tioman Island lasted 5 days in a beach hut in the village of Juara where they all ate the same food alternatively.

Four days after leaving Tioman, one sister presented aqueous diarrhoea, nausea and fever followed 2 days later by high fever, myalgias and asthenia. When she consulted one month later for persistence and worsening of symptoms, the eosinophil count was $0.7 \times 10^9/L$, whereas CPK and ASAT were normal. All the biological diagnosis tests were negative. The diagnosis of occult strongyloidiasis was raised and she received ivermectin (12 mg once) without effect. Nine days later, the eosinophil count rose to 1.35 G/L whereas muscular enzymes increased to 226 IU/L for CPK, 10.9 IU/L for aldolase and 46 IU/L for ASAT. A muscular biopsy showed myositis with focal myofiber necrosis, mild interstitial eosinophilic, lymphohistiocytic infiltrates and intramuscular *Sarcocystis* sp. cysts. Fever disappeared but myalgias, diarrhea and asthenia continued during more than 3 months, with eosinophil count, CPK and aldolase rising up to 1.574 G/L, 628 IU/L and 12.8 IU/L respectively. Meanwhile she received albendazole (800 mg/d, 1 week) followed by trimethoprim-sulfamethoxazole (400/80 mg twice a day, 1 week) without efficacy. A colonoscopy was normal. On day 150, all the symptoms had almost completely improved except mild myalgias and asthenia.

Her two brothers presented similar but milder symptoms lasting 3 months and 10 days respectively. The two other family members were not symptomatic.

Conclusion: This family cluster includes a biopsy-proven case. It shows the large clinical spectrum of sarcocystosis in humans. The incubation period varied from 4 to 30 days. None of the 3 antiparasitic treatments (ivermectin, albendazole and trimethoprim/sulfamethoxazole) was efficient. The patients recovered spontaneously.

Abstracts - Free Communication Sessions

LBS1.5

Cluster of Acute Muscular *Sarcocystis*-like Infection in 12 Travelers Returning from Peninsular Malaysia, 2012, Bordeaux, France

D. Nguyen¹, M.-C. Receveur¹, D. Malvy¹

¹*Travel Clinics and Division of Tropical Medicine and Clinical International Health, Department of Infectious and Tropical Diseases, University Hospital Pellegrin, University of Bordeaux Segalen, Bordeaux, France*

Background: An outbreak of muscular *Sarcocystis*-like illness has been evidenced since summer 2011 among travelers after visiting Tioman Island, Malaysia. As of November 2012, GeoSentinel, working with TropNet, has been notified of 100 reported patients. A cluster of 12 patients returning since summer 2012 were seen in Bordeaux, France.

Objective: We describe the cluster of diseased travelers seen in Bordeaux, France and highlight the clinical insights and treatment issues of the disease.

Methods: Cases were defined as travelers returning from Malaysia with persisting myalgia, unexplained blood eosinophilia, elevated CPK levels and negative trichinellosis serology.

Results: In the period of September-October 2012, a cluster of 12 cases (7 male, 5 female; aged 11-46 years) were referred. All spent their vacation from 28 July to 25 August 2012 on the east coast of peninsular Malaysia and belonged to a tourist group from south western France. The group was composed of 4 families. Of note, the 3 members of one family declined the optional 4-day stay on Tioman Island and were instead moving on the neighbouring Perhentian place. Almost all patients presented high-grade fever, fatigue, headache, moderate-to-severe myalgia and arthralgia. Three cases experienced febrile illness for more than 14 days. Two patients had suffered from diarrhoea and maculopapular rash. A muscle biopsy from one patient revealed intense myositis, but no intramuscular cysts. Half of patients healed using usual antalgic treatments. Six patients were given empirically albendazole 400 mg b.i.d for 7 days and oral prednisone (0.5 mg/Kg/day) for 3 days tapered over 2 days. Six weeks later, four patients were still unrecovered. Prolonged manifestations were mainly asthenia and myalgia. The patients were effectively treated with additional prednisone 0.5 mg/Kg/day for 5 days and decreasing dosage over 14 days. All patients were reported to GeoSentinel and TropNet was informed.

Conclusion: The cluster of 12 diseased travelers living in south western France mainly contributed to the 65 patients returning from Malaysia who represent the second wave of an outbreak of acute muscular *Sarcocystis*-like illness. With little known about this disease, our experience suggests that late manifestations may occur and short term corticosteroid course could benefit symptomatic patients.