PO01.01

Efficacy of *Ipomea pes-caprae* Ointment as an Add-on Therapy in Patient with Jellyfish Dermatitis

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**Background:** Jellyfish dermatitis is a common skin problem among travelers who expose to seawater. In the tropics, the plant, *Ipomea pes-caprae* has been known as an effective herbal treatment for jellyfish dermatitis. However, no clinical trial has been done to prove its efficacy.

**Objective:** To prove the efficacy of *Ipomea pes-caprae* ointment as an add-on therapy in patient with jellyfish dermatitis

**Material and method:** This was an open label, prospective, test of superiority efficacy trial of *Ipomea pes-caprae* ointment in patient with jellyfish dermatitis. Adult patients with the onset of dermatitis less than 7 days were eligible to the study. The investigator divided the dermatitis area of each patient into two parts (Test and Control). Each patient received standard medical treatment depended on the severity of dermatitis in both areas. *Ipomea pes-caprae* ointment was applied as an add-on only to the “test area”.

Patients were asked to come for follow up 6 times in the 28-days study period. Primary outcome was time to non-active skin lesion while the secondary outcomes were the duration of pain and itching due to jellyfish dermatitis.

**Result:** Forty-eight patients (19 males, 29 females) with jellyfish dermatitis were enrolled in this study. Their median age was 31 years, 72.9% of participants exposed to jellyfish on the day of enrollment. Nearly all patients (89%) received topical steroid, 50% received oral antihistamine while 10% received oral prednisolone as standard treatment. All participants applied *Ipomea pes-caprae* ointment for only test area. Time to non-active skin lesion in test and control area were 5.52 days, 5.93 days, respectively (p=0.057). There was no different in duration of pain between test area and control area (4.15 VS 4.37 days, p=0.192). However, duration of itching in test area was significantly less than the control area (3.30 VS 3.77 days, p=0.04). Overall skin outcomes were recovery without scar (59%), hyperpigmentation(35%) and healing with scar (7%). There was no statistical significant in test and control area.

**Conclusion:** The current result could not demonstrate the efficacy of *Ipomea pes-caprae* ointment in the treatment of jellyfish dermatitis. However, this ointment was effective in reducing the duration itching.
PO01.02
Analysis of the Quality of Web-based Pre-travel Health Advice for Prospective Travellers to High Altitude

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Background: Travel to altitude carries health risks, including the development of potentially fatal high altitude illness. A high degree of self reliance is critical in a wilderness environment and this is particularly so at high elevations, where facilities are often rudimentary and the remoteness of the
location may hamper any attempts at rescue of an incapacitated traveller. It is important that individuals who engage in adventure travel to high altitude be fully aware of the dangers inherent in this activity, be familiar with the presentation of high altitude illness, and be prepared to take appropriate action if they or a travelling companion become unwell. There is a responsibility on expedition providers to educate trekkers on the health risks they face. Little has been published about the quality of such advice provided.

**Objective:** This study aimed to evaluate the health advice given to travellers on websites promoting high altitude treks.

**Method:** Active websites advertising high altitude treks were identified. Each website was interrogated to extract information relating to the specific advice provided about altitude illness and its prevention. Websites were also examined to determine if prospective trekkers would have access to a portable hyperbaric chamber.

**Results:** Of 74 eligible websites analysed, 81% referred to altitude travel risks. Seventy percent mentioned acute mountain sickness while 30% discussed high altitude cerebral or pulmonary oedema. Sixty-two percent advised gradual acclimatisation to altitude. Over a third discussed the use of a portable hyperbaric chamber while a quarter of sites provided information about drugs used to manage altitude illness. Forty-two percent invited clients to share their medical history, while 39% stated that an expedition doctor would be available. The overall mean score of the websites (maximum 20) was 9.01, based on an aggregate of the 20 variables examined.

**Conclusion:** This study yields valuable information about the extent of pre-travel health advice provided by trekking companies to prospective clients. Deficiencies are revealed regarding severe high altitude illness, and access to an expedition doctor and hyperbaric chamber. Companies should make every effort to inform and protect these vulnerable travellers.

**PO01.03**

Emergency Medical Management of Air Embolism & Arterial Gas Embolism in SCUBA Divers

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Air embolism results from vascular occlusion due to a significant amount of air trapped in a patient’s bloodstream, representing a leading cause of death among SCUBA divers, perioperatively and other patients usually undergoing invasive procedures. Arterial Gas embolism (A.G.E.), leads to Cerebral Gas Embolism (C.G.E), when gas bubbles traverse the blood brain barrier resulting in CVA, Cerebral edema, seizures, and multitudes of focal neurological deficits. Venous Gas embolism (V.G.E), involves air or gas bubbles occluding veins, and is usually non-fatal, unless bubbles gain access to systemic circulation. We elucidate the clinical features, dire consequences and preventive measures of air and arterial gas embolism distinguished by whether ambient air vs. a mixture of pressurized gases is utilized by divers and other patients.

The Pathophysiology, Signs & Symptoms, several diagnostic modalities deployed in rapid triage of this life-threatening constellation of syndromes are reviewed. We explore evidence-based preventative measures and therapeutic modalities, effective forms of supplemental oxygen therapy, proper patient positioning, thereby preventing propagation of air bubbles, through a Patent Foramen Ovale (PFO) which may be present in 27-30% of the population, potentially resulting in coronary vascular occlusion, Myocardial infarction and dangerous dysrhythmias. Additional ominous clinical consequences of vascular occlusion in the CNS, Kidneys or extremities lead to necrosis and eventual organ failure, without timely triage.

Breath-holding during accelerated rapid ascent after a prolonged deep dive, with a paucity of residual gases remaining and dangerous pressure gradients arising from indiscriminate high altitude air travel shortly before or after diving must be avoided. Meticulous adherence to NAVY Dive tables, compliance with Diver Alert Network (DAN) guidelines must be followed thus ensuring maximal survival rates. A rapid triage sequence is imperative limiting long-term disability, expedient diagnosis, prudent use of diagnostic modalities, without delay of the formidable and measurable benefits of Hyperbaric Oxygen Therapy (HBOT) and facilitation of safe transport to tertiary referral centers, equipped for administering HBOT.
Enteric Infections

PO02.01
A Placebo Controlled Pilot Study of Dietary Nitrate as Beetroot Juice, in the Prevention of Traveller's Diarrhoea

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Background: Diarrhoea and gastrointestinal disease are frequent causes of morbidity in travellers to developing countries. Dietary nitrate is absorbed into the circulation through the gut, then concentrated and secreted in saliva. Nitric oxide is generated in the mouth and stomach and an 'entero-salivary' circulation of nitrate undergoes sequential reduction to become nitric oxide in the stomach. The presence of gastric acid and nitric oxide has been shown to be a potent bactericidal combination against most enteric pathogens, including viruses and bacteria.

Objectives: A placebo controlled study of beetroot juice containing high levels of nitrate versus nitrate depleted juice in the clinical prevention of traveller's diarrhoea in a cohort of individuals visiting Everest base camp in Nepal.

Methods: 40 healthy participants (Aged 14-18) were randomised to either 140mls of beetroot juice containing 8.06 - 9.17 mmol of nitrate or a low nitrate appearance similar drink, daily. Stool frequency, consistency and other abdominal and constitutional symptoms were recorded using a study diary. Main outcomes were diarrhoea attack rate, duration of illness and length of incapacity.

Results: A non-significant difference in attack rate of diarrhoea of 33% and 31% (7 intervention and 6 control) OR of 1.056 in the groups. Odds of having loose stools was 3.2 (CI: 1.2 - 8.7) in the intervention group compared with 1.7 (CI: 0.7 - 4.3) OR of 1.9 (χ² p=0.369). There was a 53% reduction in the duration of diarrhoea in the intervention group from 86.5 hours to 40.6 hours (p>0.05) and a mean reduction of 46 hours of diarrhoea. A reduction in the mean number of days lost to diarrhoea in the intervention group was 2.43 days compared to 4.5 days in the control. There was no significant difference in the severity of diarrhoea between either group.

Conclusion: Dietary nitrates, through the entero-salivary circulation and symbiotic generation of nitric oxide contribute to the body's innate gastrointestinal defence. Despite not having as clear-cut effect as with antibiotic chemoprophylaxis in this pilot study, nitrates could with further research, be a safely taken dietary prophylaxis against traveller's diarrhoea, reducing the need for antimicrobial agents.

PO02.02
Norovirus Outbreak at a Resort Hotel - United States Virgin Islands, 2012

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Background: Norovirus is highly infectious, environmentally persistent, and the leading cause of acute gastroenteritis outbreaks. On April 17, 2012, CDC was requested to assist in investigating an outbreak of gastrointestinal illness among guests and employees of a resort (Hotel A) in St. Thomas, US Virgin Islands.

Objectives: To determine the etiology, describe the extent of the outbreak, and identify the likely source.

Methods: Cases were defined as ≥3 episodes of loose stools and/or ≥1 episode of vomiting in 24 hours, in an employee or guest of Hotel A, with onset on or after April 1, 2012. Confirmed cases had a stool sample positive for norovirus by real-time reverse transcription-polymerase chain reaction (RT-qPCR). Employees who met the case definition were interviewed and asked to submit stool samples.
Hotel guests, were contacted and asked to complete an online survey aimed to identify cases, potential exposures and estimate quality adjusted vacation days (QAVD) lost.

**Results:** Of 20 employees that met the case definition, 18 were interviewed. Eighty six guests responded to the survey, among which 46 (53%) met the case definition. The first reported illness onset occurred in a hotel employee on April 8, while the first reported onset in a guest occurred on April 13 (figure). An employee suffered a public diarrhea event on April 13 in the central kitchen, followed by illness onset in the next day among employees that assisted with the clean-up. We estimated 59 QAVDs were lost by 43 guests (1.37 days/patient). Using an approximate cost of $450 per vacation day, we estimated indirect illness cost at $616.50 per case. Seven (64%) of 11 stool specimens collected from ill employees tested positive for norovirus, subsequently genotyped as GII.4 Den Haag.

**Conclusions:** Norovirus was identified as the cause of this outbreak, affecting at least 53% of guests of Hotel A. Due to timing of events, illness among employees was suspected as the source of the illness among guests. Ill employees, particularly those working in food service, should be excluded from work for ≥48-72 hours after resolution of symptoms.

**Figure:** Date of illness onset for Hotel A employees (blue) and guests (red)—United States Virgin Islands, 2012.

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**PO02.03**

Enteric Fever in 3 Vaccinated Portuguese Travelers Returning from India

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**Introduction:** Enteric fever (EF), caused by either *Salmonella Typhi* or *S. Paratyphi*, is rarely diagnosed among us. In returning travelers from developing countries the estimated incidence is from 3-30 cases/100,000 travelers. Polysaccharide Typhoid Vi Vaccine efficacy on preventing EF is estimated from 50 to 80%.

**Aim:** To describe 3 EF cases in vaccinated back-pack travelers returning from India.
Methods: We retrospectively accessed to clinical data of the patients admitted with imported EF, from 1984-2014, selecting those who were previously vaccinated with EF Polysaccharide Vi Vaccine. Demographic, laboratory, clinical and treatment features were analyzed.

Results: From the 7 travelers with EF, the 3 vaccinated for the disease were Portuguese healthy young adults (aged 21-27 years-old) who were also vaccinated for Hepatitis A plus B and have done malaria chemoprophylaxis. They have traveled across India, including rural areas. Cases are depicted on the table.

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Trip’s duration (days)</th>
<th>Days of symptoms before admission</th>
<th>Symptoms: Malaise, fever, bloody diarrhea</th>
<th>Signs: Mucosal dehydration, Cervical-axillary lymph nodes, Abdomen diffusely tender/ Rash</th>
<th>Hepato/ splenomegaly</th>
<th>Blood cultures/Stool cultures</th>
<th>Widal Test</th>
<th>Resistance to fluoroquinolones</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60</td>
<td>21</td>
<td>Yes</td>
<td>Yes/No</td>
<td>No/No</td>
<td>S. Paratyphi a/Negative</td>
<td>Negative</td>
<td>Susceptible</td>
<td>Ceftriaxone+Azytromycin</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>11</td>
<td>Yes</td>
<td>Yes/No</td>
<td>Yes/No</td>
<td>S. Paratyphi a/Negative</td>
<td>1/100</td>
<td>Susceptible</td>
<td>Ceftriaxone+Azytromycin</td>
</tr>
<tr>
<td></td>
<td>210</td>
<td>4</td>
<td>Yes</td>
<td>Yes/No</td>
<td>No/Yes</td>
<td>S. Paratyphi a/Negative</td>
<td>Negative</td>
<td>Resistant</td>
<td>Co-trimoxazol</td>
</tr>
</tbody>
</table>

[Table 1 - Patients Description]
Screening tests for malaria, Q fever, toxoplasma acute infection, and syphilis were negative. Despite transitory hepatitis during Patient A’s stay, the outcome was favorable in all patients.

Conclusions:
1. Enteric fever remains a possible cause of fever in returned travelers, even for those who report having been immunized, as vaccine does not confer protection for *S. Paratyphi*.
2. Pre-travel advice should always include EF precautions, especially when it comes to young backpack travelers.
3. Widal test was negative in 2 patients.
4. Resistance to fluoroquinolones was found in one patient.
5. Concerning *S. Paratyphi*, drug resistance and lack of effective vaccination suggests that this infection may become a concern.

PO02.04
Phenotypic Characterization of Enterotoxigenic *Escherichia coli* (ETEC) Isolates Obtained from International Travelers with Diarrhea to India and Latin America and a Pediatric Population from USA

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Background: Enterotoxigenic *Escherichia coli* (ETEC) is the most common bacterial cause of diarrheal disease in children in developing countries and the major cause of diarrhea in travelers from North America and Europe visiting developing countries. ETEC strains produce an antigenic heat-labile enterotoxin (LT) and a poorly antigenic heat stable toxin (ST). LT-based vaccines provide protection against LT-producing strains. ST-producing strains which may outnumber LT-positive ETEC
strains require an immune response against the antigenic colonization surface colonization factors (CFs) to prevent infection. An ideal ETEC vaccine combines LT antigens with CFs of prevalent ETEC in the area in which the vaccine is being developed.

**Methods:** 252 ETEC strains isolated between 2009 and 2012 from adult travelers with diarrhea during visits to Latin America (Mexico and Guatemala) (n=146) and India (n=73) and children with diarrhea studied in a hospital clinic in Houston (n=33) were tested for seven of the most frequently occurring and potentially important CFs among ETEC strains causing diarrhea: CS1, CS2, CS3, CS4, CS5, CS6 and CFA-1 using PCR.

**Results:** We found that ST was the most common toxin type found in the ETEC isolates studied: Latin America (n=81/146 [55%]), India (n=41/73 [56%]), and United States (n=23/33 [70%]). ST/LT-producing ETEC isolates expressed higher number of CFs compared to LT only or ST only producing strains 54/71 (76%) vs. 15/37 (41%) vs. 44/145 (30%) respectively (p< 0.0001). Of the 219 ETEC strains isolated in Latin America and India 110 (50%) had a detectable CF. In the pediatric patients with ETEC diarrhea in Houston only 3 of 33 (9%) were CS-positive. CS6 was the most frequently occurring colonization factor among the ETEC isolates in our study.

**Conclusions:** ST-producing ETEC predominate in naturally occurring ETEC strains in two diverse regions of the world complicating vaccine development. The most common CFs found in travelers' diarrhea cases were CS6, CS1, CS2 and CS3 and should be included in future vaccines being developed. ETEC in the U.S. should be studied to determine their virulence and pathogenicity.

**PO02.05**

**Use of a Bioactive Polyphenol Solution to Treat Acute Infectious Diarrhea in Adults**

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**Background:** Acute diarrhea is rarely fatal in adults but can impact quality of life and take away from work, resulting in loss of wages. Treatment with rehydration therapy does not reduce duration of diarrhea and repeated use of antibiotic agents can result in resistance in pathogens.

**Objective:** Assess the efficacy of a novel plant extract to reduce the duration of diarrhea and other abdominal problems.

**Methods:** In a randomized controlled study, adults presenting to a community clinic with acute diarrhea (less than 48 hours) were assigned to study arm (polyphenol solution + oral rehydration solution) or control arm (water + oral rehydration solution). After giving informed consent, patients were given one of the mixtures and monitored in the clinic for 2 hours before being released with instructions to note the time diarrhea ceased and to return to the clinic in 5 days for a follow-up visit. At the same time, patients were asked to rank their abdominal pain and bloating levels on a scale from 0 (none) to 10 (worst possible).

**Results:** A total of 78 patients were enrolled in the study, with 54 in the study arm and 24 in the control arm. The median time to resolution of diarrhea was 2 hours in the study arm versus 73 hours for those in the control arm. When patients returned to the clinic 5 days after entering the study, all in the study arm had diarrhea resolved while 17% of those in the control arm continued to have diarrhea. Mean ranking of abdominal pain was less than 1 for those in the study arm at the end of day 1, while those in the control arm had significantly higher ranking of stomach pain and gas/bloating at the end of day 1 and at day 5.

**Conclusion:** In this randomized study, adults with acute diarrhea returned to formed stools sooner when consuming a bioactive polyphenol solution than if they consumed oral rehydration solution alone. This test solution shows promise as a safe, effective supplement to assist in rapidly improving symptoms of acute infectious diarrhea syndromes.
PO02.06
Disseminated Strongyloidiasis Successfully Treated with Parenteral Ivermectine

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Background: Disseminated strongyloidiasis is an imported severe parasitosis. There are no official recommendations regarding treatment.

Methods: We report a disseminated strongyloidiasis case successfully treated with parenteral ivermectine and arteriovenous extracorporeal membrane oxygenation (ECMO).

Results: A 36-year-old female from Benin was admitted for a four month-lasting intense abdominal pain associated with vomiting. Clinical examination revealed a severe undernutrition. There was no eosinophilia. Gastroscopy and colonoscopy showed a diffuse congestive mucosa with ulcers at multiple levels. The patient later developed a myocarditis (confirmed on magnetic resonance imaging) followed by multiple organ dysfunction syndrome and was transferred to the intensive care unit. Digestive tube biopsies and bronchoscopic alveolar lavage revealed Strongyloïdes stercoralis larvae. Due to the severe presentation, the patient received arteriovenous ECMO. A 12 µg/day subcutaneous ivermectine treatment (temporary use authorization) was then administered during seven days, followed by seven days of oral treatment due to a favorable course. Shortly after, she developed Enterococcus faecalis meningitis successfully treated by a 14 day-amoxicilline regimen. Immunodepression screening detected HTLV1-related chronic leukemia with no treatment indication. Patient relapsed eight months later presenting with epigastric pain and weight loss due to a recurrence of digestive strongyloidiasis. Oral ivermectine then albendazole intake amended symptomatology. Due to the recurring characteristic of this parasitosis, an ivermectine monthly regimen was initiated.

Conclusion: This observation confirmed the severity of HTLV1-related strongyloidiasis. As in our case, parenteral ivermectine (available in France only for temporary use authorization) seems efficacious but there are still no official recommendations regarding treatment course. The role of ECMO which successfully helped our patient to recover has not been defined yet.

PO02.07
A Diarrhea Outbreak Caused by Norovirus at Sea Aboad a Foreign Passeger Cruise Ship

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Objective: To investigate the cause of a diarrhea outbreak aboad “Diamond Princess”. A foreign passenger cruise ship for the control of the epidemic.

Methods: Dejection samples of the diarrheal cases and relevant food samples were collected. Immune colloidal gold technique was adopted for rapid of potential pathogen of the outbreak. Enzyme-linked immunosobant assay(ELISA), real-time PCR, and virus nucleic acid sequencing were also used to identify the suspected isolates.

Results: Norovirus was detected in all dejection samples and in lettuce samples. The results of nucleic acid sequencing demonstrated that the prevalent strain of the epidemic was G1norovirus without mutation in nucleotide sequence.

Conclusion: The pathogen of the diarrhea outbreak is norovirus. Contaminated lettuce is presumed to be the most possible reason of infection.
Immunizations (YF, JEV, Rabies, Others)

PO03.01
Safety Analysis of Chinese-produced Quadrivalent Meningococcal Polysaccharide Vaccine

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Background: In recent years, Y and W135 serogroups of meningococcal were under spotlight in the United States, Saudi Arabia and countries all over the world. According to WHO statistic data, the global cases of W135 meningococcal infection were up to hundreds of thousands since 2002, causing more than 2,000 deaths in the world. At present, there is no quadrivalent meningococcal conjugate vaccine licensed in China. Only polysaccharide vaccine is available.

Objective: To evaluate the safety of Chinese-produced Quadrivalent Meningococcal Polysaccharide Vaccine (MPVS4, including A, C, Y and W135 serogroups of polysaccharide: each 50 ug, 0.5 ml/dose).

Methods: Two statistically identical groups were enrolled. The test group of 510 recipients aged 12-40 years old received Chinese-produced MPVS4 vaccine in injection. The control group of 510 healthy recipients aged 16-55 years old received excellent Chinese-produced bivalent polysaccharide vaccine. A randomized controlled clinical study was conducted to analyze the safety of Chinese-produced MPVS4 vaccine.

Results: No immediate reactions or severe reactions were observed in both groups. Main local reactions including erythema, swelling and pain lasting 1-2 days at the injection site accounted for 0.98% of the recipients. Fever, the main system reaction, accounted for 3.14% of the recipients. No statistical difference of adverse reaction rate was found between the test group and the control group.

Conclusion: The results indicated that the safety of Chinese-produced Quadrivalent Meningococcal Polysaccharide Vaccine (MPVS4) was excellent. MPVS4, instead of bivalent polysaccharide vaccine, can be recommended to travelers of high risk groups: including pilgrims to Saudi Arabia and students planning to study in the United States (In the United States, most schools require freshmen living on campus to complete quadrivalent meningitis vaccine before enrollment).

PO03.02
Immunogenicity of Booster Doses of the Inactivated Polio Vaccine among Japanese Adult Travelers

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Background of the Study: A booster dose(s) of polio vaccine is recommended for adult travelers to polio-endemic or high-risk areas. According to the recommendation by WHO, one dose is given for adults who have previously received three or more doses of OPV or IPV. However, Japanese immunization program has been two doses of OPV, before the IPV introduction in Japan for routine immunization in 2012. Therefore, it is necessary to determine how many booster doses of IPV are required for Japanese adult travelers who have previously received OPV.

Objective: We aimed to evaluate immunogenicity of two booster doses of conventional IPV (cIPV) among Japanese adults previously immunized with OPV.

Method(s): Forty-nine Japanese adults with good general health received two doses of cIPV, 28 days apart. Neutralizing antibody (NT) titers were tested before the first booster dose and on 28 days after each dose. NT titers were Sabin 1, Sabin 2, Sabin 3, Mahoney, ME-1, Saukett and type 2 vaccine-derived polioviruses (VDPVs; SV3128, SV3130, 11196, and 11198 strains)

Summary of results: Subjects were aged 20-57 years (mean: 36±8.3). Twenty-eight people had twice OPV vaccination history, two people had once, and 19 people were unknown OPV immunization history. The seropositive rates (defined as NT>1:8) were Sabin1(87.8%), Sabin2(93.9%), Sabin3(55.1%), Mahoney(71.4%), ME-1(91.8%), Saukett(36.7%), and VDPV (SV3128(91.8%),...
SV3130(91.8%), 11196(91.8%), 11198(89.8%). The seropositive rates after the first booster dose were Sabin1(96.9%), Sabin2(100%), Sabin3(98.0%), Mahoney(98.0%), MEF-1(100%), Saukett(98.0%), and VDPV (SV3128(100%), SV3130(100%), 11196(100%), 11198(100%). The second booster led to a pronounced increase in NT titers and resulted in 100% of seropositive rates for all poliovirus strains examined.

**Conclusions:** Two booster doses of cIPV were well tolerated and highly immunogenic among Japanese adult travelers.

**PO03.03**

**Determining Immune Responses to Japanese Encephalitis Vaccination - Comparison of Three Different Serological Methods**

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**Background and objective:** Currently, the plaque-reduction neutralization test (PRNT) is regarded as the standard method for studying the immunogenicity of Japanese encephalitis vaccines. This method is considered reliable, yet laborious and time-consuming. In this study, we explored antibody responses elicited by the inactivated, Vero cell-derived Japanese encephalitis vaccine (JE-VC; trade name Ixiaro). The main aim was to compare the results of the PRNT50 test to those obtained with a rapid neutralization assay, the rapid fluorescent focus inhibition test (RFFIT). In addition, we studied the vaccine-induced IgG responses using an immunofluorescence assay (IFA).

**Methods:** The study population comprised 31 Finnish and Swedish travelers who received the JE-VC primary series prior to their trip to Asia. Pre- and post-vaccination sera were tested for presence of antibodies against Japanese encephalitis virus (JEV). The results obtained with the standard PRNT50 method have been published previously [1]. For the purpose of this study, the sera were analyzed using two additional serological methods: RFFIT and IFA. The tests were performed as previously described [2, 3], with minor modifications. The test strain in the assays was Nakayama, which is heterologous to the vaccine strain (SA14-14-2) but belongs to the same JEV genotype.

**Summary of results:** The response rates varied depending on the serological method used. When determined with PRNT, neutralizing antibodies (titer ≥10) were detected in 94% (29/31) of the subjects after immunization. With RFFIT, neutralizing antibodies (titer 5-10) were detected in only 32% (10/31), and none of the subjects had a RFFIT titer ≥20. With IFA, anti-JEV antibodies (titer ≥10) were detected in 84% (26/31) of the subjects.

**Conclusions:** With PRNT and IFA, the antibody response to JE-VC could be demonstrated in the majority of subjects. The rapid neutralization test RFFIT was not comparable to the standard PRNT assay in detecting vaccine-elicited neutralizing antibodies.

**References:**

**PO03.04**

**Rabies Post-exposure Prophylactic Vaccination for Japanese Travelers**

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Background: There is low production of rabies vaccine worldwide, so countries have made efforts to reduce use of this vaccine, for example by administering only 4 intramuscular or 5 intradermal doses for rabies post-exposure prophylaxis (rPEP). However, in Japan, rabies vaccine is administered in 6 doses subcutaneously (days 0, 3, 7, 14, 30, 90), which is not recommended by the World Health Organization.

Objective: We evaluated features and immunogenicity of rPEP in Japan to reduce the number of vaccine doses.

Methods: We conducted a single-institute, prospective, cross-sectional study from September 2013 to December 2014. We included patients who were exposed to animals in foreign countries and received rPEP at our clinic. Patients who previously received rPEP and those who received rPEP with rabies immunoglobulin were excluded. We administered purified chick embryo-cultured rabies vaccine (Kaketsuken, 1.0 mL, lot number RB18 to RB20) (PCEC-K) subcutaneously. Blood tests were performed at patients’ first visiting and at the fifth and sixth immunization visits. We measured rabies virus neutralizing antibody response by rapid fluorescent focus inhibition test.

Results: Fifty-nine patients were enrolled, and currently 34 patients’ data (16 men; median age 31 years old) are available. Twenty-four patients (70.6%) did not go to the local hospital in the countries where they were exposed to animals, and 26 patients (76.4%) did not receive rPEP at the appropriate time; the median time to rPEP initiation was 2.5 days after exposure (IQR 1-6 days). The geometric mean titers were 1.98 IU/mL and 1.12 IU/mL on days 30 and 90, respectively. The antibody titer on day 30 for patients who started taking rPEP in foreign countries was significantly higher than that of patients who received PCEC-K only (p = 0.016), but there was no significant difference on day 90 (p = 0.11) (Figure). Seroprotection rates (≥ 0.5 IU/mL) were 88.2% and 76.5% on days 30 and 90, respectively.

Conclusions: Based on these data, it is important to educate Japanese travelers on rPEP, and we should reconsider the method of rPEP administration in Japan.
**Methods:** Participants were randomized to 1 of 4 groups: conventional Rabies (R-Conv: 3 IM PCECV doses: days 0,7,28); conventional JE (JE-Conv: 2 IM JEV doses: days 0,28); conventional Rabies and conventional JE (R/JE-Conv) or accelerated Rabies and accelerated JE (R/JE-Acc: 3 IM PCECV doses: days 0,3,7; and 2 IM JEV doses: days 0,7). For Rabies, the cut-off for adequate immune response after vaccination was defined as Rabies virus neutralizing antibody (RVNA) concentrations ≥0.5 IU/mL. For JE, protective levels of anti-JE antibodies was defined as Plaque Reduction Neutralization Test (PRNT<sub>50</sub>) titers ≥1:10.

**Results:** Non-inferiority of R/JE-Acc to R-Conv at 7 days post final active vaccination was demonstrated as the lower limit of the 95% CI of the difference was -2.8%. At 1-year follow-up, the percentages of subjects with adequate GMCs ranged from 68% (accelerated regimen) to 80% (conventional rabies). Non-inferiority of R/JE-Acc to JE-Conv at 28 days post final active vaccination was demonstrated as the lower limit of the 95% CI of the difference was -4.8%. At 1-year follow-up, 94%, 86% and 88% of subjects in R/JE-Acc, R/JE-Conv and JE-Conv, respectively, had protective titers.

**Conclusions:** No interference of concomitant accelerated Rabies and JE regimens was observed on short- to mid-term immune responses or safety profile of either vaccine. For both vaccines, immunogenicity was sustained for 1 year after the accelerated regimens. Accelerated, 1-week Rabies and JE regimens, if licensed, could potentially be offered as an alternative to the currently recommended regimens, especially for individuals requiring vaccination on short notice.

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**PO03.06 Intradermal Preexposure Rabies Vaccination: A 6-year Experience in a Canadian Travel Clinic**

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**Background:** Intradermal (ID) preexposure rabies vaccination (PERV) has been proven safe and immunogenic in travelers. Only the 1.0 ml intramuscular (IM) dose is available in Canada. Therefore, aliquots of 0.1 ml were used on fixed days for ID-PERV of several travelers providing an important cost reduction for them. In December 2008, ID-PERV was implemented in our travel clinic.

**Objectives:** To evaluate the impact of the introduction of ID vaccination route on PERV at our travel clinic. To compare the demographic and epidemiologic characteristics between travelers receiving the IM versus the ID-PERV route.

**Method:** We performed a retrospective observational study based at Clinique Santé-Voyage de la Fondation du CHUM in Montreal, Canada. All patients who presented for pretravel assessment between December 2008 and December 2014 were included. Demographic and epidemiologic data as well as PERV status and route of administration were retrieved from computerized clinic databases. Statistical analyses were performed with SPSS.

**Results:** A total of 37,032 travelers were included in the study, of which 1721 (4.6%) received PERV (ID: 54.7% and IM: 45.3%). The Mean age (±SD) was 32.2 ±18.1 years. Of all, 53.6% were female. Compared to unvaccinated travelers, vaccinated travelers were older (35.8 vs 32.1 years; p< 0.0001), traveled for longer duration (16.7 vs 5.2 weeks; p< 0.0001) and were more likely to travel alone (25.8% vs 15.8%; p< 0.0001). Travelers receiving the ID vaccine were younger (34.6 vs 37.2 years; p< 0.0001), traveled mostly for vacation (79.5% vs 56.2%; p< 0.0001) and were more likely to travel as a couple (43.8% vs 34.7%; p=0.001) compared to travelers who received the IM vaccine. In the first year of implementation, 225 travelers were vaccinated (ID:78.7% and IM:21.3%) which represents 23% more vaccination than a comparable previous year.

**Conclusion:** Since December 2008, we offer ID-PERV in our travel clinic. Vaccination of several travelers around the same time allowed this approach to be cost-effective. As a result, more travelers are vaccinated against rabies. We were able to reach the younger travelers for whom, according to recent studies, vaccine cost is the main reason for not being vaccinated.
PO03.07
Rapid Responses to Two Bivalent Virus-like Particle Norovirus Vaccine Candidate Formulations in Healthy Adults

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**Background:** Norovirus is the most common cause of acute gastroenteritis (AGE) around the world, posing a significant public health burden, with high morbidity in all age groups and significant mortality in the very young and older adults. Travellers are frequently exposed to outbreaks of norovirus.

**Objective:** This randomised, double-blind, placebo-controlled phase II study was performed to assess the safety and immunogenicity of two formulations of adjuvanted bivalent norovirus VLP vaccine candidate in healthy adults (clinicaltrials.gov: NCT02142504).

**Methods:** A cohort of 454 healthy male and female adults, aged 18-49 years, was enrolled and randomized 1:1:1 to three groups to receive one intramuscular injection of placebo (saline) or candidate vaccine formulations containing either 15µg or 50µg GI.1 genotype VLP and 50µg GII.4 VLP (15/50 and 50/50 antigen-formulations), with 50µg monophosphoryl lipid A and 0.5 mg Al(OH)₃ as adjuvants. Immune responses to GI.1 and GII.4 were assessed as serum Pan-Ig, IgA and functional histoblood group antigen (HBGA) blocking antibodies at Days 1, 3, 5, once on 7-10, and 28. Safety and reactogenicity were assessed as solicited and unsolicited adverse events, serious adverse events (SAEs), and adverse events of special interest (AESIs).

**Results:** Immune responses to vaccination were analysed in 442 subjects according to protocol. High levels of immune response were already achieved at Day 7-10 and persisted through Day 28. Higher immune responses to GII.4 were observed in the 15/50 antigen-formulation compared with the 50/50 antigen-formulation. Reactions were mainly mild to moderate. The most frequent injection site reaction was transient pain, reported by 8%, 65% and 73% of placebo, 15/50, and 50/50 groups, respectively, with other local reactions occurring at ≤ 5%. The most frequent solicited systemic reaction was myalgia, reported by 7%, 21%, and 25% of placebo, 15/50, and 50/50 groups, respectively, with 16.2-17.5% of the three groups reporting headache and fatigue. No vaccine-related SAEs or AESIs were reported.

**Conclusions:** The two candidate VLP vaccine formulations were well tolerated, with acceptable safety profiles, and elicited robust immune responses 7-10 days after vaccination, with persistence through day 28.

PO03.08
Development of Takeda Vaccine's Candidate Norovirus VLP Vaccine

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**Background:** Noroviruses (NoVs) are the leading cause of acute infectious gastroenteritis worldwide. NoV infection is responsible for high morbidity in all age groups, and fatal outcomes may be observed in at-risk populations such as the very young and older adults especially those with underlying diseases. Outbreaks occur globally, in various settings, but those in travellers, notably on cruise ships or in hotels or restaurants, frequently receive extensive publicity. As NoV are highly infectious and highly resistant to environmental conditions they have multiple routes of transmission including fecal-oral, aerosol, person to person, food-borne and surface contamination, which makes physical prevention measures impractical for travellers.

**Objective:** Of the six NoV genogroups, the most frequent cause of human disease is genogroup II (GII), particularly the GII.4 genotype, followed by genogroup I (GI), which includes the historically first identified Norwalk virus. Takeda Vaccines Inc. is developing a bivalent, adjuvanted candidate norovirus vaccine based on two virus-like particles (VLPs), one from a GI.1 and a second consensus GII.4 sequence derived from three natural GII.4 variants, to potentially induce a broad immune
response. NoV vaccine candidates, containing Al(OH)₃ adjuvant, are administered by intramuscular (IM) injection.

**Results:** Investigational vaccine formulations with dosages from 5-150 µg of the two VLPs, with and without monophosphoryl lipid A (MPL), have been evaluated in Phase I and II trials involving over 1100 adults. These trials have shown that candidate vaccine formulations are generally well tolerated with acceptable safety profiles. No vaccine-related SAEs or AESIs have been reported. High and rapid immune responses after one dose have been observed when assessed as total Ig and IgA antibodies, and as functional antibodies with the ability to block histoblood group antigen (HBGA) binding to VLP.

**Conclusions:** The difficulties faced by travellers in avoiding exposure to norovirus infection makes vaccination a practical prophylactic approach. The Takeda Vaccines’ bivalent VLP vaccine candidate formulations are rapidly immunogenic after one dose, with an acceptable safety profile, offering the potential to provide punctual protection for travellers against the leading cause of infectious gastroenteritis.

**PO03.09**

**Vaccination against Seasonal Influenza Has no Significant Influence on Expected Decrease in Absence from Work due to Acute Respiratory Tract Diseases**

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¹MFA Poland, Foreign Service Medical Centre, Warsaw, Poland

**Background:** Vaccination against seasonal influenza (IV) is considered as important measure against related respiratory tract disease, with expected reduction of absence from work. The population of patients in this study consisted of personnel fit for foreign service and travel, with no severe prevailing health conditions, which would exclude an individual from this kind of work. Controversies over mass company immunizations range from proof of benefits to arguments pointing to possible exacerbation of ongoing infections and processes.

**Objective:** We investigated the overall incidence of acute respiratory tract diseases (RTD) in the following year in a group of vaccinated employees and randomly chosen control group, in respect to other mild chronic health conditions, sex and age in both groups.

**Method:** A group of employees received inactivated influenza vaccine (IV) types A and B (trivalent, split virion, from the same batch) during the first decade of September 2013 (age range 28 - 70 yrs, mean 50.24, N=100) and were observed and eventually treated for respiratory tract diseases over the following year. The results were compared with control group (age range 28 - 70 yrs, mean 45.61, N=100) of employees remaining under our constant observation.

**Results:** In the IV group RTD occurred in 15 % of healthy pts and in 9 % of patients with chronic diseases. Control group developed 22 % of RTD in healthy patients and 4 % in group with chronic diseases. There was no statistical significance of RTD incidence (binomial regression) in respect to IV (p = 0.987), age (p = 0.014), sex (p = 0.530) nor chronic disease (p = 0.107).

**Conclusion:** We found no relevant influence of IV on overall incidence of respiratory tract infections, regardless of prevailing health conditions. It is probable though, that population of employees under study is partially resistant due to annual vaccination throughout previous years. The results do not support occupational efficacy of employer-sponsored vaccination against seasonal influenza.

**PO03.10**

**Long Term Immunity 6 Years after Booster Vaccination against Japanese Encephalitis**

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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, ³Berlin Center for Travel and Tropical Medicine, Berlin, Germany
Background and Objective: Japanese Encephalitis is a mosquito-borne viral infection. In endemic regions mainly in Southeast Asia, every year about 68,000 clinical cases of Japanese Encephalitis occur. The only internationally available vaccine to prevent from the viral encephalitis is an inactivated whole-cell vaccine containing the strain SA14-14-2. Basic immunization is recommended at day 1 and day 29, followed by a booster vaccination 12 to 24 months later. To date, immunity after the booster dose in adults has been investigated up to 12 months. This study was initiated to assess antibody decline and to predict long-term duration of seroprotection.

Method: A random sample of 70 volunteers from a preceding booster trial (booster given 15 months after the primary series, 45% of originally vaccinated) was invited to the follow up study and 67 (96%) participated approximately 6 years after their booster dose against Japanese Encephalitis. Sera were analyzed using a 50% plaque reduction neutralization test (PRNT$_{50}$-test). A positive opinion by responsible ethics committees was present and all subjects provided informed consent.

Result: Six years after the last booster dose, geometric mean titer was still 148 (95% CI:107 to 207), and 96% of the tested subjects had antibody titers above PRNT$_{50}$ values of 10, the surrogate level of protection according to WHO. Antibody titers generally were lower in subjects aged 50 years and older. Yellow fever vaccination and vaccination against TBE had no significant effects on antibody titers against Japanese Encephalitis.

Conclusion: Long-term protection against Japanese Encephalitis after basic immunization and one booster dose against Japanese Encephalitis up to 6 years could be shown in the majority of subjects. This implies that a second booster may not be necessary for at least 6 years after the first booster.

Conflict of Interest: The study was supported by Valneva, Austria.

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PO03.11

Single Visit Intradermal Rabies Vaccination Is Immunogenic

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Background: The current 3-visit intramuscular (IM) rabies pre-exposure vaccination (PrEP) schedule is costly and often hampered by insufficient time between travel clinic visit and departure. Scientific literature provides clues that seroconversion may occur after a single visit rabies vaccination. This dose-finding pilot study provides a proof-of-principle for an ultra-short schedule.

Objective: To determine the optimum dose of purified Vero cell rabies vaccine (PVRV) for inducing seroconversion in all subjects in a single visit. Seroconversion was defined as a rabies virus neutralising antibody (RVNA) titer >0.5 IU/mL determined by Fluorescent Antibody Virus Neutralization test (FAVN).

Methods: 20 healthy rabies-naive volunteers were randomly assigned to 4 study arms for a single visit vaccination: 1x 0.5 mL IM dose (A, control), 1x fractional (0.1 mL) intradermal dose (ID) (B), 2x 0.1 mL ID (C) or 3x 0.1 mL ID (D). Serology was performed 1 month after vaccination.

Interim results: All experimental study arms (B, C, D) reached 100% seroconversion at 1 month after vaccination. In the control arm (A), one subject did not seroconvert (RVNA = 0.5 IU/mL).

<table>
<thead>
<tr>
<th>Study arm description</th>
<th>A (1 dose IM n=5)</th>
<th>B (1/5th dose ID n=5)</th>
<th>C (2x 1/5th ID n=5)</th>
<th>D (3x 1/5th ID n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seroprotection (1 month post)</td>
<td>4/5</td>
<td>5/5</td>
<td>5/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Geometric mean titre IU/mL [95% CI]</td>
<td>1.78 [0.88-3.68]</td>
<td>2.95 [1.45-6.00]</td>
<td>6.65 [2.88-15.36]</td>
<td>4.23 [1.38-12.97]</td>
</tr>
</tbody>
</table>

Conclusion: This pilot study provides a strong indication that rabies PrEP can be achieved in a single visit. The intradermal vaccination schedule tested here demonstrated 100% seroconversion 1 month after vaccination. This new schedule should be further investigated in large trials.
PO03.12
Intradermal Meningococcal Vaccination (MEN-ACYW135)

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Background: Vaccination with conjugated purified polysaccharides is generally accepted as the best way to prevent invasive meningococcal disease. But the costs of vaccination are prohibitive in many low-resource settings. Intradermal administration of vaccines has the potential to lower costs through dose reduction without sacrificing efficacy.

Objective: To establish the lowest intradermal dose of conjugated quadrivalent meningococcal vaccine (Menveo® and Nimenrix®) that results in seroprotection for all serotypes in ≥75% of subjects.

Methods: Intradermal dose-escalation study of 12 naïve subjects. Antibody levels were measured using a Luminex multiplex immune assay (MIA) at day 28 after vaccination for all serotypes. Seroprotection was defined as an anti-PS IgG concentration of >2.0 µg/mL, established for serotype C and substituted for the other serotypes. Gold standard serum bactericidal assay (rSBA, protective titer >1:4) will be performed for all serotypes at a later stage.

Preliminary results: Two groups of 4 subjects were vaccinated using a 1/10th dose of either vaccine. Antibody levels (MIA) proved insufficient, so another 4 subjects were enrolled for a 1/5th dose of Nimenrix only because Menveo had become unavailable. After 4-6 months, all 12 subjects were boosted with Nimenrix, using the same fractional dose as received before (Table).

<table>
<thead>
<tr>
<th>Serotype</th>
<th>1/10th dose ID, n=8</th>
<th>1/5th dose ID, n=4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary</td>
<td>Booster</td>
</tr>
<tr>
<td>A</td>
<td>25</td>
<td>63</td>
</tr>
<tr>
<td>C</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Y</td>
<td>38</td>
<td>75</td>
</tr>
<tr>
<td>W135</td>
<td>13</td>
<td>38</td>
</tr>
</tbody>
</table>

Conclusion: 1/5th ID fractional dose of 4-valent meningococcal vaccine with fractional booster after 4-6 months is effective in inducing protective antibody levels. Initial SBA results for serotype C point to an underestimation of vaccine efficacy in this study.

PO03.13
Update on Takeda’s Live Attenuated Tetravalent Dengue Vaccine (TDV) Candidate

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We have developed a live attenuated tetravalent dengue vaccine candidate based on an attenuated dengue virus-2 (TDV-2) and three chimeric viruses containing the pre-membrane and envelope genes of DENV-1, -3 and -4 expressed in the context of the attenuated TDV-2 genome (TDV-1, -3, & -4, respectively). This vaccine candidate is currently in phase II clinical trials in humans. Preclinical and clinical characterization of the immune response to this vaccine provides evidence that it stimulates innate immune responses, and elicits a humoral response and T-cell mediated immunity to dengue
structural and non-structural proteins. Furthermore, clinical trials in dengue endemic and non-endemic geographic areas demonstrate that the vaccine is generally well-tolerated. A single dose elicits an immune response to all four serotypes, with little improvement when a second dose is given at 90 days. We are currently planning a pivotal phase III study to investigate the efficacy of this vaccine candidate.

PO03.14
Influenza Vaccine and Respiratory Illnesses before and after the 2009 Pandemic

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Background: Hajj is one of the unique global mass gathering event that’s occur annually where around 3 million Muslims from around the globe go to Makkah for rituals. This phenomenon increases the risk of acquiring respiratory infectious diseases during Hajj; and the risk of transmitting newly emerged viruses to any corner of the globe. Vaccination against various infectious diseases like influenza is recommended for Hajj pilgrims. However, several factors affect vaccination uptake over years.

Objective: This study aimed to explore influenza vaccine uptake among Hajj pilgrims and discover their health status during several Hajj seasons before and after the 2009 pandemic.

Method: A survey has been conducted among Hajj pilgrims mainly from Australia, United Kingdom, and Saudi Arabia during several Hajj seasons before and after 2009 pandemic, specifically 2005-2007 and 2011-2013. Self-reported information about influenza vaccine and respiratory symptoms were obtained during their stay at Mina where rituals conducted there.

Results: The total number of participants is 1,624 distributed in seven years 2005-2007 and 2011-2013 with different median age each year that is around 45 years. The influenza vaccine uptake among Hajj pilgrims before 2009 was 17.84% and increased significantly to 83.49% in 2011-2013. Likewise, symptoms of ILI, while ILI was defined as subjective fever with cough and sore throat, were observed among 30.44% of pilgrims in 2005-2007 while during Hajj 2011-2013 the figure diminished significantly to 7.73%.

Conclusion: Obtaining protective measures like influenza vaccine has been increased during the last decade specifically after the 2009 pandemic which help in improving the health status of all pilgrims.

PO03.15
Characterization of an Age-response Relationship to GSK’s Recombinant Hepatitis B Vaccine in Healthy Adults: An Integrated Analysis

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Background: Older adults aged 40-80 years demonstrate a reduced response to hepatitis B vaccination. The disease burden is highest in adults aged 25-44 years. However, little is known on when immunogenicity starts to reduce.

Objective: To characterize the age-response relationship to GSK’s recombinant hepatitis B vaccine in healthy adults.

Methods: We undertook a pooled analysis of GSK sponsored studies evaluating a 3-dose regimen of 20µg of GSK’s recombinant hepatitis B vaccine (HBV) (eTrack-201931). Studies were selected if: they were completed after 1996; had enrolled healthy adults aged ≥20 years; had administered a 3-dose regimen of 20µg HBV according to a 0-1-6-month schedule; had measured anti-hepatitis-B surface antibodies (anti-HBs) seroprotection rate one month post-dose-3 (protection cut-off ≥10 mIU/mL). The impact of age on seroprotection rate one month post-dose-3 was investigated using a logistic model assuming a linear decrease of the log-odds starting from an age cut-off. The seroprotection rate was tabulated with 95% confidence intervals (CI) according to 5-year age sub-groups.

Results: A total of 2,620 subjects from 11 studies were included; 57.7% were female and 91.8% were Caucasian. The overall seroprotection rate was 94.5% among all subjects. The model showed a statistically significant decrease over the full age range, with the highest anti-HBs seroprotection rates in the 20-24 years sub-group (98.6%; 95% CI: 97.5%-99.3%) and the lowest in the ≥65 years sub-group (56.8%; 95% CI: 50.6%-77.3%) (Table 1). The seroprotection rate, estimated from the model was ≥90% in subjects up to 49 years and >80% up to 60 years.

Conclusion: Our study indicates that the immunogenicity to GSK’s recombinant HBV decreases with age according to a log-linear curve. Seroprotection rate remains above 80% of up to 60 years of age, and hence is beneficial in at-risk populations.

Table 1: Seroprotection rates for anti-HBs antibody concentrations measured one month after the third dose of HBV vaccine, stratified by age (in years)

<table>
<thead>
<tr>
<th>Age groups (years)</th>
<th>N</th>
<th>n (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All subjects</td>
<td>2532</td>
<td>2392 (94.5)</td>
<td>93.5-95.3</td>
</tr>
<tr>
<td>20-24</td>
<td>729</td>
<td>719 (98.6)</td>
<td>97.5-99.3</td>
</tr>
<tr>
<td>25-29</td>
<td>415</td>
<td>401 (96.6)</td>
<td>94.4-98.1</td>
</tr>
<tr>
<td>30-34</td>
<td>293</td>
<td>285 (98.3)</td>
<td>96.2-99.6</td>
</tr>
<tr>
<td>35-39</td>
<td>193</td>
<td>174 (93.5)</td>
<td>90.1-96.1</td>
</tr>
<tr>
<td>40-44</td>
<td>137</td>
<td>127 (94.4)</td>
<td>91.1-96.8</td>
</tr>
<tr>
<td>45-49</td>
<td>204</td>
<td>204 (92.4)</td>
<td>88.5-95.3</td>
</tr>
<tr>
<td>50-54</td>
<td>113</td>
<td>98 (88.7)</td>
<td>79.1-92.4</td>
</tr>
<tr>
<td>55-59</td>
<td>60</td>
<td>48 (80.0)</td>
<td>67.7-89.2</td>
</tr>
<tr>
<td>60-64</td>
<td>54</td>
<td>43 (79.5)</td>
<td>66.5-89.4</td>
</tr>
<tr>
<td>≥65</td>
<td>54</td>
<td>35 (64.3)</td>
<td>50.6-77.3</td>
</tr>
</tbody>
</table>

N=Number of subjects in each category
n (%)=number (percentage) of subjects with anti-HB-antibody concentration ≥10 mIU/mL
95% CI=exact 95% confidence interval
Seroprotection rate using the best fit model was calculated as Logit (P) = 4.2309 + (-0.0704) * age,
for ages >20

[Table 1]
**PO03.16**

**No Evidence that Advancing Age Reduces Response to GSK’s Inactivated Hepatitis A Vaccine in Healthy Adults**

O. Van Der Meeren¹, P. Crasta², M. De Ridder¹³

¹GSK Vaccines, Wavre, Belgium, ²GSK Pharmaceutical Ltd., Mumbai, India, ³Université Libre de Bruxelles, Brussels, Belgium

**Background:** Hepatitis A is a common vaccine-preventable travel-associated infectious disease. It is therefore recommended that in countries with low hepatitis A virus endemicity, individuals at risk of exposure, such as travellers to endemic countries, should be vaccinated. The immunogenicity and field efficacy of GSK’s inactivated hepatitis A vaccine has been demonstrated in clinical trials, population-impact studies as well as in several outbreak settings. However, limited data has been reported on its immunogenicity in adults aged ≥40 years.

**Objective:** To assess the immunogenicity and safety of the inactivated hepatitis A vaccine in healthy adults ≥40 years by pooling data from completed studies.

**Methods:** We pooled and analyzed four double-blind randomized studies in which healthy adults aged above 20 years received 2 vaccine doses (1440EU) 6 to 12 months apart. Controls aged 20-30 years from the same studies were matched to subjects aged ≥40 years based on country and, whenever possible, on gender. Immunogenicity was compared in terms of seropositivity rates and geometric mean concentrations (GMCs). Solicited and unsolicited symptoms during the 4-day and 30-day post-vaccination periods, respectively, were also assessed.

**Results:** Each group consisted of 80 subjects. The mean age was 47 years in the older group and 24 years in the control group. The seropositivity rates 2 weeks and one month after dose 1 in subjects aged ≥40 years were 79.7% and 97.5%, respectively. Corresponding values in the control group were 92.3% and 97.4%, respectively. One month post-dose 2, all subjects were seropositive in both groups (Table 1). Safety profiles were similar in both groups.

**Conclusion:** The immune response and safety profiles of GSK’s inactivated hepatitis A vaccine in subjects aged ≥40 years were similar to that in younger matched controls. A more rapid seroconversion may be observed in younger subjects.

### Table Seropositivity rates and anti-hepatitis A virus antibody GMCs from 4 studies (Pooled)

<table>
<thead>
<tr>
<th>Group</th>
<th>Timing</th>
<th>n/N (%)</th>
<th>95% CI</th>
<th>Value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥40 years</td>
<td>P1(D15)</td>
<td>59/74 (79.7)</td>
<td>68.8-88.2</td>
<td>126.55</td>
<td>88.61-180.74</td>
</tr>
<tr>
<td></td>
<td>P1(M1)</td>
<td>71/79 (97.5)</td>
<td>91.2-99.7</td>
<td>329.12</td>
<td>254.74-425.21</td>
</tr>
<tr>
<td></td>
<td>P1(M6)</td>
<td>71/80 (88.8)</td>
<td>79.7-94.7</td>
<td>144.24</td>
<td>107.39-193.73</td>
</tr>
<tr>
<td></td>
<td>P1II</td>
<td>78/78 (100)</td>
<td>95.4-100</td>
<td>2378.95</td>
<td>1848.51-3061.59</td>
</tr>
<tr>
<td>20-30 years</td>
<td>P1(D15)</td>
<td>72/78 (92.3)</td>
<td>84.0-97.1</td>
<td>219.45</td>
<td>168.06-286.56</td>
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<tr>
<td></td>
<td>P1(M1)</td>
<td>76/78 (97.4)</td>
<td>91.0-99.7</td>
<td>469.2</td>
<td>385.23-602.75</td>
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<tr>
<td></td>
<td>P1(M6)</td>
<td>72/78 (92.3)</td>
<td>84.0-97.1</td>
<td>140.54</td>
<td>110.49-178.77</td>
</tr>
<tr>
<td></td>
<td>P1II</td>
<td>75/76 (100)</td>
<td>95.3-100</td>
<td>4370.94</td>
<td>3535.12-5404.37</td>
</tr>
</tbody>
</table>

GMC = geometric mean concentration

n (%) = number (percentage) of subjects with concentration ≥20 mIU/mL

N = number of subjects with available results

95% CI = 95% confidence interval

P1(D15): blood sample 15 days after vaccine dose-1

P1(M1): blood sample 1 month after the vaccine dose-1

P1(M6): blood sample 6 months after vaccine dose-1

P1II: blood sample one month after vaccine dose-2
PO03.17  
**A Prospective Clinical Trial of Hepatitis B Vaccine in Adults with Type II Diabetes Mellitus**

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**Background:** Diabetic patients are at increased risk for chronic liver disease and hepatocellular carcinoma, and for hepatitis B. Several countries, including the United States, have issued recommendations to vaccinate adults with diabetes against hepatitis B.

**Methods:** In a prospective controlled study (NCT01627340), adults with type 2 diabetes and non-diabetic controls matched for age and body mass index (BMI) received three doses of recombinant hepatitis B vaccine (Engevix-B™, GlaxoSmithKline, Belgium). The primary endpoint was anti-HBs seroprotection rate one month after the third dose.

**Results:** 378 diabetic patients and 189 controls were included in the primary analysis. Seroprotection (anti-HBs antibody level ≥ 10mIU/mL) was observed in 75.4% of type 2 diabetes patients and in 82.0% of controls, with a between group difference of 6.61% (95% CI: -0.70, 13.34). The geometric mean antibody concentrations (GMC) were 147.6 mIU/mL in the diabetic group and 384.2 mIU/mL in controls. Age-stratified seroprotection rates in the diabetic group were 88.5% (20-39 years), 81.2% (40-49 years), 83.2% (50-59 years), and 58.2% (≥60 years). Rates of solicited local and general adverse events and overall safety were similar between groups.

**Conclusion:** Hepatitis B vaccine is immunogenic, with an acceptable reactogenicity and safety profile, in diabetic patients. In this trial, seroprotection rates were above 80% in subjects aged 20 to 59 years. Since age reduces the likelihood to achieve seroprotection, hepatitis B vaccine should be administered as soon as possible after the diagnosis of diabetes mellitus.

**Infectious Diseases (Epidemiology, Diagnosis, Treatment)**

PO04.01  
**Comparison of Different Tests for Chlamydia Trachomatis Screening**

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**Objective:** To compare the value of detecting Chlamydia Trachomatis (CT) from cervical swabs by different tests.

**Methods:** Cervical swabs were collected from 300 asymptomatic cases and the CT was detected by cell culture, polymerase chain reaction (PCR) and two rapid immunological kits (LAB and QUICK). If cell culture is positive or other two or more methods are positive, it is defined as true positive or “expanding gold standard”.

**Results:** According to the “expanding gold standard”, there were 46 cases diagnosed with CT infection. The Chlamydia positivity was 11.73% (46/392). The sensitivity of cell culture, PCR, LAB and Quick was 58.70%, 91.30%, 95.65% and 54.37% respectively. The specificities were 100%, 98.84%, 63.29% and 96.80% respectively. The positive predicting value of cell culture, PCR, LAB and Quick was 58.70%, 91.30%, 25.73% and 96.15% respectively. The negative predicting value of cell culture, PCR, LAB and Quick was 94.49%, 98.84%, 99.10% and 94.10% respectively.

**Conclusion:** Clinical diagnosis of female reproductive CT infection has some limitation by only one method.
PO04.02
Management of Imported Cutaneous Larva Migrans: A Case Series

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Background: Cutaneous larva migrans (CLM), a zoonotic helminthiasis imported to Canada by travelers to beach destinations in the tropics, causes morbidity due to severe, intractable pruritus. Treatment in Canada is only available through the Special Access Program (SAP) of Health Canada, thus, many patients are prescribed ineffective courses of non-targeted therapy.

Objective: We analyzed the proportion of patients with CLM referred to our specialized Tropical Disease Unit (TDU) having failed non-targeted therapy prior to referral, and characterized the demographic and travel related factors associated with CLM.

Methods: Patients with CLM seen in the TDU from June 2012 through December 2014 were identified through our SAP application log, and charts were reviewed. Demographic, clinical, and travel-related data were extracted and analyzed following institutional review board approval.

Results: 25 patients with CLM were identified through our SAP log: 12 women, and 13 men. Median age was 35 years (range 4 to 58 years). Patients had primarily acquired their CLM in the Caribbean (80%), with Jamaica being the most well represented source destination (N=10, 40%). Reported symptoms included intense, function-limiting pruritus (N=25, 100%) and loss of sleep (N=3, 12%). Twelve patients (48%) with CLM had received at least 1 course of non-targeted therapy prior to referral. This included 7 patients who had received topical steroids, 3 patients who had undergone cryotherapy, 2 who had received oral antibiotics, and 11 who had received oral mebendazole. Prior to referral, the median number of physician encounters per CLM patient was 1 (range 1 to 5). Median duration of symptoms was 34 days (range 5 to 226 days). Of the 25 patients with CLM, 23 (92%) were prescribed a single 3-day course of albendazole and responded appropriately, and 2 (8%) required a second 3-day course of albendazole.

Conclusions: Although CLM is non-communicable and of little public health relevance in Canada, it causes significant morbidity. A substantial proportion of patients with CLM referred to our specialized TDU had a prolonged course of illness and were prescribed ineffective and non-targeted therapies. Albendazole or ivermectin are the drugs of choice for CLM, and should be prescribed as first-line therapy.

PO04.03
Rapid Differentiation of Filariae in Unstain and Stain-paraffin-embedded Sections by a HRM-PCR Assay

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Background of the Study: Apart from infection with human filariae, zoonotic filariasis also occurs worldwide and the numbers of cases have steadily increased. Diagnosis of some intact filariae in tissue or organ depends on histological identification. The morphology of parasites in tissue
embedded section is very impoverished, and shows high levels of homoplasy. Thus the use of morphological characters in taxonomic studies difficult and may not allow a specific diagnosis.

**Objectives:**
1) to determine whether HRM-PCR can be a useful method for identify and differentiate filarial infection in FFPE specimens;
2) to gain a rapid paraffin removal, we developed a quick paraffin removal technique and compare with standard paraffin removal technique;
3) to test the interference of H&E in DNA extraction by compare with the unstained FFPE specimen.

**Methods:** This study applied a real-time PCR with high resolution melting analysis (HRM) to detect and identify *B. malayi*, *B. pahangi*, *D. immitis* and *W. bancrofti* in paraffin embedded sections. Specificity of the assay was studied using other tissue dwelling parasites i.e. *Angiostrongylus cantonensis*, *Gnatostoma spinigerum* and *Cysticercus celluloseae*. We also developed a quick paraffin-removal protocol.

**Summary of Results:** Both human and animal filarial in formalin-fixed paraffin-embedded sections (FFPES) could be rapidly diagnosed and identified whereas the other parasites show negative result. Tm of amplified products of filarial DNA from the unstained FFPES and the H&E stained sections revealed no difference. It is indicated that the DNA extraction protocols presented in this study could be used for a real time PCR with HRM.

**In Conclusion:** We report the successful application of a HRM-PCR assay to differentiate 4 filarial parasites in FFPES, thus providing the pathologist with an alternatively effective diagnostic procedure.

**Further, a quick paraffin removal protocol developed here could shorten time and step of the paraffin removal using standard protocol.**

**PO04.04**

**Identification of Leptospiral Low Molecular Weight Membrane Proteins for Early Diagnosis of Leptospirosis**

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**Background:** Leptospirosis is one of the most widespread zoonoses worldwide. Laboratory testing of leptospiral infections is important for accurate diagnosis of leptospirosis. Moreover, early diagnosis is particularly important for the clinical management of the patients with undifferentiated febrile illness syndromes.

**Objective:** To identify and characterize low molecular weight membrane proteins from pathogenic *Leptospira* strains for early diagnosis of leptospirosis.

**Method:** Outer membrane (OM) components from pathogenic *Leptospira interrogans* serovar Autumnalis were extracted by alkaline plasmolysis buffer followed by sucrose gradient ultracentrifugation. Each pooled fraction of 5 orderly fractions was prepared. Protein, lipopolysaccharide (LPS) and lipid in pooled fractions were tested by coomassie brilliant blue, LPS staining kit and Sudan Black B staining, respectively. Immunoreactive membrane components were detected by using one dimensional SDS-PAGE coupled with immunoblotting with acute-phase serum samples from leptospirosis patients.

**Results:** Protein bands in pooled fractions 1, 2, 5, 6, 7, and 8 were detectable. The protein bands were observed at MW of 11, 16, 17, 18, 20, 25, 35, 41, 59, 69 and 75 kDa. LPS bands were MW of 9, 13, 18, 22 and 65 kDa, Lipid band could not be detected. Interestingly, specific immunoreactive bands were detected in only pooled fraction 2 (fractions 6 to 10). The pooled fraction 2 from 6 *Leptospira interrogans* serovars Autumnalis, Bataviae, Bratislava, Copenhegeni, Australis and Patoc were characterized for immunoreactive activity by immunoblotting with rabbit polyclonal antibody against serovar Autumnalis. The results showed that the low-MW antigens showing strong immunoreaction were the 18 kDa bands found in two types, a discrete protein band and a diffuse LPS band, 20 kDa protein and 25 kDa protein. In pooled fraction 2, IgM immunoreactivity with the serum samples at early phase from leptospirosis patients were tested. IgM antibody could react with the low-MW antigens at the 18 kDa LPS/protein, the 20 kDa protein and 25 kDa protein. However, the results clearly indicated that the reacted antigens in all serum samples were proteins at MW of 25 kDa.
**Conclusion:** The identified 25 kDa immunogenic protein can be used as antigen for early serodiagnosis of leptospirosis.

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**PO04.05**

**Measles, Mumps, Rubella, and Varicella: Using Locally Derived Samples to Determine Differences in Seroprevalence by Birth Cohort**

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**Background:** Even after dramatic reductions in the prevalence of measles, mumps, rubella and varicella in the United States, there continue to be outbreaks of these diseases, stressing the need for ongoing immunization and pre-traveling counseling. Most prior studies of seroprevalence for these viral diseases are often based on national surveillance data. It is therefore important to get a clearer understanding on the local level of immunity so that more focused recommendations can be made for our patient population.

**Methods:** Leftover, non-duplicate outpatient serum samples obtained in Lehigh Valley Pennsylvania were tested for IgG antibodies using commercially available enzyme immunoassays to mumps, measles, rubella, and varicella. Samples were collected sequentially, and de-identified. Five birth cohorts were created and 460 samples were collected as follows: < 1957 (52), 1957-1966 (109), 1967-1976 (117), 1977-1988 (121), and 1989-1995 (61).

**Results:** Overall seroprevalence (excluding equivocal results) for measles, mumps, rubella, and varicella were (%): 85.8, 82.8, 96.6, and 97.4. There was a significant association between seroprevalence and birth cohort for measles (p=0.010) and mumps (p=0.037) only. Pairwise comparisons of the cohorts found that for measles there was a significant difference between the < 1957 versus 1967-1976 (p=0.005) cohort and the < 1957 versus 1989-1995 (p=0.001) cohort. Additionally, the overall seroprevalence for our study sample was significantly different than national seroprevalence results for rubella, mumps, and measles.

**Conclusion:** Our study on local seroprevalence showed dramatically lower immunity rates to measles and mumps than prior national seroprevalence studies have shown. The rates in many of the later birth year cohorts were significantly lower than rates reported necessary to sustain herd immunity. The results of this study show the tremendous value in determining seroprevalence on a local basis. We will use these results to alter our approach to assessing travelers and others in our clinics based on their birth year.
Figure 1: Bar Chart of Percentage of Birth Cohort Immune to Each Disease (Excluding Equivocal)

Figure 2: Line Chart of Percentage of Birth Cohort Immune to Each Disease (Excluding Equivocal)

Table 1: LVHN Overall Seroprevalence by Disease Compared to National Seroprevalence (Excluding 1989 – 1995 Cohort)

<table>
<thead>
<tr>
<th>Disease</th>
<th>LVHN % Immune</th>
<th>US % Immune</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubella</td>
<td>96.1</td>
<td>89.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Mumps</td>
<td>82.4</td>
<td>90</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Measles*</td>
<td>87.2</td>
<td>93</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

National vs LVHN MMR Overall Seroprevalence
PO04.06
Reasons for Outpatient Visits by Foreign Travellers to an Urban Hospital in Tokyo

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Background: International travel has increased in recent years, which has in turn increased the number of people visiting outpatient clinics in the countries to which they travel. International travellers face unique challenges regarding communication and culture, and it is important to understand both the medical and the cultural needs of international travellers.

Objectives: The problems that people experience during their stay in Japan have not yet been studied, particularly with regard to patients visiting general medicine departments. In this study, we investigated the reasons for these visits.

Method: We retrospectively reviewed the charts of travellers who visited the Department of General Medicine at Juntendo University Hospital between April 2008 and March 2014. The charts of 71 international travellers were screened for symptoms, diagnoses, and number of hospital visits.

Results: The age range of the study population was 3-78 years; the median age was 35 years. The most common symptom was fever, which was noted in 34 patients (47.8%). Sore throat and cough were noted in 18 (25.3%) and 15 (21.1%) patients, respectively. Other symptoms were as follows: headache, 12 patients (16.9%); abdominal pain, 18 patients (25.3%); chest pain, 5 patients (7.0%); and diarrhoea, 9 patients (12.6%). Sixteen patients (22.5%) had upper respiratory infections (URIs), 7 (9.8%) had influenza, and 13 (18.3%) had gastrointestinal infection. The diagnoses for the other patients included arrhythmia, herpes zoster, sepsis, pneumonia, hyperventilation, cellulitis, diverticulitis and pyelonephritis.

Summary of Result: The most frequent reason for medical visits was fever, which was predominantly caused by URIs, gastrointestinal infections, and influenza. We also found a large variation in the diagnosed conditions, indicating the absence of a clinical trend regarding hospital visits.

Conclusion: This study describes the reasons for hospital visits by international travellers who fell ill in Japan and their final diagnoses. The small sample population does not enable a definite conclusion. However, we found that fever-related and non-life threatening problems were the most frequent health issue among international travellers in Japan.

PO04.07
Tuberculosis Infection in Travelers: Screening and Serial Testing with an Interferon Gamma Release Assay in 8431 French Travelers

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Background: Very few data exist on risks of Tuberculosis (TB) in travelers. Since 2013, 8431 travelers visiting our clinic have been screened for TB infection using an Interferon gamma release assay (IGRA) which is a laboratory test detecting immune response to tuberculosis infection. Unlike Tuberculin Skin Test, IGRA is unaffected by BCG vaccination, hence convenient in France where BCG is common.

Objective: We investigated incidence and risk factors for TB infection in travelers.

Methods: Screening for tuberculosis infection was performed using QUANTIFERON TB Gold assay (QFT). Study population comprises business travelers and their family. Some of them are expatriates, some other do short but repeated stays (missions or rotations). Residence location was onshore or offshore. 8431 individuals were evaluated at baseline. 590 persons were tested twice or more within an interval of 6 to 15 months. TB acquisition was detected by conversion from a negative QFT to a positive test result. Definition for conversion is transgression above the cut-off (0.35 IU/ml). In QFT
positive individuals, advanced medical assessment and chest X rays were performed to distinguish active TB from latent TB infection.

**Results:**

- At baseline, 587 (69%) individuals were found QFT positive
- QFT positivity was more frequent in regular travelers (previous expatriations, repeated missions or rotations) than in individuals traveling for the first time or sporadically (73% versus 3%)
- In serial testing, conversion rate was 3.8%
- Travel destination appears to be a major determinant for TB acquisition since all individuals with QFT conversion were returning from endemic regions (50% from Africa, 27.5% Asia, 0% Europe/North America/Australia)
- Sex ratio for the conversion group is 2.7 versus 2.3 in the study population. Mean age is 40 years old versus 30 y.o
- No significant difference in conversion incidence was observed respectively between offshore and onshore stays, repeated short stays and expatriations
- No active TB was detected so far

**Conclusions:** Regular travelers to endemic areas are at increased risk for TB, regardless their conditions of stay (offshore or onshore, missions, rotations or expatriations). They should be screened for TB infection.

**PO04.08**

**Brucellosis in Israeli Travelers**

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**Background:** Brucellosis, a zoonotic infection caused by human exposure to fluids of infected animals, is considered a worldwide health issue. Consumption of infected milk or food products and occupational exposure are the most significant risk factors. Israel is considered endemic for Brucella, however there is also a large number of travelers who visit developing countries and other regions of the world endemic for the disease.

**Objective:** To explore the role of travel to endemic countries as a risk factor for brucellosis diagnosed in Israel.

**Methods:** A retrospective study of all Brucellosis cases among the Jewish-Israeli population, reported to the Israeli Ministry of Health and to Sheba Medical Center between the years 2001-2013 was conducted.

**Results:** Of 123 reported cases, an epidemiological investigation was performed on 53 cases. In 27 of the 53 cases, a risk factor was identified. Six of these cases (22%) were travel related, whereas 21 cases (78%) were acquired in Israel following food or occupational exposure. In 26 (49%) of the 53 cases, no risk factor was identified. However the standard epidemiological questionnaire in these cases did not include travel history inquiry.

**Conclusions:** Travel to endemic countries appears to be an important risk factor for brucellosis in the Jewish population of Israel, accounting for 22% of cases where risk factor was identified. In about half of the cases no apparent risk factor was identified, but travel to endemic countries was not sought out. Travel history therefore must be an integral part of an epidemiological investigation, even in endemic countries for brucellosis, such as Israel. Pre-travel consultation must include instruction on the prevention of brucellosis, and travelers should know the importance of avoiding unpasteurized milk products, as well as contact with potentially infected animals.
The Efficacy of Three Novel Tetracyclic Iridoids Isolated from Morinda lucida against Leishmania spp

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Leishmania spp are parasitic protozoans that cause Leishmaniasis which is characterized by disfigurement, morbidity and mortality. Chemotherapy, the main form of control is undermined by toxic effects of available drugs and emerging drug resistance. The use of traditional medicine to treat infections is very common in Africa. Morinda lucida, is one of the popular medicinal plants in West Africa. Although several research groups have reported on Morinda lucida to have antiprotozoa (e.g. Trypanosome and Leishmania) properties, no compound(s) have been assigned the responsibility for this activity. Our research group first identified novel tetracyclic iridoids, ML-2-2, ML-2-3 and ML-F52, active against trypanosome by in vitro assay-guided purification from Morinda lucida leaves. This study was therefore aimed at finding their anti-Leishmania properties. In vitro bioassay was performed using FACS and found that ML-2-2 and ML-F52 possessed anti-Leishmania activities with IC50 values of 4.24 μM and 3.38 μM respectively while ML-2-3 had no activity. Immunofluorescence study showed that both ML-2-2 and ML-F52 inhibited cytokinesis and caused short stumpy forms of parasites. The mode of action of ML-2-2 and ML-F52 might be associated with parasites cell cycle, and may be good lead compounds for new chemotherapy against Leishmaniasis.

PO04.10
Ebola; A Migrating Global Disease

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Background: Ebola, a deadly virus with early cases diagnosed since 1976, yet there is no licensed treatment. Subsequent outbreaks indicate a relatively high case fatality rate of up to 90%. The recent outbreak of Ebola disease which started in West Africa in March 2014 has claimed over 8000 lives as per World Health Organization updates of January 2015. The virus has an incubation period of 2-21 days. Evidence from research indicates fruit bats from pteropodidae family to be natural Ebola virus host found in the rainforests. An increase in globalization could facilitate an Ebola outbreak in one country imposing threat to other countries. There are many risk factors and behaviors associated with contacting the virus but a direct contact with a symptomatic patient’s bodily fluid is needed in it transmission.

Objective: To analyze characteristics between past and current outbreaks and the impact of the current outbreak on globalization.

Method: A literature review was conducted on all relevant articles published on Ebola since 1976, follow-up updates in the News and relevant websites on infectious diseases. Telephone interviews were also conducted for situational analysis in Liberia.

Results: Predominant differences between outbreaks includes the current outbreak occurring in urban setting with densely populated and facilitated border, with more movement of people and strong cultural practices which differ from previous outbreaks. Low literacy rate, lifestyle and lack of trust were identified as negative impacts in this current outbreak.

Conclusion: The initial case of Ebola occurred in Guinea. It is important to note that all the other outbreaks in Liberia, Sierra Leone, Nigeria, USA, Spain, Mali, and United Kingdom, are all traced from mobilization of people from one location to another. This illustrates the very strong role globalization has upon Ebola virus. Thus, risk communication, social and community mobilizations are essential tools for positive management. An understanding of the differences between past and present outbreaks will provide a better platform for intervention and management. Finally, we propose approaches in managing the risk based on the cultural context and perception. Recommendations that can be carried forward will be made to the public, politicians and policy makers.
A Potential role of *Tetrahymena* Ciliates in the Transmission of Legionnaires' Disease

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**Background:** Legionnaires' disease (LD) is an atypical pneumonia caused by the Gram-negative bacterium, *Legionella pneumophila*. *L. pneumophila* replicates intracellularly in amoebae in freshwater environments, and then accidentally infects susceptible humans. In contrast to most respiratory diseases, LD is not transmitted from person to person. *L. pneumophila* has a developmental cycle that alternates between replicative forms and resilient, metabolically dormant mature infectious forms (MIFs), which are thought to be responsible for the transmission of LD. We have previously shown that MIFs are poorly produced inside human macrophages and that *L. pneumophila* progeny from human macrophages is less fit and infectious than its progeny from amoebae. *Tetrahymena* ciliates also inhabit freshwater environments. They do not support the intracellular replication of *L. pneumophila* but rather package legionellae into pellets. The role of legionellae-laden pellets has not been yet identified.

**Objective(s):** We set out to test the hypothesis that legionellae-laden pellets could be infectious to protozoa (in natural water environments) and to susceptible humans and therefore may play a role in the transmission of LD.

**Method(s):** Legionellae-laden pellets from the ciliate *Tetrahymena tropicalis* were compared to *L. pneumophila* progenies from the amoeba *Acanthamoeba castellanii* and U937-derived human macrophages with respect to morphology (electron microscopy), resistance to antibiotics, and infectivity (plaque assay and fluorescence-based assays).

**Results:** Pellets of MIFs produced in *Tetrahymena* ciliates demonstrated similar levels of morphological differentiation, higher resistance to ciprofloxacin (used to treat LD) and higher infectivity to L929 cell model when compared to the *L. pneumophila* progeny obtained from amoebae. They both demonstrated comparable infectivity levels to monolayers of amoebae and human macrophages.

**Conclusion:** *L. pneumophila* pellets produced in *Tetrahymena* ciliates provide some fitness and infectivity advantages. *Tetrahymena* ciliates may play an important, and previously unrecognized role, in the life cycle of *L. pneumophila* and in the transmission of LD, acting as 'packagers' of MIFs. These findings may further explain, at least in part, why LD is not communicable.
eosinophilia, positive serology and history of contact with freshwater in endemic region. All our patients were treated with praziquantel. Eight of ten CE cases were diagnosed in migrants from endemic countries: Bulgaria (2x), Romania, Russia, Kazakhstan, Montenegro, Tajikistan, and Uzbekistan. The CE cysts have been identified in liver in 7 patients, in lungs only in 1 case. There is one patient in the long-term follow up at our department with prolong hypereosinophilia and probable lymphatic filariasis after visiting West Irian in 2007. Imported onchocerciasis was diagnosed in traveler to Cameroon and neurocysticerciasis in 6-year old boy living with parents in India for 4 years.

**Conclusion:** Tissue helminthic infections are chronic diseases with low mortality but substantial morbidity and long-term sequel. The acute stage of these infections may be connected with the systemic immune reaction based on immune complex production and presented as fever, rigor, headache, muscle and joint pain, cough, chest pain, rash and high eosinophilia. They represent infrequent infections and need specialized diagnostics and treatment. Systemic helminthic infections are recognized as an important health problem as increasing number of Czech tourists and workers travel to epidemiological risky regions in tropics.

### Long-stay Travellers (Including Expatriates)

**PO05.01**

*Current Medical Support for the Employees Overseas in India as the Company Hospital*

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**Background:** A company which has globalized their business has to pay attention to the health condition of the employees overseas especially in developing and rising countries because of increased risk of diseases.

**Objective:** Many employees overseas in developing and rising countries will face the difficulty to handle the issue regarding the work and daily life. Some of them might develop diseases in mentally or physically. We take care of our company's employees overseas to reduce the incidence of various diseases through pre, during and post travel.

**Method:** On pre-travel clinic, we administer the appropriate vaccines to the employees and provide updated medical information on their destination. During their stay overseas, we accept electric mail and a call regarding health problems from them and treat those. The company doctor who is in charge of travel clinic for them has regular visit to India once a year.

**Result:** More than 60% of the visitors in our travel clinic are our company's employees. India to which our company sends many employees occupied 52% of visitors' destination. We have administered vaccines against hepatitis A, hepatitis B, tetanus, Japanese encephalitis, rabies and typhoid fever to the employees leaving for India. The company doctor who is in charge of travel clinic has visited various places in India including 19 medical facilities, 7 thermal power plants and 8 residences to support the employees in medical aspect. As the post travel clinic we have experienced traveler's diarrhea, dengue fever and surgical diseases.

**Conclusion:** A company has the responsibility for the health management for the employees overseas and has to provide considerable information on daily life, security, medical situation and so on to the employees overseas especially in developing and rising countries. Not only pre-travel care, but also during travel care as regular visit by medical staff and strengthening post travel clinic are needed to maintain employees' health. First of all, we initiated medical support for the employees overseas in India three years ago. We expect to continue these support for the employees overseas in India and also in other countries.

**PO05.02**

*Travel-associated Infectious Diseases in Long-term Expatriates to Africa: Surveillance Analysis from Sichuan International Travel Healthcare Center in 2014*
Background: Each year, almost 20,000 expatriates are dispatched to underdeveloped countries from Sichuan Province located in southwest China, and 90% of the destinations are in Africa. Since 2008, imported malaria has posed a real challenge to local public health safety as the indigenous cases are under elimination.

Methods: To investigate the spectrum of travel-related infectious diseases in long-term expatriates to Africa, we conducted a retrospective study in returned expatriates who came to our center spontaneously, symptomatic or asymptomatic. Between January and December in 2014, through a series of questionnaires and specific laboratory tests, a general situation concerning demographic, clinical characteristics was gained.

Results: During the study period, 192 returned expatriates presented to our center, 31 (16.1%) of whom were symptomatic on site. The duration of stay in destination countries ranged from 7 to 81 months with the average time of 27 months. 81 (42.2%) expatriates were diagnosed as travel-related infectious diseases when they were in destination countries, and the spectrum of diseases included malaria (n=75 (92.5%), dengue fever (n=3 (3.7%)), typhoid fever (n=2 (2.5%)), filariasis (n=1 (1.2%)) and unknown insect-bite induced skin lesions (n=2 (2.5%)). Among 75 cases of malaria, 53.3% were confirmed by laboratory tests but without evidence of plasmodium type. The number of malaria attacks varied from 1 time to 5 times but could not distinguish relapse from recrudescence. 3 (3.7%) expatriates suffered from two kinds of diseases, which were malaria with dengue fever, malaria with typhoid fever and malaria with filariasis. Among 31 symptomatic returned expatriates, 18 (58.1%) expatriates had a diagnosis of infectious disease abroad, and 4 (12.9%) expatriates showed positive when using rapid diagnostic test for plasmodium. Another 3 cases showing positive in rapid diagnostic test for plasmodium were asymptomatic, and 1 case had been diagnosed abroad before.

Interpretation: The long-term expatriates to Africa are considered at the highest risk of travel-associated infectious diseases. It is encouraging that 147 (76.6%) expatriates in this study had sought pre-travel advice, completed required vaccinations and got antimalarial drugs (artemisinin-based compound). As more and more long-term expatriates raised the awareness of travel health, malaria was still the most concerned. One case of filariasis was confirmed and two cases of skin lesions were undiagnosed in the study, which indicated that skin lesions as the initial symptom should be recognized.

PO05.03
Mexican Expatriates: Monitoring Mental Health during their Stay Abroad

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In Mexico, expatriates' health is unknown during their stay abroad. (Expatriates= No pleasure trip, stay >30 days). CAPV has a voluntary monitoring program for this travelers. Identify anxiety problems, depression, social phobia, alcohol and sexual behavior determinants caused during traveling. All travelers that came to pre-travel consultation during February 2013 to October 2014, were included in this study. Procedure was explained and they were asked for previous consent. Web based questionnaire was sent trough e-mail every 30 days while abroad following the first month of stay. Data was analyzed in PAWS Statistics program.

2,050 travelers had pre-travel consultation during the 20 months study period, 656 expatriates were included. The response rate for the first questionnaire was 34% (222/656). The average age is 24 ± 6 years old, 52% were female and principal residence was located inside metropolitan area. International students and teaching were the main reasons for travel (78%) with average stay of 31 to 180 days. Psychiatric relevant background was documented in 9% of expatriates, only 36 (16%) had chronic diseases during the medical consultation (endocrine 25%, dermatological 22%, gynecological-obstetric 17%, gastrointestinal 17%, psychiatric 14% and HIV 1%). 222 expatriates were included and 388 questionnaires were received (90 expatriates answered at least 2 questionnaires), obtaining the main health problem is generalized anxiety 171 (44%), depression 46 (12%) and seasonal flu 16 (4%), ultimately, social phobia (12) and traveler’s diarrhea (12) were reported. Condom use between
heterosexual (93%) and homosexual (7%) expatriates were collected, only 58% of heterosexuals and 60% of homosexuals reported always using condom during sexual relation. 13% reported increased rates of alcohol consumption.

Common health problems observed in this study were depression, generalized anxiety and sexual behaviour. Elevated rates of the present diseases may be associated with cultural shock adaption. Alarming rates of non-use condom relationships, and alcohol consumption increased rates are shown. Expatriates directed programs are necessary to implement this need to cover pre-consult issues, abroad contact and post-travel attention. More studies in the student community need to be done in order to prevent health deterioration.

Malaria

PO06.01
Concurrent Dengue and Malaria: To Alert the Domestic Traveler. A Case Report

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Introduction: Malaria and dengue are two major public health concerns in tropical areas and concurrent infections are rare. We report a case of dengue fever with acute malaria due to *Plasmodium vivax*.

Objective: To describe and to alert health professionals about co-infections malaria and dengue in travelers returning from or living in endemics areas.

Case report: A 63-year-old female presented to the Malaria Clinical Trial, in Evandro Chagas Institute, Pará, Brazil, on 17 September 2012 with vivax malaria confirmed with blood cells in thick (2000 forms asexual parasites/mm³) in use chloroquine and primaquine. She travelled to Brazilian Amazon (Acre State) to work, where she has been for seven days. In the fifth day of treatment the patient persisted with headache, severe myalgia, fever, chills, sweating, back pain and anorexia. There was no vomiting and bleeding. Two days later the patient was reevaluated and showed little improvement, persistent anorexia, headache, insomnia and isolated episodes of diarrhea. Physical examination: she was conscious, febrile (38°C), dehydrated, hypotensive (BP: 100x70 mm Hg), diffuse rash. After physical examination was formulated the hypothesis of concurrent dengue fever and malaria due to the persistence of symptoms. Laboratory tests: Blood hemoglobin 13.2 g/dl, total leucocyte count 13.500/mm³; differential leucocyte count, 87% neutrophils, 10% lymphocytes, 1% monocytes, platelet count 229.000/mm³. Biochemical tests were normal. Blood serology positive for dengue virus on the sixth day after onset of symptoms. Laboratory tests after 1 week presented leucocyte count 6400/mm³; platelet count 421000/mm³ and absence of malaria parasites in the blood film. The patient was monitored daily and clinically oriented to increase fluid intake daily and to rest. She relapsed three months after the follow-up, when a new treatment with chloroquine and primaquine (30 mg daily for 17 days) was established for radical cure of *P. vivax*. After the new treatment, she evaluate asymptotically with normal hematological and biochemical parameters during six months.
Conclusions: Malaria and dengue must be in suspected febrile patients living in or returning from areas endemic for these infections.

**PO06.02**
**Time Series Analysis of Diagnostic Assays in *Plasmodium falciparum* Malaria**

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**Background:** While rapid diagnostic tests (RDTs) and real-time PCR (qPCR) assays are sensitive techniques for diagnosing malaria, because they detect *Plasmodium* antigen and DNA respectively, their findings may not reflect active infection.

**Objective:** We evaluated differences in performance characteristics between diagnostic tests in specimens containing *P. falciparum* parasites over time in order to determine the duration of positivity of RDT and qPCR following conversion to smear negativity.

**Methods:** Biobank specimens from individuals with at least one EDTA-blood sample that was smear-positive for *P. falciparum* and at least 1 sample that was smear-negative for *P. falciparum* within a 1-month period were identified. Kaplan-Meier curves and log-rank tests were conducted to compare the survival distributions of the three diagnostic tests over time. Performance characteristics, including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for each test were calculated.

**Results:** Ninety specimens from 24 individuals were included, with 48 specimens initially microscopically positive for *P. falciparum*, and 42 subsequently negative. Of 42 specimens that converted to microscopy-negative following an initial positive, 26 (61.9%) and 41 (97.6%) were positive by qPCR and RDT, respectively. Survival curves of microscopy and qPCR as well as microscopy and RDT differed significantly (p = 0.0002 and p < 0.0001, respectively). Compared to reference-standard microscopy, sensitivity of qPCR was 100.0% (95% CI 90.8-100.0%), and that of RDT was 100.0% (95% CI 90.8-100.0%). Specificity of qPCR and RDT for smear-positive asexual parasitemia was 38.1% (95% CI 24.0-54.3%) and 2.4% (95% CI 0.1-14.1%), respectively. PPV for qPCR was 64.9% (95% CI 52.8-75.4%) and NPV was 100.0% (95% CI 75.9-100.0%). PPV and NPV for RDT were 53.9% (95% CI 43.1-64.4%) and 100.0% (95% CI 5.5-100.0%) compared to microscopy, respectively.

**Conclusions:** RDT and qPCR are simple, objective assays with high sensitivity for *Plasmodium falciparum* malaria. However, due to slow clearance of circulating antigen and DNA from bloodstream, RDT and qPCR have low specificity for asexual parasitemia in post-treatment samples that are microscopy negative. Thus, microscopy remains the gold standard as it can reliably distinguish true asexual parasitemia from prolonged clearance of antigen and nucleic acid in a convalescing patient.

**PO06.03**
**Molecular Surveillance for Drug Resistant Plasmodium falciparum Imported to Ontario**

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**Background:** *Plasmodium falciparum* causes the most severe form of malaria in humans. Single nucleotide polymorphisms (SNPs) at several loci have been correlated to *P. falciparum* treatment failure, delayed parasite clearance, and/or in-vitro drug resistance.

**Objectives:** Our objective was to study the prevalence of molecular resistance SNPs in *P. falciparum* infections imported by returning travelers and migrants to Ontario.

**Methods:** *P. falciparum* monoinfection in microscopy-confirmed specimens stored in our malaria biobank was verified by real time PCR. Pyrosequencing to detect SNPs associated with drug
resistance and/or treatment failure was performed on the following gene targets: \textit{atpase6}, chloroquine resistance transporter (\textit{PfCRT}), cytochrome b (\textit{cytb}), dihydrofolate reductase-thymidylate synthase (\textit{dhfr}), dihydropteroate synthetase (\textit{dhps}), and multidrug resistance protein (\textit{mdr1}).

**Results:** Of 90 \textit{P. falciparum}-positive specimens analyzed, 50 had known travel history with 49 cases travelling to sub-Saharan Africa, and 1 to the Caribbean. All 90 cases contained at least one mutant SNP, with the most prevalent mutations occurring at \textit{dhfr} triple codon 51, 59, 108 (87%); \textit{dhps} 437 (89%); and \textit{PfCRT} 76 (56%). No mutants were observed at \textit{cytb} codon 268. All \textit{PfCRT} codon 76 mutants (50/90 isolates, 56%) had co-mutations at codons 74 and 75, with 48 of these cases co-existent with \textit{dhfr} triple codon mutations. Forty percent of isolates had mutation of \textit{mdr1} codon 86, and a small proportion (6%) at the \textit{atpase6} gene. With a threshold setting of ≥20% in SNP proportions, at least 38 isolates (42%) had a represented minor genotype along with the dominant in the same gene.

**Conclusions:** Mutant genotypes for various molecular markers of drug resistance were highly prevalent among \textit{P. falciparum} isolates imported to Ontario from sub-Saharan Africa. Co-mutations in multiple genes suggests potential resistance to more than one anti-malarial. Our observation of minor genotypes confirms the heterogeneous nature of infection, which may lead to differential drug resistance levels and therapeutic responsiveness.

**PO06.04**

**Variation in Recommendations for Malaria Prophylaxis**

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**Background:** National recommendations for malaria prophylaxis for travellers are known to display considerable differences. It is unclear why this should be so since guideline panels have access to the same information. It may be that many travel medicine practitioners are unaware of this phenomenon.

**Objective:** To illustrate the wide variation in expert advice for or against malaria chemoprophylaxis across several countries, and to explore reasons for this.

**Method:** The national malaria recommendations of eight countries in North America and Europe, as well as those of the World Health Organization are applied to five common travel destinations, tabulated and compared.

**Results:** For five common travel itineraries, malaria prophylaxis recommendations show inconsistencies across nine different guideline panels.

**Conclusion:** Despite access to the same information, there is a lack of uniformity among national and international advisory bodies regarding the need for malaria chemoprophylaxis. We discuss possible reasons for this.

**PO06.05**

**Repeated Relapses of \textit{Plasmodium vivax} Acquired in Papua New Guinea due to Impaired Hepatic Primaquine Metabolism**

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**Background:** Primaquine is the only drug available for preventing relapse following a primary infection by \textit{Plasmodium vivax}. This drug imposes the problems of:

(i) daily dosing over two weeks;
(ii) toxicity in patients with glucose-6-phosphate dehydrogenase deficiency;
(iii) partner blood schizontocides impacting primaquine safety and efficacy;
(iv) cytochrome P-450 abnormalities impairing metabolism and therapeutic activity; and
(v) some strains of parasite may be tolerant or resistant to primaquine.
Thus there are many possible causes of repeated relapses in a patient treated with primaquine.

Case report: A 56-year-old Caucasian woman from New Zealand travelled to New Ireland, Papua New Guinea for 2 months in 2012. She took 100 mg doxycycline daily while there, and for 1 month after returning home. One week after stopping doxycycline she became acutely ill and was hospitalized with a diagnosis of *Plasmodium vivax* malaria, confirmed by nested PCR. Over the ensuing year she suffered 4 attacks of vivax malaria at approximately 2 monthly intervals despite consuming primaquine 30 or 45 mg daily for 14 days after each attack.

Isolated DNA was collected from the patient and extracted using Puregene (Gentra®Puregene®) and its concentration measured at 635 ng/µL (NanoDrop2000®, Thermoscientific) and 1.58 DNA purity (A260/A280). CYP2D6 genotyping was performed using xTAG CYP2D6 kit v3 (Luminex® Corporation, USA). The genotype of the patient's cytochrome P-450 2D6 allele (*5/*41) corresponded with an intermediate metabolizer phenotype of predicted low activity.

Conclusion: Although we cannot completely exclude non-compliance, poor quality primaquine or resistance, it is likely that the repeated relapses were due to due to impaired primaquine metabolism associated with cytochrome-P450 polymorphism. Identification of such patients is important because repeated and increasing doses of primaquine will not prevent relapses. Alternative strategies are necessary.

PO06.06

Anti-Plasmodial Properties of Some Selected Ghanaian Medicinal Plants: Identification of Novel Active Compounds against *Plasmodium falciparum*

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Malaria, caused by *Plasmodium* spp has been considered as a major disease of public health importance affecting multitudes of people worldwide, particularly in the tropics and sub-tropics. Due to increasing drug resistant parasites to existing drugs, development of new anti-malarial drugs are eagerly awaited. In Africa, there is extensive use of traditional medicinal plants for treatment of various diseases. Many research studies into medicinal plants have shown their significant potentials for anti-plasmodial properties but a few of the active ingredients have been studied. The present study aimed at screening selected medicinal plants used in Ghana for activity against *Plasmodium falciparum* to determine their active compounds. A high-throughput 96 wells flow-cytometry screening system was established using the method reported by Smilkstein and others, with modification. 50% Et-OH crude extracts of medicinal plants were prepared and applied to synchronized *P. falciparum* (3D7 strains) culture and FACS analysis was carried out to determine the IC<sub>50</sub> of the extracts. Although screening is still ongoing, one active crude extract, obtained from *Morinda lucida*, was found possessing activities against *P. falciparum* and identified three novel tetracyclic iridiods, ML-2-2, ML-2-3 and ML-F52. These compounds have significantly high anti-*P. falciparum* activities with IC<sub>50</sub> values of 0.14 µM, 1.22 µM and 10.32 µM respectively. Their selective index (SI) for different human cell lines ranged from 50.79 to 102 for ML-2-2, >50 for ML-2-3 and 0.46 to 1.76 for ML-F52. Novel compounds identified in this study could be candidates to develop new chemotherapy for malaria. Furthermore, our high-throughput FACS screening system could be useful tool for malaria drug assay.

PO06.07

Development and Application of Liquid Bead Array Method for the Detection of *Plasmodium*

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Objective: To establish a method for detecting of plasmodium based on a liquid bead array in order to rapidly detect and identify four kinds of plasmodium.

Methods: Primers and probes were designed and synthesized according to genomic sequences in the NCBI Genbank database. Protozoa DNA was extracted and target sequences were amplified. PCR products were hybridized with coupled nucleic acid probe beads set and detected by the Bio-Plex™ 200 system.

Results: PCR conditions were optimized, and the limits of detection for each plasmodium were about 9DNA copies for Pv, Pm and 90DNA copies for Pf, Po. 30 clinical samples were detected by the established assay, 12 out of the 30 samples were confirmed to be positive. The results compared with the specific fluorescence real-time PCR had the very high consistency. However, it had advantages in detecting complex samples rapidly.

Conclusion: A liquid bead array method for detecting of plasmodium was developed, which was a highly specific and saving time way, and had no cross-reaction to simultaneously detect four kinds of plasmodium, and may play a new and important role in rapid screening and identification of plasmodium.

Keywords: Plasmodium; liquid bead array; PCR

PO06.18
Overseas Imported Malaria Brings Challenge to China Malaria Elimination: A Malaria Cases Retrospective Analysis in Hubei Province, 2009-2014

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Background: China aimed to eliminate malaria in the whole nation no later than 2020. However overseas imported malaria brings challenge to the aim, though the prevalent of malaria has been significantly reduced.

Objective: We investigated and described the epidemiological profile of all malaria cases during the period of 2009-2014 in Hubei Province, PR China, to identify the risk of overseas imported malaria and the high importing risk original malaria epidemic countries to the province.

Methods: Data on both imported and indigenous malaria cases in Hubei Province from 2009 to 2014 were collected from the infectious disease surveillance system and case investigation reports. The data analyzed by Microsoft Excel 2010. Epidemiological trends were described, the most common malaria species was identified and the top 10 original countries importing malaria to the province in 2011-2014 were ranked.

Results: From 2009 to 2014 in Hubei Province, 549 malaria cases and seven malaria deaths were imported infectors from abroad, accounting for 32.1% of total malaria cases and 100% of all malaria deaths. During the period the annual number of indigenous cases decreased from 681 to 0, though the number of imported cases increased from 17 to 106. P.f. (Plasmodium falciparum) was the most common species among imported cases (370 cases, 67.3%). From 2011 to 2014, the imported malaria cases were mainly acquired from African malaria epidemic countries (384 cases, 70.1%).

Conclusions: From 2009 to 2014 in Hubei Province, the number of imported malaria cases there was consistently increased, while the number of locally acquired cases sharply declined. It should attach more importance to the substantial increase of number of P.f. cases and the malaria importing risk by entry people from African malaria epidemic countries.

PO06.09
Efficacy and Safety of Intravenous Artesunate in Adult Travelers Presenting with Imported Severe Plasmodium falciparum Malaria

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Background: Since 2010, the World Health Organization (WHO) recommends intravenous (IV) artesunate (AS) for treating severe malaria. In high income countries, the observation of a 20% proportion of delayed hemolytic anemia raised concerns. In France, the drug is available since May 2011 and data in travelers is scarce.

Objective: To assess the efficacy and safety of intravenous artesunate in a cohort of travelers.

Methods: All adult travelers, treated with IV AS between July 2011 and December 2014, were prospectively included. IV AS was made available through a named patient programme and initiated in severe P.falciparum malaria cases defined by a positive blood smear with sexual parasite forms of P. falciparum associated with at least one criterion of severity (WHO). Patients were prospectively evaluated during a 28 day follow-up. Patient characteristics, outcome and adverse events were recorded.

Results: Twenty six patients (20 males and 6 females; visiting friends and relatives [n=14], servicemen [n=8], tourists [n=2] and businessmen [n=2]) were included. All patients were infected in sub-Saharan Africa. Seven patients were medevaced. There were a median number of two (1-7) severity criteria. Median parasitemia was 7% (1-12). Median number of AS doses was four (2-9). A first-line treatment (IV quinine) was given in three cases. Ten patients were transferred to the intensive care unit. One death was recorded. It occurred within the first 48 hours. We followed up 23 out of the 26 patients for 28 days. Regarding adverse effects, one patient presented with hives and another had a post-malaria neurological syndrome. Two cases of elevated liver enzymes and four cases of anemia (three persistent and one with a delayed onset and 7g/dl nadir) were observed. No severe anemia or blood transfusions were reported.

Conclusions: This study confirms the efficacy and safety of intravenous artesunate in severe imported P. falciparum malaria. Studies are needed in order to find predictive markers of delayed anemia.

PO06.10
Efficacy and Safety of Dihydroartemisinin-piperaquine in Real Life Conditions in Adults Presenting with Imported Malaria

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Background: Dihydroartemisinin-piperaquine (DHA-PPQ) is one of the artemisinin-based combination therapies recommended by the World Health Organization (WHO) for the treatment of uncomplicated P. falciparum malaria. Although prolongation of the QTc interval without clinically significant arrhythmias has been reported, it has a good safety profile. It is available in France since the end of 2003. However, limited data is available.

Objective: To assess efficacy and safety of DHA-PPQ in real life conditions in imported malaria.

Methods: We conducted a prospective study from November 2013 to December 2014. We included all malaria cases confirmed by parasitological diagnosis and treated with at least one DHA-PPQ dose (3 or 4 tablets according to weight). Full regimen comprised one daily dose during three days. Patients were followed up clinically and parasitologically on D3, D7 and D28. An electrocardiogram was recorded with QTc calculation (Bazett formula) three times: upon admission, before the third intake, and then, 4 to 6 hours after it. Adverse events (AE) were collected on D3, D7, D28.

Results: Thirty six regimens were initiated in adults with a 32 year median age (18-73): P. falciparum (n=32), P. vivax (n=2), P. ovale (n=1). DHA-PPQ was the first-line therapy for 18 patients. In 18 cases, it was administered following parenteral quinine or artesunate. Parasite clearance was fast (33/36 on D3) and all blood smears were negative on D28. At least one AE was reported in 24/36 patients during the follow-up, mainly during the first three days. The most frequent AEs were general weakness, abdominal pain, nausea and diarrhea. Two cases of temporary elevated liver enzymes were reported. A case of significant prolonged QT (QTc > 500ms) was observed in one patient previously treated by IV artesunate. The drug was then stopped.
Conclusion: The results of this pilot study suggested the efficacy and good tolerability of DHA-PPQ. The establishment by the pharmaceutical company of a risk management plan and a European register on cardiovascular tolerance might help to better assess the potential of QTc prolongation.

PO06.11
Imported Malaria in a Changing Greece: A 20-year Survey

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Background: Greece, declared malaria-free in 1974, lies at the crossroads of three continents facilitating inbound-outbound travel. Imported malaria was commonly diagnosed among Greek seafarers.

Objective: Malaria cases imported in Greece over the past 20 years were retrospectively examined in relation to the country's socioeconomic context.

Method: Data sources were registries from the Malaria Reference Laboratory, National School of Public Health, Athens, Greece between January 1, 1995 and December 31, 2014.

Results: We found 414 imported malaria cases: 213 (51.4%) contracted malaria in Africa; 194 (46.9%) came from Asia; only seven (1.7%) visited the Americas. Most (307/414; 74.2%) cases were immigrants; 179/307 (58.3%) arrived from Asia; 128/307 (41.7%) were Africans (Graph 1). The 107/414 (25.8%) Greek cases returned from malarial areas, mostly (85/107; 79.4%) in Africa. Imported malaria cases were predominantly seafarers from 1995-2001; leisure travelers from 2002-2010; and business travelers from 2011 onwards. Socioeconomic events affecting Greece in the last 20 years were shown.

<table>
<thead>
<tr>
<th>Period</th>
<th>Greeks</th>
<th>Leisure travelers</th>
<th>Seafarers</th>
<th>Business travelers</th>
<th>Expatriates</th>
<th>Volunteers</th>
<th>Officers</th>
<th>Repatriated from the former Soviet Union</th>
<th>Expedition traveler</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2001</td>
<td>34</td>
<td>7</td>
<td>16</td>
<td>0</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2002-2010</td>
<td>44</td>
<td>24</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2011-2014</td>
<td>29</td>
<td>4</td>
<td>0</td>
<td>17</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td>35</td>
<td>20</td>
<td>18</td>
<td>18</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

[Table 1. Greeks with imported malaria, 1995-2014]
Conclusion: By the end of the 20th century, the number of seafarers infected with imported malaria declined following Greece’s shift to the service-based sector. An unprecedented standard of living
boosted leisure travel after the 2002 euro introduction; naive lifestyle travelers visited exotic destinations of high malaria endemicity, while increasing numbers of Asian immigrants substituted locals in agricultural and construction industry. The 2010 Pakistan floods resulting in a massive population movement from malaria-affected areas may have triggered the 2011-2013 outbreak of malaria in a rural Greek area. In the aftermath of the 2010 economic crisis, immigration has been reduced; currently, the majority of imported malaria cases concerns Greeks seeking job abroad, mainly in Africa. For more than two decades, imported malaria in Greece reflects the country's social transition.

**Migrants and Refugees**

**PO07.01**

**Overcoming Language Barriers: Training and Integrating Community Interpreters in a Refugee Health Clinic**

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**Background:** Refugees' health is known to decline following arrival in a host country. Language barriers are one of the reasons for this decline and trained community interpreters can help overcome these challenges. However, such training remains scarce.  
**Objective:** The purpose of the project was two-fold. It first aimed to train interpreters and second, to integrate them on a full-time basis in a refugee clinic in order to facilitate communication with patients and their follow-up.  
**Method:** Nepali speaking migrants were recruited as interpreters and underwent 50h of training. Their tasks included interpreting and assisting in patient follow-up. To evaluate the project, mixed data were collected. At baseline and follow-up, practitioners quantitatively evaluated clients' health, and both parties indicated their satisfaction levels with the provided care. Interviews were also conducted at the end of the project with interpreters and practitioners.  
**Results:** On the one hand, practitioners reported appreciating the full time presence of interpreters. It brought stability, continuity of care, facilitated collaboration, and allowed for quicker patient follow-ups. They also expressed the desire for the clinic to hire trained interpreters for every language spoken by their clientele. On the other hand, their satisfaction levels remained stable but they reported dissatisfaction regarding the selection of interpreters and mentioned the difficulty to evaluate the pertinence of the project due to unpredictably low numbers of Bhutanese clients. Interpreters were grateful for this opportunity but stated it was challenging to manage their many roles. Regarding refugee clients, their health remained stable for the majority and interestingly, they were slightly less satisfied at the end of the project.  
**Conclusion:** Although low numbers of Bhutanese clients made it difficult to evaluate the full pertinence of the project, integrating interpreters within the clinical team appeared valuable. Indeed, it allowed for better collaboration and mutual knowledge of both cultures. Yet, it requires proper selection of interpreters, initial training for both practitioners and interpreters, and on-going joint-workshops.

**PO07.02**

**A Missed Opportunity: Integrating VFR Travel Medicine into Primary Care at FQHCs**

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**Background:** Travelers visiting friends and relatives (VFR) make up a significant percentage of international travelers and have an increased risk for travel-related health problems. No studies have specifically focused on VFR travel among immigrants who receive primary health care services at Federally Qualified Health Centers (FQHCs).
Objective: To evaluate knowledge, attitudes and practices of both patients and health care providers with regard to VFR travel in immigrants who receive primary care services at a FQHC in a New York suburb, with a large patient population of Haitian immigrants. To investigate the impact of educational interventions for patients and providers as well as the impact of system changes through an electronic medical record (EMR) to integrate VFR pre-travel care into primary care.

Methods: Manual chart audits were performed on a random sample of 238 primary care office visits between October 2013 and December 2013, looking for documentation of VFR travel preparation. A survey (in patients’ native languages) was administered on patients coming into the clinic during a one-week period in January 2014. Primary care providers in the practice were surveyed the same week regarding their knowledge base of travel-related issues.

The intervention was three-pronged:
1) Patient education, which included signage in the waiting room relating to travel,
2) In-service lecture on travel medicine delivered to the healthcare providers
3) Creation of EMR template to both trigger providers to ask about travel, and give access to patients to request electronically travel prescriptions.

Manual chart audits were performed in May 2014 to look at changes in practice. Patients and providers were again surveyed concerning pre-travel care knowledge, attitudes and practice of VFR travel.

Results: Initial audits and surveys demonstrated that primary care providers were not addressing issues of travel with their immigrant patients. Patients and providers were largely not aware of travel risks. After the interventions, there was an increase in attention to VFR travel during primary care visits.

Conclusions: With thousands of VFR travelers in the USA who receive health care at FQHCs, there is need to incorporate pre-travel care into routine primary care. Simple interventions can impact on this goal.

PO07.03
The Trends of Tuberculosis Prevalence among Foreign Workers in Taiwan, 2004-2013

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Background: During the past decades, the number of foreign workers in Taiwan had been increasing due to unmet need of labor market, reaching 484,367 in the end of 2013, accounted for 2% of the population. These foreign workers come from Southeast Asian countries, some of which are among those with highest prevalence of tuberculosis (TB) of the world, implying epidemiological impact in domestic area.

Objective: The study aimed to analyze the difference of epidemiological characteristics between foreign workers and Taiwanese to support national TB screening policy.

Method: The foreign workers are obligated to pre-arrival, post-arrival and regular chest X-ray screening during their stay in Taiwan. We retrospectively collected and analyzed these data extracted from Alien Workers Health Database in Centers for Disease Control, Taiwan.

Results: A total of 2254 foreign worker TB cases were notified during 2004-2013, attributed to 44.5% of all foreign-born TB cases, and 1.6% of all notified cases during the period in Taiwan. The TB incidence rates of foreign workers are lower compared to their native countries (Indonesia: 61.4/10^5 vs 209.3/10^5, standardization incidence ratio (SIR) = 0.49; Philippines: 76.4/10^5 vs 280.7/10^5, SIR = 0.58; Thailand: 59.7/10^5 vs 135.6/10^5, SIR = 0.44; Vietnam: 39.8/10^5 vs 176.4/10^5, SIR = 0.48). While the annual incidence of Taiwanese is decreasing, the annual incidence rate of foreign worker is increasing. Female and younger foreign workers have an increased risk of TB (male group standardized incidence ratio (SIR) = 0.79; female group SIR = 1.49; age group ≤24 year-old: SIR = 5.31; age group 25-34 year-old: SIR = 2.63, age group 35-44 year-old: 1.40; age group 45-54 year-old: 0.62). Higher odds ratio of TB are associated with younger age (age group ≤24 y/o: odds ratio [OR] = 5.30, p < 0.0001; age group 25-
Conclusion: The TB epidemiology is different between foreign workers and Taiwanese. The study warrants further investigation of high-risk group and whether additional screening is needed in this group.

PO07.04
Comparison of Rates of Uptake of Preventive Measures between Canadian VFR Travellers and Non VFR Travellers Going to High-risk Destinations

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Background: In Canada, international travel and immigration are increasing. Immigrants and new Canadians who visit their countries of origin (VFRs) represent a population at increased risk of acquiring infectious diseases, especially young children VFRs.

Objective: To compare the uptake rate of preventive measures between VFRs and non VFRs travelling to two high-risk regions.

Methods: We conducted a multicentre retrospective chart review of travellers visiting either Sub-Saharan Africa or the Indian Sub-Continent. Travellers were grouped into VFRs and non-VFRs.

Results: A total of 2,130 patient charts met inclusion criteria, from 8 different travel health clinics across 4 Canadian provinces. Overall, 52.8% of travellers were female and 75.6% were 18 - 64 yrs of age. VFRs accounted for 33.8% of travellers. The proportion of VFRs seen in each clinic varied from 13.8% to 74.0%. Travel to sub-Saharan Africa predominated among both VFRs (67.1%) and non-VFRs (69%).

Several statistically significant differences (p< 0.001) between VFR and non-VFR travellers were observed. VFRs were more likely to be < 10 yrs old (29.4 vs 2.1%), to travel for durations > 28 days (69.7 vs 36.3%), and to visit a travel health clinic for consultation ≤ 7 days prior to their trip (17.5 vs 9.8%).

Statistically significant differences (p< 0.001) were found in acceptance rates between VFRs and non VFRs for malaria chemoprophylaxis (87.6% vs 93.1%), and for vaccines such as measles (89.2% vs 94.8%), polio (82.7% vs 95.5%), hepatitis A (81.6% vs 96.7%), hepatitis B (70.0% vs 92.8%), typhoid (83.6% vs 94.6%) and yellow fever (91.9% vs 96.8%).

Conclusion: This is the first Canadian study comparing the actual rate of uptake of preventive measures between VFRs and non VFRs. Our findings confirm observations made by travel health practitioners that VFRs are at increased risk for travel-related morbidity as compared to other types of travellers due to their demographic and travel characteristics, but also due to their lower acceptance rate of preventive measures.

Possible factors that hinder VFRs' acceptance of preventive measures will be explored, and approaches to optimize the impact of preventive strategies among these high risk travellers will be proposed.

Non-infectious Disease Travel Risk, Including Jet Lag, Pulmonary Embolism

PO08.01
Profile of Travellers with Pre-existing Medical Conditions Attending a Specialised Travel Medicine Clinic
Background: Patients with complex medical co-morbidities may travel for protracted periods to remote destinations, often with limited access to high quality medical care. The risk of interactions between travellers’ medications and drugs used for malaria chemoprophylaxis and prevention of travellers’ diarrhoea must be considered by travel health practitioners. The published literature on this subject is limited and few descriptions are available of the health burden of international travellers.

Objective: The present study aimed to characterise the profile of pre-existing medical conditions and current medications among a cohort of travellers seeking pre-travel health advice in a specialised travel medicine clinical setting.

Method: The pre-travel medical records of travellers attending the Tropical Medical Bureau clinic in Galway city between 2008 and 2014 were examined and information relating to the past medical and surgical history of subjects was extracted and entered into a database. Data were recorded only where the traveller had a documented medical history and/or was taking prescribed medications.

Results: 56% (n=2702) of travellers had a documented past medical history and 56% (n=1525) of these were taking medication. Almost a third of subjects (n=863) reported more than one personal medical morbidity. The majority of travellers with pre-existing conditions were female (67%, n=1820). The mean period remaining before the planned departure date was 40 days. Over a third of travellers with pre-existing conditions were travelling to multiple international regions. Over 400 travellers with medical conditions were travelling alone (17%, n=404). The most frequently reported medical conditions in this cohort were allergies (20%, n=541), insect bite sensitivity (15%, n=415), asthma (11%, n=300), photosensitivity (5%, n=135), psychiatric conditions (4%, n=110), and hypertension (3%, n=78). Of the 30 diabetic travellers, nearly half required insulin (n=14). Seventeen travellers reported being immunocompromised, while 125 subjects (4.5%) were currently taking immunosuppressant drugs. Half of the female travellers were taking the oral contraceptive pill.

Conclusion: This study provides an insight into the medical profile and medication usage of travellers attending a travel health clinic. A diverse range of diseases were reported, which highlights the importance of educating travel medicine practitioners about the specific health risks associated with particular conditions.

PO08.02
Field Efficacy of Herbal Repellent against Biting Midges in Thailand

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Biting midges are nuisance pests usually found on the shorelines and sandy beaches. They feed on tourists and resident visiting the beaches and resorts. These insects deter human recreation and also diminish tourism industry. In Thailand, Leptoconops spinosifrons is one of the predominant species of biting midges and has been found on various beaches in 9 provinces (Trat, Chantaburi, Rayong, Chonburi, Prachuap Kirikhan, Chumphon, Surat Thani, Nakhon Si Thammarat, Songkhla) around the Gulf of Thailand and 6 provinces (Ranong, Phang Nga, Krabi, Trang, Satun, Phuket) along the Andaman Sea, including some islands located in both seas. Since the control of biting midges along beaches by larvicides or adulticides is hardly possible, attempts have been made then to prevent its nuisance by using repellent application. An herbal repellent, containing essential oils from Eucalyptus citridora Hook. and Litsea cubeba (Lour.) Pers., was evaluated for repellency against L. spinosifrons in comparison with N,N-diethyl-3-methylbenzamide (deet). Both repellents were prepared as 20% in ethanol and each one was applied on the clothes (long sleeve T-shirt and pants) at the dosage of 0.5 mg a.i./cm². Assessments were made using landing rates on the treated clothes as compared with controls (untreated clothes). Both repellents showed relatively high repellency against L. spinosifrons; however, the herbal repellent provided higher degree of repellency (98.3 - 99.7%) than did deet (82.7 -
This study demonstrates a high potential for use of the herbal repellent to protect from biting of *L. spinosifrons*.

**PO08.03**

**Travelers’ Thrombosis Risk Factors and Perception Survey at Mexico City International Airport**

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¹Preventive Care Traveler’s Clinic (CAPV), UNAM, Research Division, Mexico, Mexico

Few studies of Travelers’ Thrombosis (TT) have been done in developing countries; limited data exists for prevalence of known risk factors in this population, in contrast, growing globalization trends in developing nations are increasing air mobility and cardiovascular risk factors associated with TT. The aim of this study is to know the prevalence of risk factors associated with TT in international travelers of Mexico City International Airport, risk perceptions and use of thrombosis prophylaxis measures.

A standardized questionnaire was applied at departure gates, previous informed consent, individuals under 40 years old were excluded, due to logistic limitations travellers were non-randomly selected, the principal flights included in the survey per day were Madrid-Spain and Lima-Peru). From August to December 2014, 600 questionnaires were collected by health professionals and preventive measures were explained. On average 20% of the travelers at departure gates were asked to participate (response rate 60%). 422 (70%) were Mexicans and 57% females, main purposes of travel were pleasure 67%, visiting friends and relatives 14% and business 12%, economic was the preferred travel class(98%).

Historical main risk factors associated with medium and high risk of TT are described in Table 1.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Prevalence in Adults (&lt;60 Years)</th>
<th>Prevalence in Seniors (&gt;59 Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &gt;30</td>
<td>72 (16%)</td>
<td>33 (20%)</td>
</tr>
<tr>
<td>Height &lt;1.65m</td>
<td>170 (39%)</td>
<td>86 (62%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>63 (15%)</td>
<td>73 (44%)</td>
</tr>
<tr>
<td>Varicose Veins</td>
<td>136 (31%)</td>
<td>73 (44%)</td>
</tr>
<tr>
<td>Flight time &gt;8h</td>
<td>328 (76%)</td>
<td>129 (78%)</td>
</tr>
</tbody>
</table>

**[Main Risk Factors for TT]**

Most flight times included in the survey were higher than 8h (76%). Risk perception: only 47% were aware of the association between long haul flights and TT, and 37% knew the risk factors, predominantly very low and low perception was reported (66%). Few travelers went to a physician before travelling (9%) and of those extraordinary cases refer talking about TT during consult (4%). Cardiovascular and metabolic diseases are increasing causes of morbidity and mortality in developing countries; TT risk factors are commonly associated with those diseases. Adequate assessment of the TT problem is useful for making policies that can prevent non-infectious disease travel risks.

**Occupational and Military Medicine**

**PO09.02**

**Pre-travel Health Advice Guidelines for Humanitarian Workers: A Systematic Review**

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Background: In the last decades, there have been several natural disasters and global catastrophes with a steady increase in humanitarian relief work. This resulted in increased research in the field of humanitarian help, but the focus was mostly on the victims of the disasters and not on the people and organizations providing aid.

Objectives: The intent of this research is to review the literature available on pre-deployment interventions and recommendations such as vaccinations and other health preserving measures in volunteers and professionals deploying abroad in humanitarian relief missions.

Methods: We performed a systematic literature review of papers written in English, French, Italian or German. We searched the following databases: Cochrane, PubMed, CINAHL, EMBASE and also hand searched reference lists. The cut-off date for the publication search was June 1st, 2014. Papers were reviewed by the study team to determine whether or not they pertained to humanitarian aid, whether they addressed healthcare workers and whether or not they were relevant to pre-deployment health advice guidelines.

Results: We identified 156 papers of possible relevance and finally included 32 papers in the systematic review. Pre-deployment physical and mental fitness are paramount for success in such missions. However, in many settings, pre-travel medical and psychological assessments and/or training/education session are not mandatory. The medical evaluation can identify problems or disease and assess risk factors, such as psychological frailty, that can be exacerbated by the stressful settings of such a mission. In this setting the routine vaccinations can be controlled and completed. Plausible high-risk hazards for helpers include: (location specific): accidents, violence, tuberculosis, HIV, hepatitis A, leptospirosis, dengue, typhoid, seasonal and H1N1 influenza. Vector-borne diseases are important and malaria chemoprophylaxis may be applicable in addition to netting and personal protection against insect bites. Advice about traveller’s diarrhea such as food and water precautions, ORS and other medications is essential. A mission specific first-aid kit is recommended.

Conclusion: There is a lack of evidence-based literature on the theme of pre-travel advice guidelines for humanitarian workers. A shared database on literature on this topic and some standardization of guidelines could be useful for future planning.

PO09.02
A *Giardia intestinalis* Diarrhea-related Reactive Arthritis in a French Soldier Repatriated from Mali

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Background: Diarrhea is the most frequent travel-related health issue in travelers. While most of the time it has acute and self-limited symptoms, it can cause long-term sequelae such as reactive arthritis (ReA).

Methods: We report the case of a *Giardia intestinalis* diarrhea-related ReA in a French soldier deployed to Mali.

Case report: A 29-year-old male was admitted to the rheumatology ward on September 19, 2014 after his repatriation from Mali for unilateral gonarthritis associated with urethritis and bilateral keratoconjunctivitis. He reported a diarrhea occurring less than three weeks previously, with negative stool cultures but *Giardia intestinalis* positive stool examination that was treated with 500mg metronidazole TID. Upon admission, he had a 38°C temperature with asthenia, anorexia and a 7kg weight loss within three weeks. Left knee was swollen and painful. Palpation of the spine and sacroiliac joints was normal. There was neither enthesopathy nor heart murmur. Laboratory findings were: 17 780 leukocytosis, 350 mg/L C-reactive protein, blood and urine cultures were negative, malaria screening was negative, HLA B27 screening was negative, *Chlamydia trachomatis* and *Neisseria gonorrhoea* PCR were negative. HIV, HBV and HCV serologies were negative. Synovial fluid analysis revealed 14000 WBC but no microorganisms or crystals. Synovial fluid culture was negative. Chest, abdomen and pelvis CT scan was normal. The ophthalmologist found no uveitis but a decreased visual acuity.

Outcome was favourable following the oral administration of morphin, nefopam and ketoprofen associated with synovial puncture and injection of cortivazol (7.5mg) then a week later of triamcinolone hexacetonide (80mg). Patient was discharged on September 29, 2014.
**Conclusion:** ReA was discovered by French and German military physicians during the First World War through its classic but uncommon triad of symptoms including the urethra, conjunctiva, and synovium as in our case. Moreover, *Giardia intestinalis* is a rare etiologic agent far behind *Campylobacter*, *Salmonella*, *Shigella* and *Yersinia*. Military are at high risk of exposure to diarrhea causing-pathogens during deployments and may subsequently be at an increased risk of ReA. This further justifies efforts aimed at decreasing the incidence of diarrhea in deployed troops.

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**PO09.03**

**Diminishing Returns: Post-deployment Screening for Latent Tuberculosis Infection in the Canadian Armed Forces**

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**Background:** The Canadian Armed Force (CAF) has used tuberculin skin testing (TST) to screen for latent tuberculosis infection (LTBI), including after deployment, for many years. Isoniazid (INH) chemoprophylaxis is offered to those with recent LTBI. We have concerns regarding the low positive predictive value of TST in the modern era. Interferon gamma release assay (IGRA), in series with TST, has been in use since mid-2011, i.e. a significant TST would lead to an IGRA and, if the IGRA is positive, then the member would be classed as LTBI and, as appropriate, offered INH.

**Objective:** We analyzed data concerning: TST+ in the pre-IGRA era; TST+ and TST+/IGRA+ in the post-IGRA era; and the use of INH for LTBI in both eras.

**Methods:** Using surveillance reports from Jun 04-Dec 07 (pre-IGRA) and Jan 11-Dec 13 (post-IGRA), positivity rates were derived. A pharmacy database was used to determine the number of members given INH during Apr 10-Sep 11 (pre-IGRA) and Oct 11-Mar 13 (post-IGRA).

**Results:** The table displays the data from the two periods. Rates of TST positivity were similar in the two periods. The majority (76%) of those tested with IGRA were negative and, hence, classed as not having LTBI. INH was prescribed for 68% of positive TSTs in the pre-IGRA era and 27% of positive TSTs in the post-IGRA era.

<table>
<thead>
<tr>
<th>Era</th>
<th>TST</th>
<th>IGRA (n=63 [51%] of 123 positive TSTs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive (% of all TSTs)</td>
<td>Negative</td>
</tr>
<tr>
<td>Pre-IGRA</td>
<td>129 (1.7)</td>
<td>7520</td>
</tr>
<tr>
<td>Post-IGRA</td>
<td>124 (1.5)</td>
<td>8450</td>
</tr>
</tbody>
</table>

**Conclusions:** The use of IGRA in series with TST has resulted in a substantial reduction in LTBI diagnoses in the post-deployment situation. This has resulted in a concomitant reduction in the use of INH and, hence, a reduction in members who are given INH for no benefit since they likely do not have LTBI.

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**PO10.01**

**Knowledge, Attitude and Practice of Travelers about Travel Risks Related to Food**

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**Background:** During travels and on the final destination, travelers meet different risks. Among especially important are risks related to food. There are several reasons, some of them are:
consuming of different types of food in different parts of the world, the presence of different microorganisms, different hygiene standards.

As a consequence, many different diseases appear, the most important are viral hepatitis A, typhoid fever, traveler’s diarrhea. In order to prevent these diseases travelers should have adequate knowledge about the risks associated with food, adequate attitudes and apply them in practice.

**Objective** of this work was to examine the knowledge, attitudes and practices of travelers in international traffic on the risks associated with food.

**Methods:** Questionnaires were administered to international travelers from Bosnia and Herzegovina, aged 18 years or more, departing from the International Airport Sarajevo.

**Results:** Overall 200 questionnaires were completed. For more than half of the travelers (62%) countries in Europe were the final destinations. The majority of travelers (71%) traveled for business and they stayed in hotels. Only 30% had sought pre-travel advices. The risk of foodborne diseases was perceived to be low. Less than 10 % of the travelers know which kind of food is the most risky, and how to avoid risks connected to drinking water.

Only 10% of the travelers are familiar with a vaccine and had been vaccinated against hepatitis A, typhoid fever and poliomyelitis.

**Conclusion:** International travelers from Bosnia and Herzegovina underestimate the risk of foodborne diseases. They are not enough prepared for the prevention. There is a need for increased awareness about travel related risks, especially about foodborne diseases.

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**PO10.02**

**Telemedicine for Health Problems while Abroad: Are Travelers Interested and Willing to Pay prior to Departure?**

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**Background:** Online telemedicine is emerging as a useful tool to provide expert medical advice to individuals facing health issues while traveling in remote areas. We are currently developing a telemedicine service enabling contact with our medical team within 24-36 hours. However, the needs and expectations of travelers are largely unknown. We conducted therefore a survey to evaluate opinions about the relative importance of various travel criteria that may pertain to our insurance service.

**Objectives:**
1) to assess if such insurance service is deemed necessary by travelers;
2) to investigate which telecommunication link is preferred;
3) to determine which subgroup of travelers would be most interested in this service;
4) to estimate the amount of money travelers would be willing to pay for such telemedicine service.

**Method:** Travelers coming to our clinic for pre-travel advice were given a questionnaire to be filled in before the consultation. The questionnaire focused on demographics, travel details, health status and willingness to pay for a telemedicine service.

**Results:** A total of 306 questionnaires were returned. Of all, 164/276(59%) travelers were interested and 162/164(99%) willing to pay for a telemedicine service. Of these individuals, email was the preferred communication link in 102/164(62%), mobile phone in 74/164(45%), and video calls in 48/164(29%) (cumulative answer). Travelers above 60 years were twice more likely to be interested in telemedicine than younger ones. No association was found between interest in telemedicine and destination, length of stay, purpose of travel, type of accommodation, risky activities, urbanization of visited area, estimated time to reach a medical center, previous stay in tropical country, chronic disease or immunosuppression. Median duration of travel was 3 weeks and price travelers would be willing to pay was 50 USD. There was no correlation between travel duration and amount to be paid.

**Conclusion:** Among individuals consulting for pre-travel advice at a specialized clinic, there is considerable interest in telemedicine, particularly among older travelers. Based on these data, a pilot study using email communication to help travelers confronted with health issues while abroad is about to open at our travel clinic.
PO10.03
US Entry Screening for Persons Arriving from West Africa to Control the Spread of Ebola, October 11 - November 30, 2014

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1Centers for Disease Control and Prevention, Atlanta, United States

Background: In August 2014, the WHO determined the Ebola outbreak a Public Health Emergency of International Concern and advised countries with Ebola transmission to conduct exit screening at international borders for unexplained febrile illness consistent with Ebola. On October 11, 2014, after the first imported Ebola case was identified in the United States, an enhanced entry screening program was started at five U.S. international airports to identify travelers from Guinea, Liberia and Sierra Leone, and starting November 17, Mali, who might have been exposed to or who had signs or symptoms of Ebola.

Objective: Describe the characteristic of arriving travelers identified during US entry screening.

Methods: Numbers of international travelers leaving the countries were estimated using Diio flight industry data. Entry screening data analysis included traveler characteristics, symptoms, potential exposure risks, temperature and visual observations. Travelers with self-reported or measured fever, other symptoms, or Ebola exposure were referred to CDC personnel who assessed Ebola exposure risk (low, some, high). Contact information was obtained from arriving passengers. States were notified via CDC’s secure notification system (Epi-X).

Results: For October-November 2014, an estimated 40,000 travelers departed Guinea, Liberia and Sierra Leone by air. Of 3,339 travelers screened at U.S entry during October 11-November 30, 146 (4.4%) were referred to CDC public health officers for additional evaluation; 7 (4.8%) were symptomatic and referred for medical evaluation; none had Ebola. Of the 146, 115 (79%; range 50% (November 8-14) to 93% (November 1-7)) were low risk and 31 (21%) were some risk. One person, asymptomatic during travel, self-monitored and presented with Ebola in NY. The 3,339 travelers had final destinations in 49 states; most from New York (19.3%), Maryland (12.7%), and Pennsylvania (10.3%). Most (85.5%) were aged ≥18 years; 3.2% reported working in a healthcare facility or laboratory.

Conclusion: Most arriving passengers were categorized as low risk; few required medical evaluation of which none had Ebola. The asymptomatic traveler with Ebola was not detected by screening but was linked to care. The program allowed federal authorities to link arriving travelers with state and local partners, facilitating health monitoring and prompt referral for care if they became ill.

PO10.04
Medical Evacuations in the Oil and Gas Industry - A Retrospective Review with Implications for Future Evacuation and Preventative Strategies

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Background: Shell Health developed a Remote Health Care (RHC) strategy based on use of Telemedicine for the Arctic to address medical emergency response requirements in areas with a lack of local health infrastructure and rotary wing support. The strategy was informed by: professional experience; expert advice; literature reviews, and learnings from expedition medicine.
Objective: To improve evidence and outcome base of our strategy through a retrospective review of Shell employee medical evacuation (MedEvac) data that are similar in operational constraints and work population profile.

Method: We retrospectively reviewed and statistically analyzed data for Shell employees who underwent MedEvac between Quarter (Q) 1 2008 and Q2 2012. Employee record data and Human Resource data were used for additional medical information and to supply denominator data for the study population. Comparative MedEvac data from specific Shell locations were used to compare patterns of diagnoses. Data analysis was performed with SPSS; given the large variability in some data, medians are presented; standard formulae for confidence intervals were used and relative risk calculations were performed for medical histories of top diagnoses.

Conclusion: The results reveal a similarity in diagnoses across data sets as well as demonstrate a higher relative risk for MedEvac with some pre-existing conditions. With the availability of denominator data, we have been able to calculate MedEvac costs. Higher costs for MedEvacs from countries where health risk is high were found, showing a significant upward trend particularly for personal non-work related causes. Important lessons for future innovative strategies can be derived from our study results.

PO10.05
Student Travel Abroad: ISTM Clinicians Identify Priorities for Research, Education and Action

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1
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Background: Students travel internationally in greater numbers each year. It is estimated that 300,000 U.S. students will study abroad in 2015 and 37% of UK students expressed a similar interest. Travel health clinicians are seeing more students of every age in their practices. ISTM recently created a Student Travel Abroad (STA) special interest group focused on the travel health needs of this population.

Objective: The purpose of this study was to identify and prioritize, from the clinician perspective, important student travel health issues.

Methodology: In December 2014 a nine item SurveyMonkey questionnaire was emailed to a convenience sample of 145 ISTM clinicians who provide services to students in four world regions.

Results Summary: 69/145 completed the survey (47% response). Respondents included: nurses (50%), NPs and PAs (27%), physicians (15%), pharmacists (4%), and others (4%). 79% of respondents practice in the U.S. with others from the Indian Subcontinent, Southeast Asia, NZ, the UK, and Canada. 83% of respondents see students age 18-22; many also see other age groups: under 16 (29%), age 16-18 (46%), 22-28 (67%); 44% see graduate and “nontraditional students” up to age 70. All report seeing more students in their practices every year. Important challenges ranked for student travelers:

#1 Lack of awareness of pre-travel preparation or importance by students, parents and others
#2 Need for more effective student health counseling techniques
#3 Psychological issues
#4 Last minute care and #5 Insufficient student funds.
Professionals prioritized their education needs:
#1 Destination resources for health care and medications and
#2 Better communication skills with students.
Other CE topics: student health insurance, long-stay student trips, legal issues, and “the reality of destination health and hygiene provisions.” Respondents prioritized three research topics:
#1 Malaria compliance,
#2 Evaluation of counseling effectiveness, and
#3 Alternative models for student pre-travel services.

Conclusions reached: Students of every age are traveling more. Diverse ISTM clinicians care for students and face similar challenges: lack of awareness and appreciation for pre-travel services, need for effective counseling techniques for improved compliance, poor knowledge of destination resources, psychological issues, and late encounters.

Conclusion: This survey can help the interdisciplinary STA set a robust agenda for research and professional education.
PO10.06
Digital Advertising to Travelers - Leveraging Current Events for Optimal Reach

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Background: The 2014 Ebola epidemic in West Africa is the largest in history and resulted in a small number of cases in the United States. CDC has worked to prevent domestic spread, ensure the health of US citizens, and inform the US public.

Objective: To leverage increased online interest in Ebola to increase the number of CDC Travelers’ Health (TH) Facebook followers and build future capacity for travel health-related message dissemination.

Method: TH ran paid advertisements promoting the Facebook page and website to non-followers with relevant interests from 7 October-30 November 2014.

Results: Within the first week of advertising, new followers per day (NF/D) to the TH Facebook page increased 1675% from a previous 2014 average of 8 to 142. Average NF/D earlier in the Ebola response (31 July-6 October) was 11, only slightly higher than the yearly average. Small organic spikes in followers occurred during 28 July-3 August (when CDC posted Level 3 Travel Warnings and the first patient was brought to the US) and 29 September-5 October (when the first US case of Ebola was diagnosed). NF/D during those weeks averaged 24 and 14, respectively. NF/D increased to 189 in the first week and 222 in the second week of advertising, when Ebola media coverage peaked. During this time, NF/D to the TH Twitter account grew by a factor of 2-3 from the yearly average, while FB growth was more than 15 times the yearly average. While some increased interest in the page would have occurred naturally, advertisements were more effective in attracting new followers than increased coverage alone. Although the ads did not directly address Ebola, the correlation was important to growth. Follower growth remained high throughout the campaign, leveling off to an average 108 NF/D. Unfollows remained low, indicating that new followers remained interested in TH even with decreasing Ebola coverage.

Conclusion: Using online advertising, especially during times of national attention, can help disseminate messages and grow awareness. TH leveraged interest in Ebola with an advertising campaign to build a future audience for travel health messages.
**Background:** All medical students at the Universities of Liverpool and Lancaster spend five weeks studying in a country of their choice. Each student completes a comprehensive preparation programme and perform a risk assessment. Those going overseas, attend the Liverpool School of Tropical Medicine travel clinic to review their travel and work study risks to reduce the risk of infection and non-infection-related hazards.

**Objectives:** To determine the health and other issues experienced by medical students on elective placements.

**Methods:** Since 2005, medical elective students are required to submit an anonymous health questionnaire with their elective reports. The questionnaire includes details of illnesses during or on return from elective, whether medical attention was required and if they experienced any incidents whilst on elective e.g. accidents/assaults. Individual's data are entered onto an Excel spreadsheet for comparison of year groups, destination, types of illness and incidents.

**Results:** In 2005-2014 (no 2012 electives), 2602 students completed a post elective questionnaire (>99% response). 2162 (83.1%) travelled abroad and 440 remained in the UK. 513 (19.7%) were unwell whilst abroad (UK 7.4%; P< 0.05). 89 (17.3%) sought medical advice (UK 4.1%; P=0.01).

Of 1785 students travelling to countries other than "Western" destinations (Western Europe, North America, Australia and New Zealand), 333 (18.6%) reported diarrhoeal episodes ("Western" 0.6%; P< 0.05). Other illnesses included respiratory 34 (1.8%) ("Western" 0.4%; P=0.001) and dermatological...
conditions 40 (2.1%), (“Western” 0.4%; P< 0.05) and 10 (0.6 %) blood borne virus exposures (“Western” < 0.01%; P= 0.15).
Of the 2602 students, (1.1%) reported accidents, typically road traffic related, (non-“Western” v “Western” 0.9% v 0.2%; P< 0.05). A total of 175 (6.7%) reported other incidents concerning personal safety and theft of personal property often involving violence (non-“Western” v “Western” 6.5% v 0.2%; P < 0.05).

**Conclusions:** Results demonstrate the expected contrasting range of illnesses in “Western” and non-“Western” settings. They highlight the risk of trauma and violence while travelling overseas, and the importance of personal safety advice before elective students travel. The rates of illness are less than those described elsewhere, and this may reflect the compulsory preparation programme that students undertake.

### Pre-travel Advice and Approaches (Including Risk Assessment / Communication)

**PO11.01**
The Use of Hand Sanitizers among Dutch Travelers Visiting (Sub)Tropical Destinations

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**Background:** Hand hygiene is effective in preventing germs to spread between persons. Different types of hand hygiene methods are available such as water and soap or hand sanitizers. However, limited data is available about the use of alcohol hand sanitizers in travelers.

**Objective:** To investigate knowledge, attitude and practices about performing hand hygiene in the Netherlands and during travel among Dutch travelers.

**Method:** Prospective cohort pilot study among 34 adult Dutch travelers who visited the travel clinic at the LUMC and had the intention to travel to the (sub)tropics. Participants filled out a questionnaire before departure and after returning home.

**Results:** 65% of the travelers completed both questionnaires. Tourism was the main reason for travel. Most participants traveled to South-Eastern Asia (50%), Eastern Africa (23%) and South America (14%). Median travel duration was 24 days (range 12-90 days). 36% were health care employees. 86% of the travelers considered hand hygiene important during (sub)tropical travel. Five travelers stated that they did not receive any information about hand hygiene during the consult. 27% of the travelers obtained additional travel information, mainly online or at a pharmacy. Some travelers were not aware of the effect of hand sanitizers on preventing a respiratory infection (36%) or diarrhea (18%). The method of drying hands after washing is also important. Only 59% of the travelers reported that paper towels were the right way. Others opted for a jet-air hand dryer, drying by air or they did not know. All travelers carried a hand sanitizer during travel, often bought at a drugstore. Wet wipes (46%) and soap (41%) were also taken. 96% actually used a hand sanitizer, mostly before eating (82%) and after using the restroom (59%). Surprisingly, 41% of the travelers used a hand sanitizer when having visible dirty hands. Only 12 travelers reported to use a hand sanitizer in the Netherlands, mainly work-related.

**Conclusion:** The pre-travel consult should address the importance of hand hygiene and discuss available products and how and when to use them correctly. This is especially important for travelers to areas with low hygienic standards.

**PO11.02**
Evaluation of Pre-travel Preparation of Travelers Visiting sub-Saharan Africa

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²Regional Department of Public Health and Social Welfare, South Aegean, Ermoupolis, Greece,
Background: The number of travelers from Greece who travel to tropical and subtropical areas including sub-Saharan Africa has increased in the last decade.

Objectives: To identify patterns of vaccination and malaria prophylaxis of travelers visiting countries of sub-Saharan Africa.

Methods: A prospective study was conducted from 01/01/2011 to 31/12/2014 in all (57) departments of public health which are the official travel health providers. Data were collected using a standardized form per traveler including demographic characteristics, travel variables and travel counseling information from travelers seeking pre-travel medical advice.

Summary: 1768 travelers who attended the 57 health departments during the study period visited sub-Saharan Africa; 69.2% (1223) were male and 95.4% (1686) of Greek nationality with mean age of 39.2 years. 58.5% (1034) traveled for work, 29% (513) for vacation, and 5.8% (102) for visiting friends and relatives. The most common destination was Nigeria (15.7%), followed by Kenya (10.9%) and Somalia (8.9%). Out of all travelers 0.2% (4), 0.2% (4), and 1% (17) visited Guinea, Liberia and Sierra Leone, respectively; 84% (21) traveled for work. According to the area of travel 56.7% (1003) stayed in urban areas, 18.3% (323) stayed in urban and rural areas, and 3% (53) stayed in rural areas. Regarding duration of travel 57.9% (1024) stayed for < 1 month, and 35.5% (627) stayed for ≥ 1 month. 79.7% (1409), 30.9% (546), 19.7% (349), 16.8% (297), 15.8% (280) and 14.1% (249) of travelers received yellow fever, typhoid fever, tetanus-diphtheria, hepatitis A, poliomyelitis and meningococcal vaccines, respectively. Malaria prophylaxis was administered to 41.5% (734) of all travelers; 26.7% (472) and 14.1% (250) received atovaquone/proguanil and mefloquine, respectively. Travelers visiting friends and relatives were more likely to be women and of foreign nationality (p value: < 0.001) whereas those traveling for recreation were more likely to stay for < 1 month and to be vaccinated with hepatitis A vaccine (p value: < 0.001).

Conclusions: Our results show that there is a need for improvement regarding recommendation of vaccination and malaria prophylaxis for travelers to sub-Saharan Africa. This indicates the necessity for individualized and more selective recommendations for travelers seeking pre-travel advice.

PO11.03
The Role of Digital Health Tools in Optimizing a Patient’s Travel Health Experience and Care: From the Pre-travel Assessment to Remote Health and Medication Adherence Monitoring

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The delivery of travel medicine has evolved over the past 30 years including its expansion and integration into the community pharmacy practice arena. Pharmacists in Canada, UK, US and other countries have expanded their training and role in travel health care leading to increased service accessibility for travelers. Now the usage of digital health technology is on the verge of disrupting the patient pre-travel health and monitoring experience. We have seen an explosion of digital wearable devices which can monitor and store patient biometric data from blood glucose levels to sleep efficiency. What is the role of digital health in travel medicine and how can the patient experience benefit from this new platform of engagement? What is the role of the health care practitioner in terms of interpreting this data and who is best positioned to fulfill this role? From assessment of travel itineraries and patient medical conditions to real time remote monitoring of medication adherence and emergency travel assistance, the traditional patient travel health experience is being transformed. In a traditional pre-travel assessment, a health practitioner obtains the travel itinerary, planned trip activities, and the patient’s medical history. Recommendations are then made in conjunction with the traveler as to recommended immunizations and medications. Despite the educational efforts established as described, it is difficult to accurately measure the acquisition of knowledge during the pre-travel visit, and equally difficult to assess whether or not this knowledge is acted upon during travel. Airport surveys of travelers departing to regions considered at risk for malaria and/or vaccine-preventable disease demonstrate that despite travelers having some knowledge of the diseases, they...
often neither take antimalarial chemoprophylaxis nor receive vaccines that are indicated (especially true for VFR travelers).

Let's take a journey into understanding the unique opportunity presented by remote patient monitoring platforms. Through regular biometric communication with their providers via connected devices, a world with access to travel care anytime and anywhere is now possible. Be ready for an innovative and interactive session and learn how to successfully integrate these tools in your practice and improve your patients' travel health outcomes.

**Note: Workshop Session Proposal**

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**PO11.04**

**Pre-travel Counselling at a Public Travel Medicine Clinic in Brazil**

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1Evandro Chagas Institute, Ananindeua, Brazil, 2Emilio Ribas Infectious Diseases Institute, Travel Medicine, São Paulo, Brazil, 3University of São Paulo School of Medicine (FMUSP), Department of Clinical Infectious and Parasitic Diseases, Sao Paulo, Brazil

**Background of the Study:** Travel medicine is a relatively new medical specialty. Began in Brazil in the late 1990s, at which socioeconomic reforms have led to improvements in life of Brazilians. Travel Medicine Center (TMC) at “Instituto de Infectologia Emilio Ribas” (IIER) was the first health of traveler service created in São Paulo city in May 2000.

**Objective(s):** To describe the recommended preventive measures to travelers concerned with infectious diseases.

**Method(s):** This was a retrospective, descriptive study of travellers counselled at a travel medicine clinic in São Paulo, Brazil, between January 2006 and December 2010.

**Summary of Results:** During the study period, 2836 pre-travel consultations were provided to 2744 individuals (92 sought guidance twice). The main socio-demographic characteristics were being 18-34 years of age, female and college educated. The most popular destinations were Africa, Europe, Asia and Brazil. The most common reasons for travelling were tourism and work. Among individuals travelling for tourism, the length of stay was ≤ 30 days. Most travellers learned about the clinic from friends, health professionals or electronic media. Self-treatment for diarrhoea was most often recommended for travel to Asia. Vaccination against yellow fever, polio and meningococcal disease was most often recommended for travel to Africa, as was prophylaxis for malaria, which was recommended in 10.3% of all consultations. We found that recommendations varied depending on the destination, the purpose of the trip and the length of stay. Prophylaxis for malaria was rarely recommended for travel within Brazil.

**Conclusion(s) reached:** Our results could fuel discussions regarding the practice of travel medicine in developing countries.

**Conclusions:** Our results could fuel discussions regarding the practice of travel medicine in developing countries. On the basis of our findings and those of others, we conclude that TM should be practiced, and provide specialized services in TM, to sensitise physicians to this new area. This is our biggest challenges especially in a country of continental dimensions such as Brazil.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Africa (N=694) n(%)</th>
<th>Asia (N=417) n(%)</th>
<th>Brazil (N=422) n(%)</th>
<th>Other (N = 1270) n(%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-treatment for diarrhoea No, n (%) Yes, n (%)</td>
<td>568 (83.5) 112 (16.5)</td>
<td>279 (67.9) 132 (32.1)</td>
<td>403 (96.6) 14 (3.4)</td>
<td>1180 (93.4) 84 (6.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Self-treatment for malaria No, n (%) Yes, n (%)</td>
<td>666 (81.6) 18 (2.6)</td>
<td>411 (98.6) 6 (1.4)</td>
<td>417 (98.8) 5 (1.2)</td>
<td>1265 (99.6) 5 (0.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prophylaxis for malaria No, n (%) Yes, n (%)</td>
<td>511 (73.6) 183 (26.4)</td>
<td>387 (92.8) 30 (7.2)</td>
<td>392 (92.9) 30 (7.1)</td>
<td>1222 (96.2) 48 (3.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Recommended vaccines</td>
<td>Yes, n (%)</td>
<td>No, n (%)</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
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<tr>
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</tr>
<tr>
<td>Meningococcal A and C</td>
<td>1091 (85.9)</td>
<td>179 (14.1)</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polio No, n (%)</td>
<td>1173 (92.4)</td>
<td>97 (7.6)</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles-mumps-rubella</td>
<td>241 (19.0)</td>
<td>1029 (81.0)</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow fever No, n (%)</td>
<td>519 (41.1)</td>
<td>744 (58.9)</td>
<td>&lt;0.001</td>
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</tbody>
</table>

[Recommendations made to individuals seeking pre-tr]

PO11.05
Routine Vaccination Perceptions and Behaviors during the Pre-travel Consultation

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Background: CDC recommends travelers receive a pre-travel consultation (PTC) and be up-to-date on routine and travel-related vaccines before travel. Reports of measles and influenza (flu) among travelers underscore the importance of routine vaccines. However, little is known about the extent to which vaccine recommendations are offered and accepted during a PTC.

Objectives:
1) To investigate the feasibility of PTCs as an opportunity for travelers to become up-to-date on routine vaccines and
2) To identify evidence-based strategies to encourage uptake of routine vaccines during PTCs.

Methods: Two web-based surveys were conducted among recent (within the past year) international travelers across the United States (n=2,789). Qualitative data were collected through audio recordings of 35 PTCs of adult travelers conducted in the Atlanta area at 3 health departments, 3 travel clinics, and 1 primary care clinic. Sixteen travelers and 10 health care providers (HCPs) who participated in the PTC recordings were subsequently interviewed.

Results: Survey data found that 1/3 of international travelers seek pre-travel advice from one or more HCPs. Most frequently, travelers sought care at primary care facilities (38%) and pharmacies (27%). Routine vaccines were discussed during 75% of observed PTCs. When indicated, hepatitis A and B and tetanus vaccines were received in over 70% of appointments, while flu vaccines were received 19% of the time. Vaccine outcomes varied by trip purpose. Eighty-two percent of travelers visiting friends and relatives declined recommended routine vaccines while 72% of business travelers accepted them. During observed PTCs, HCPs were more likely to bring up costs of all vaccines except flu. Of travelers who declined a recommended vaccine during the PTC, none indicated cost as a barrier.

Conclusions: PTCs serve as good opportunities for travelers to receive needed routine vaccines. Travelers’ decisions to accept routine and travel-related vaccines are influenced by many factors including interactions with HCPs. HCPs should discuss the risks and benefits of recommended vaccines with travelers, because risk perception may be more influential than cost in acceptance of vaccines. However, flu vaccine advice may be more effective if cost-benefit perspectives are emphasized.
PO11.06
User Testing a Mobile Application for Travel Health: The TravWell Experience

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Background: The CDC Travelers' Health Branch (TH) developed TravWell, a mobile application to help users plan for safe and healthy travel. It provides destination-specific vaccine recommendations and offers a healthy travel packing list, to-do list, and document storage. However, TH did not know how users would interact with the application.

Objective: To determine the usability and user experience (UX) of the TravWell application and make improvements based on user testing results.

Methods: TH conducted usability testing with 18 US residents who had recently traveled or were planning to travel internationally. Testers used the app on their iPhone or Android device (9 users on each platform) to create a hypothetical trip to India while video-recording the device in their hands. Users were asked to find vaccine recommendations for the trip, set vaccine reminders, and store a travel document. With feedback from usability testing, TH improved the application design. To assess the usefulness of the application in the context of an international trip, TH subsequently conducted UX testing through in-depth interviews (approximately 30 minutes each) with 9 different international travelers. Interviews were transcribed and analyzed with NVivo 9 (QSR International, 2011) to identify emerging themes.

Results: Although usability testers understood the function of TravWell, some had difficulty interacting with the application. All testers preferred an intuitive interface and easy customization. Conversely, UX testers commonly misunderstood the function of TravWell, assuming it was a general travel planning resource (eg, for booking flights or hotels). These testers reported that the application was easy to use and customizable. They found the vaccine recommendations most useful, but they expressed that all functions were essential to prepare for healthy travel. All testers said that they would use the application to plan future trips, and many said they would recommend it to others.

Conclusions: Findings from usability testing allowed TH to improve the design and navigation of the application. Findings from UX testing indicate that TravWell needs to be more specifically marketed as a travel health application, but testers' willingness to use the application suggests that TravWell can be a useful tool for people planning international travel.

PO11.07
Refusal of Recommended Vaccines among U.S. International Travelers in Global TravEpiNet

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¹Massachusetts General Hospital, Travelers’ Advice and Immunization Center, Boston, United States, ²Centers for Disease Control and Prevention, Division of Global Migration and Quarantine, Atlanta, United States, ³Bronx-Lebanon Hospital Center, Division of Pediatric Infectious Diseases, Bronx, United States, ⁴University of Massachusetts Medical School, Department of Quantitative Health Sciences, Worcester, United States, ⁵Bedford VA Medical Center, Center for Health Quality, Outcomes, and Economics Research, Bedford, United States, ⁶Harvard Medical School, Boston, United States

Background: Global TravEpiNet (GTEN) is a consortium of 23 U.S. clinical practices that provide pre-travel healthcare to international travelers. We sought to understand the refusal of recommended
vaccines by international travelers, in particular by those travelers returning home to visit friends and relatives (VFR).

**Methods:** We analyzed data on travelers seen for a pre-travel consultation from July 1, 2012 through June 30, 2014 in the GTEN consortium. Providers were required to indicate one of three reasons for the traveler declining a recommended vaccine:

1. cost concerns;
2. safety concerns;
3. not concerned with illness.

Rates of refusal were calculated using the denominator of travelers in whom the vaccine would be recommended by CDC guidelines current at the time of the traveler's trip. Those with pre-existing immunity, medical contraindications, insufficient time to complete vaccination before departure, and unavailable vaccines were excluded.

**Results:** During the two-year period, 24,468 travelers were seen for pre-travel health consultation at the GTEN sites. The median time-to-departure was 24 days and median duration of travel was 14 days. Of the 24,468 travelers, 2,327 (9.5%) were VFR travelers. Six thousand three hundred sixty-three travelers (26%) refused at least one recommended travel-related vaccine. Twelve percent declined a recommended hepatitis A vaccine (1,598 refusals among 12,907 travelers), 45% declined a recommended meningococcal vaccine (2,230 refusals among 5,011 travelers), 25% declined a recommended polio vaccine (1,366 refusals among 5,373 travelers), 83% declined a recommended rabies vaccine (4,276 refusals among 5,173 travelers), 9% declined a recommended typhoid vaccine (1,689 refusals among 19,855 travelers), 61% declined a recommended Japanese encephalitis vaccine (975 refusals among 1,589 travelers), and 13% declined a recommended yellow fever vaccine (917 refusals among 7,301 travelers). The most common reason for declining vaccinations was that the traveler was not concerned about the illness. VFR travelers refused at least one travel-related vaccine at higher rates than non-VFR travelers (36% vs 25%; p< 0.0001).

**Conclusions:** Recommended vaccinations are frequently refused by international travelers. Understanding reasons for vaccine refusal for different vaccines and for different types of travelers, in particular in VFR travelers, may allow for targeted interventions to increase vaccine uptake.

**PO11.08**

**Developing Travel Health Recommendations in Canada: Adapting Evidence Based Methods**

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**Background:** The Committee to Advise on Tropical Medicine and Travel (CATMAT) in Canada has been developing recommendation statements for travel health and tropical disease health care professionals for more than 20 years. Evidence based methodologies (EBM) have evolved dramatically over the past 10 years, and CATMAT has updated its approach accordingly. Applying rigorous EBM methods to develop relevant recommendations for travel medicine is challenging given underdeveloped methods for assessing the quality of baseline risk data, the relatively low quality of risk or outcome data available for important subgroups of travellers, and the lack of data on travellers’ values and preferences.

**Objective:** To describe the new evidenced based methodology (EBM) used by CATMAT for developing recommendations.

**Results:** CATMAT has adopted the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) methodology and approach to developing recommendations and has adapted this to different contexts. Current methods to develop topic statements include a thorough review of the literature and careful selection of interventions and outcomes on which a rigorous GRADE approach is used and others on which a narrative review approach is taken. The choice of which interventions and outcomes to make GRADE recommendations on is based on the clinical importance of the intervention, the magnitude of its benefits or harms and the quality of the published evidence. We will present the rationale and examples of how the GRADE methodology was used to make recommendations in three recent CATMAT statements including Typhoid, Travellers’ Diarrhea and
Visiting Friends and Relatives (VFRs). This will illustrate the challenges encountered and how the EBM process has been adapted to different settings.

**Conclusion and future direction:** The process of developing guidelines and EBM recommendations has become more transparent and rigorous over the past 10 years. The CATMAT experience may inform the evolving process of applying these methods to travel medicine.

**Background:** The Committee to Advise on Tropical Medicine and Travel (CATMAT) is made up of up to 14 experts in travel and tropical medicine and related fields. Established in 1989 as an external advisory body to Health Canada (now reporting to the Public Health Agency of Canada), CATMAT develops recommendation statements on travel-related vaccine preventable diseases (e.g. yellow fever, typhoid), non-vaccine preventable travel-related conditions (e.g. dengue, malaria, altitude sickness, risk of injury) and special groups of travellers (e.g. pregnant, pediatric).

**Objective:** To outline the role and structure of CATMAT, the process for the development of recommendations and the future of CATMAT.

**Results:** CATMAT was developed to address the ongoing need in Canada for guidelines on travel and tropical medicine to protect the health of the travelling Canadian population and support the health care providers who care for them. The Committee meets once per year in person and has a number of meetings via teleconference during the year. In the last 5 years, CATMAT has produced eight new statements and 10 updates. The process for the development of recommendations has evolved with modern evidence based medicine methodologies. Current methods include a combination of thorough literature review, evidence based medicine using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) methodology and expert opinion. Publication of recommendations includes a full statement and a short summary statement highlighting the main recommendations in an accessible web version. Recently CATMAT has presented its recommendations to health care professionals through webinars.

**Conclusions and future direction:** CATMAT will continue to develop evidence based recommendations to protect the health of the travelling Canadian public in addition to building on current methods for disseminating information to the health care professional.
Background: The 2014 Ebola outbreak in West Africa is the largest ever recorded. It required developing a variety of communication products for travelers, including those arriving in the United States.

Objective: To effectively communicate Ebola risk, transmission, and prevention messages to international travelers.

Methods: CDC posted and promoted travel notices for Guinea, Liberia, and Sierra Leone in spring 2014. As the outbreak progressed, additional travel notices were released, including alerts for travelers to Nigeria and Mali. The travel notices were revised as the situation in each country changed. Because of the serious and evolving nature of the outbreak, additional communication materials were developed, such as guidance documents and detailed information for arriving travelers.

Results: As of January 2015, the travel notices were viewed a total of 567,974 times and achieved high levels of engagement on social media. Since not all travelers visit CDC's website before travel, we also created infographics for electronic monitors at international airports about the risk of Ebola and the need to seek treatment if symptoms develop. Millions of travelers saw these infographics in airports, and they were viewed or downloaded from CDC's website 51,335 times.

In response to the first US case of Ebola in a man who traveled from Liberia, the United States implemented enhanced entry screening for travelers arriving from countries with Ebola. As part of this screening, CDC developed a package of materials—called CARE (Check and Report Ebola) kits—to inform travelers about Ebola signs and symptoms and to help them monitor their health for the 21-day incubation period. This program began in October 2014, and as of January 2015, more than 3,000 CARE kits had been distributed to arriving travelers.

Conclusions: Risk communication during a dynamic international outbreak is challenging. Evolving information needs and communication priorities require that a variety of mechanisms be employed and adapted to effectively communicate to people who may be at risk.

PO11.11
Improving Usability and User Experience for the CDC Travelers’ Health Website to Facilitate the Accessibility of Pre-travel Advice

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Background: CDC Travelers’ Health (TH) has endeavored to improve its website through a comprehensive redesign and the introduction of new features, such as customizable destination pages and clinician-focused pages. The website overhaul was guided by the results of extensive user testing. The redesigned website launched in May 2013.

Objectives: To measure the effectiveness of the TH website redesign on improving usability and user satisfaction.

Methods: TH compared web data from 2012 (pre-redesign) and 2014 (post-redesign). Changes in usage patterns and customer satisfaction scores (on a 100-point scale) were analyzed to determine whether customers were more or less satisfied with the new website. User satisfaction data are collected under the Foresee E-Government Satisfaction Index; a score of 80 is the threshold for excellence and changes of three points or more indicate significant improvement in satisfaction. Usage data are collected using Adobe SiteCatalyst.

Results: Customer satisfaction scores increased from 82 in 2012 to 86 in 2014. Scores for navigation improved dramatically: in 2012, 27% of respondents gave the site top scores for having a site layout that helps users find needed information; in 2014, the score increased to 37%. The site saw similar improvement in areas including content accuracy and quality, functionality, and design. Usage data showed that nearly 17% of destination page views included a special population selection. The most often selected populations were VFRs, children, and student/extended stay, all of which are
priority groups. Clinician-focused destination pages have seen a notable level of adoption, despite the fact that clinicians comprise a much smaller portion of the audience than travelers; for the top 10 destination pages, clinician pages received 12% of the total page views.

**Conclusions:** The new design led to a notable increase in the satisfaction scores for the website, indicating that users can find needed information and that they trust the content. Usage data showed that visitors responded to new features of the site, particularly the ability to see recommendations for specific populations. Some new features have likely contributed to the increase in satisfaction. Other features may need further refinement and promotion to increase their usefulness to the audience.

**PO11.12**

**Pre-travel Advice, Attitude and Hepatitis A and B Vaccination Rates among Travelers in Seven Countries**

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**Background:** Individual knowledge about travel-associated risk and the source of health-advice sought pre-travel is rapidly evolving and may vary between countries.

**Objective:** To understand the awareness, advice-seeking attitudes, hepatitis-A&B vaccination and adherence rates in Australia, Finland, Germany, Norway, Sweden, UK and Canada.

**Methods:** An online survey (August-October 2014) was used to screen pre-recruited online individuals aged 18-65 years, who had traveled to an endemic (hepatitis A/B) country in the past 3 years, who were aware of hepatitis A/B/A&B vaccines, their vaccination status, and had received their vaccination within the last 3 years for non-job related reasons.

**Results:** Of 27,386 screened travelers, 19,817 (72%) were aware of hepatitis A/B/A&B combination vaccines, their vaccination-status and participated in the survey. 13,857 (70%) sought advice from Health Care Professionals (HCPs), the highest being in Canada (78%) (Table). Of 13,857 who consulted HCPs, 70% sought advice from family-doctors. Travel-related websites (45%) was a predominantly sought non-HCP source for those vaccinated. Vaccination rate was high (67%; 9,328) among those who sought advice from HCPs with 1,060 (11%) vaccinated against hepatitis-A and 8,268 (89%) vaccinated against hepatitis-A&B. The highest vaccination rate was observed when advice was sought from travel clinics (80%) and the lowest from walk in clinics (63%). Lack of information/awareness was the most common reason for not getting vaccinated (66%) followed by previous visit to the country and not being affected (18%). 27% and 37% of vaccinated-travelers had adhered to the 3-dose hepatitis-A&B combination and monovalent 2-dose hepatitis-A vaccination schedules, respectively. Finland had the highest adherence rates for both vaccine schedules (Table). 61% (of 221 Hep-A) and 84% (of 1597 Hep-A&B) partially-vaccinated individuals believed that they had received the complete vaccination schedule.

**Conclusion:** HCPs remain the main source of pre-travel health advice with family doctors being most consulted. The vaccination rates are highest in travel clinics but remain suboptimal overall. A majority of hepatitis-A&B-vaccinated travelers do not complete the full recommended course. These findings highlight the need for continuous medical education of HCPs and a service/system that provides reminders to travelers for follow-up and completion of all vaccination schedules.
Level of Concern about Safety and Security Traveling Abroad in Queensland, Australia: A Preliminary Analysis

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Background: Australians are increasingly traveling overseas. In 2012, 1.4 million (30%) Queensland, Australian residents travelled overseas. International travel entails risk; however the individuals’ perception of the risk influences their decisions concerning personal precautions. Understanding the individual traveler's risk concern is useful for helping encourage people to seek appropriate pre-travel health advice.

Objective: To examine the demographics of Queensland residents who travel overseas and their level of concern regarding safety and security issues, which could significantly impact their travels.

Method: Data was obtained from the 2011 Queensland Social Survey an annual state-wide telephone survey administered to a random selection of adult Queensland residents ( ≥18 years). Two questions related to travel were added to the existing bank of demographic and health questions: the number of international trips made in a three year period (2009-2011), with the term travelers referring to those undertaking a minimum of one trip during this period; and all residents, regardless of travel experience were asked to express their level of concern [not concerned, moderately and extremely] whilst traveling in countries outside Australia (unrelated to specific destinations) about being hurt in an accident, terrorism, being a victim of crime, natural disasters and infectious diseases.

Results: From the preliminary analysis Queensland travelers were more likely (p< 0.05) to have higher levels of education ( ≥15 years), be employed full time, have high personal income (>A$100,000), have consumed alcohol in the last month and live in an urban area. For people who traveled internationally the average number overseas trips (over 3 years) was 2.35, (note: limited by 6 or more trips being the highest category). Most travelers were concerned about being a victim of a crime with non-travelers being extremely concerned with terrorism (Figure 1).

Figure 1. Level of Concern with trauma, terrorism, crime, disasters and infectious diseases.
PO11.14
Improving Access to a University Travel Clinic for Students Studying Abroad

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Background: The University of Wisconsin is a public university located in Madison, Wisconsin with an enrollment of 42,000 students. With an increased emphasis on a study abroad experience during college, the need for pre-travel consultation at the UHS (University Health Service) Travel Clinic increased substantially over the past 5 years. Without an increased budget to add staff, innovative methods were necessary to accommodate the increased demand.

Objective: Improve efficiency and access to UHS Travel Clinic without jeopardizing patient satisfaction and safety.

Methods: An on-line Travel Tutorial was developed for student access utilizing Shoreland Travax and CDC for country specific recommendations. Students were encouraged to complete the Tutorial prior to making one of three types of appointments, including a vaccine-only visit (10 minutes), an RN visit (20 minutes) or a provider visit (30 minutes) which also included a physical exam. Students were able to web-book their own appointment based on defined criteria. Nurse protocols were established for malaria prophylaxis, travelers’ diarrhea, altitude sickness and vaccine administration. An on-line, individualized summary with links to educational pdf’s, was sent to the student after their visit and an on-line post-travel evaluation was sent to them after their travel experience.

Results: There were no wait lists or referrals to outside clinics following the initiation of these changes. The Travel Clinic’s capacity for appointments increased by 200 visits per semester. A post-travel questionnaire with a return rate of 12% indicated that students were very satisfied with this new format and improved their safety while traveling as a result of the combination of on-line information and a brief clinic visit.

Conclusion: These results suggest that college students prefer on-line communication whenever possible, were very satisfied with a shortened clinic visit and felt safer during their study abroad experience as a result. By combining on-line information with a brief clinic visit, the UHS Travel Clinic
increased capacity for appointments by 30% without jeopardizing the safety of students or adding clinic personnel. This also resulted in no referrals to outside clinics and minimal use of staff time for scheduling appointments since students accomplished this on-line.

PO11.15
“Touch Malaria”: The First Multi-touch Book about Vector-borne Diseases

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Introduction and objective: According to data from World Health Organization, vector-borne diseases have a relevant impact on global health with more than 50% of world population living in high-risk areas for these conditions. Incidence of diseases such as dengue has constantly grown up in the last decade and now they represent a real threat for many countries, mainly for the higher number of travels and the subsequent risk of importation and spread of the infection. Being a relevant phenomenon, ASL Milano, in collaboration with the University of Milano, has realized a Multi-Touch Book on malaria and other vector-borne diseases, soon downloadable for free from iBooks Store. It is a multi-medial manual whose aim is to support the daily activity of operators at travel clinics and to give an innovative didactic tool for undergraduate students of medical schools and all professionals who want to go deep into this topic.

Materials and methods: Literature on epidemiology, features of vectors and diseases, and available preventative measures has been analyzed. Diseases discussed are Malaria, Dengue Fever and Dengue Hemorrhagic Fever, Yellow Fever, Chikungunya, American and African Trypanosomiasis, Japanese Encephalitis, Tick-borne Encephalitis, Onchocerchiasis, Leishmaniasis, West Nile Fever, Rift Valley Fever. The handbook has been built with the software iBooks Author and it is enriched by multi-medial contents such as pictures, animations, drawings and videos. An interactive map is available to evaluate the risk of malaria for each country, based on the Annual Parasite Incidence and the so called “ABCDE scheme protection for malaria”. At the end of each chapter there is a test to check the acquired knowledge. An interactive glossary enables to surf through the various sections of the iBook making easy to link between different topics.

Conclusions: The realization of a Multi-Touch Book represents a new communication tool that, through a multi-medial and an interactive approach, facilitates the knowledge on vector-borne diseases and gives the operators at the travel clinics a better ability to estimate the traveler's risk. “Touch Malaria” has two great advantages: it can be easily updated and it is attractive to new generations, already used to new technologies.

Professional Education and Training

PO12.01
Travel Health and Registered Nurse (RN) Prescribers in Manitoba

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Background: In several countries around the world, the scope of practice of RN’s has evolved to include prescribing medications. In Manitoba, in response to identified and growing unmet needs for the public to access healthcare in the area of Travel Health, the College of Registered Nurses of Manitoba (CRNM) has worked with the Manitoba Government to develop a new legislated regulatory
framework that will provide legal authority for RN's to become independent licensed prescribers. CRNM has developed Standards of Practice and Competencies for RN Prescribers, which Red River College (RRC) utilized for the development of a curriculum framework and course module development.

Objective: To develop an online course that is based on the Competencies for RN Prescribers, with a specific scope of practice attached to a target population that applies to travel health. The prescribing authority will be for clearly defined medications and vaccines.

Method: Courses/modules were developed based on the Competencies for RN Prescribers and relevant best practices. The course has been developed in an online format to facilitate distance learning across the province. Two core professional practice and pharmacology modules have been developed, in addition to 7 specific modules for the travel health content. Subject matter experts worked with an instructional designer to create course material for each module with built in course evaluation components.

Summary of Results: The final course material will be submitted to CRNM in accordance with Standards for educational programs for their review and approval and it is anticipated that the course of instruction will be in place by 2015, in addition to having the RN Prescriber designation included in the Regulated Health Professions Act of Manitoba. To prepare for intake of the first cohort of students, a RRC steering committee is finalizing entrance requirements, timing of the course & tuition.

Conclusion: Registered nurses in Manitoba, Canada will soon have the authorization to order specific investigations and prescribe specific medications and vaccines within their scope of practice to clients seeking pre-travel health services.

PO12.02
Travel Health Advisory Group: A Joint Travel Industry and Travel Health Initiative Promoting Healthy Travel in Australia

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Background: The Travel Health Advisory Group (THAG), established in 1997, is a joint initiative between the Australian travel industry and travel medicine professionals that seeks to promote cooperation between the travel industry and travel medicine professionals in order to raise public awareness of the importance of travel health.

Methods: The major activities of THAG are described, which include: networking and exchange among groups interested in travel health; travel health promotion targeting travel service providers and the public; undertaking travel health research; and the maintenance of an increasingly popular travel health public website.

Results: THAG is a Special Interest Group of The Australasian College of Tropical Medicine (ACTM). It is supported by industry and travel health specialists representing nine travel industry groups and health professional organizations. THAG's weltogo.com.au website has been in operation for more than 10 years and its mirror site, weltogo.org.au since 2011. The website was ranked Page 1 (#4) on a search of Google.com.au and Page 7 (#4) on a search of Google.com (as at 13 January 2015), but has been ranked as high as 4 (#3) on a search of Google.com (as at 22 January 2014). THAG members advocate for healthy travel in a number of forums, including the media. A travel health bookmark is available for distribution through travel agents and THAG members (can be ordered free in Australia via the THAG website in small quantities). THAG has also undertaken a number of research projects involving Australian travellers and published several papers in travel medicine journals.

Conclusions: A partnership approach between the travel industry and travel medicine professionals can effectively support a range of activities to promote healthy travel. The THAG website and other promotional materials as well as the outreach of its representatives are now making a significant contribution in providing information to the Australian public on travel health.
PO12.03
The Faculty of Travel Medicine - Generating Change and Setting Standards

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The Royal Colleges have a pivotal role in the UK in maintaining standards in postgraduate medical education and have an international standing, membership and reputation. Following the foundation of the ISTM in 1991 and the British Travel Health Association in 1996, discussion was pursued with the Royal College of Physicians and Surgeons of Glasgow with a view to establishing a Faculty of Travel Medicine (FTM). The College was already multidisciplinary and in addition to Faculties for physicians and surgeons had incorporated a Dental Faculty. In 2006 the College took the bold decision to extend its multidisciplinary membership to embrace nurses, pharmacists and doctors in a Faculty of Travel Medicine. An Executive Board was formed, the Diploma in Travel Medicine and Foundation Courses, previously founded and managed by Health Protection Scotland were transferred to its educational portfolio with additional input from the new Faculty, a new Membership (MFTM) examination was developed and regular symposia were held. Over nearly a decade membership has increased to nearly 400, of whom one third are located outside the UK. In 2014 the Faculty welcomed its first international Board member. A paper setting standards for education in Travel Medicine was published in 2012, the first diet of the MFTM examination was held in 2012, symposia were jointly held with three other institutions with an interest in Travel Medicine, and a Foundation course was held in Scandinavia. In 2014 a ‘Health of Travellers’ Report was published to guide government health departments of the UK and Republic of Ireland in ensuring that Travel Health Practitioners had the educational qualifications and skills to deliver a high quality service. Also in 2014, the Sultanate of Oman invited Board members to make recommendations for the development of a Travel Medicine Service in Oman and plans were made to hold the MFTM in South Africa. Collaborative links with the British Global and Travel Health Association include a joint conference in 2015.

In this presentation the past and future challenges will be discussed as the Faculty develops and extends its international strategy for advancing excellence in travel health care.

PO12.04
Multidisciplinary Travel Health Practice in Alberta

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Canada’s primary health professionals are experiencing an increase in scope of practice with multiple areas of overlap in the delivery of care. Alberta was the first province in Canada to see and adapt to these expanded scopes of practice. Pharmacists, nurses and physicians in Alberta, in the field of travel health, are finding innovative ways to provide the full scope of travel health services in a team-based environment. This poster will outline the details of the expanded scopes of pharmacists, registered nurses and physicians in Alberta, where they overlap, the team based multidisciplinary structure of the Bowmont Travel Clinic and how it utilizes nurses, pharmacists and physicians in the delivery of the full spectrum of travel healthcare.

Returning Travellers

PO13.01
Assessment of PEP and PrEP Given to Danish Travellers to Rabies Endemic Countries, 2000-2012

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Background: Since 2000, there has been a steady increase in both rabies Post Exposure Prophylaxis (PEP) and Pre Exposure Prophylaxis (PrEP) given to Danish travelers. It is unknown if this increase is due to an increase in animal bites, awareness of rabies risk among Danish travelers or increase travel to rabies-endemic countries.

Objective: To evaluate rabies-PEP treatment given to Danish travelers, to identify in which countries Danish travelers were exposed, and to assess the awareness of rabies risk among Danish travelers.

Method: We assessed data from all Danes reported to Statens Serum Institute as potentially exposed to rabies abroad, and who started rabies PEP either abroad or after returning to Denmark, between 2000 and 2012.

The yearly number of Danish travelers to Thailand from 2004 to 2012 was collected to calculate the incidence of possible exposure to rabies. We collected data on rabies vaccines sold for PEP and PrEP 2000-2012 in Denmark.

Results: A total of 1,126 Danish travelers received PEP after possible exposure to rabies abroad, between 2000 and 2012 corresponding to an annual increase of 8.8%. Vaccines sold for PrEP increased with 8.2% annually.

South East Asia was the region where most Danish travelers were possibly exposed. Thailand accounted for 43% of all cases. The yearly number of Danes travelling to Thailand increased by 7.4% per year. The incidence of animal bites per 100,000 travelers to Thailand did not show a significant increase.

In total 848 travelers started PEP with vaccination in the country of exposure but only 118 received rabies immunoglobulin (RIG) in the country of exposure.

Conclusion: The increase in PEP seems to be caused by an increasing number of Danes travelling to rabies-endemic countries. Our study found nothing that suggests an increased risk of animal bites per traveler, nor an increased awareness of rabies risk among the travelers. A quarter of possibly exposed travelers did not receive any PEP in the country of exposure, and only 11% received RIG.

Pre-travel consultations should include information about rabies risk, PrEP, and that RIG and rabies vaccine might not be available.

PO13.02
Retrospective Analysis of Post-travel Consultation in the Travel Clinic of Kurume University Hospital, Japan

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Background: At present, approximately seventeen million Japanese travel abroad each year, and the health problems while traveling are not rare. However, post-travel consultation services are not common in Japan, especially in provinces. Kurume university hospital is located in Kurume city with a population of approximately three hundred thousand. Our travel clinic started as pre- and post-travel consultation services from 2008 in the university hospital. We analyzed the characteristics of post-travel patients for the purpose of expanding travel clinic in Japan, especially in provinces.

Methods: Among 60 post-travel patients who visited our clinic between April 2008 and October 2014, 55 Japanese patients participated in this analysis. We summarized the characteristics of post-travel patients for the purpose of expanding travel clinic in Japan, especially in provinces.

Results: The mean age (±standard deviation) was 37.3±16.3 years, and 36 patients (65%) were male. Southeast Asia is their major destination (30/55, 55%), especially Philippines and Thailand (10/55, 18%, respectively). Official purpose (including Business/Education/Volunteer/accompanied family) is the major reason for their travel (27/55, 49%). Post-exposure rabies prophylaxis (none with pre-exposure vaccinations) (16/55, 29%) was the most common purpose of consultations, followed by traveler's diarrhea (15/55, 27%). Short-term travelers were 34 participants (62%). According to the
comparison of short-term travelers and long-term travelers, the diffusion of “the pre-travel consultation” was less in the short-term group (11% vs 79%, p=0.0002).

**Conclusion:** Most of post-travel patients were short-term travelers without the pre-travel consultation. And post-exposure rabies prophylaxis and traveler’s diarrhea were avoidable to some extent by the pre-travel consultations. There is a need to encourage the pre-travel consultation for not only long-term travelers, but also short-term travelers.

PO13.03
Implementation and Evaluation of a Rapid Assessment Clinic for Febrile Returned Travelers in Ambulatory Tropical Medicine

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**Background:** Fever in the returned traveler is a medical emergency warranting prompt medical attention to exclude potentially life-threatening illnesses such as malaria. However, prolonged evaluation in the Emergency Room (ER) may not be required for all patients.

**Objective:** As a quality improvement initiative, we designed and implemented an algorithm for rapid assessment of febrile travelers (RAFT) in an ambulatory tropical medicine clinic.

**Methods:** Criteria for referral to the RAFT clinic include: presentation to the ER, history of and/or documented fever, and travel to the tropics or sub-tropics within the past year. Exclusion criteria include a diagnosis of P. falciparum malaria and fulfillment of other admission criteria such as unstable vital signs or significant laboratory derangements. We performed a time series analysis pre- and post-implementation of the clinic, with primary outcome of time to definitive tropical medicine consultation. Secondary outcome measures include number of ER visits averted for repeat malaria testing and number of ER visits averted for definitive management of an infectious illness.

**Results:** Over the initial 1-month evaluation period, 17 patients were seen in the RAFT clinic: 7 men and 10 women. Median age was 37 years (range 17 to 71 years). Mean time to RAFT clinic assessment was 1.3 ± 0.11 days (range 0—2 days) post-implementation, compared to 5.4 ± 1.8 days (range 0—26 days) prior to implementation (p=0.026). Of 17 RAFT patients, 8 (47%) had an infectious illness that required specific therapy, thus, 8 “call-backs” to the ER over 1 month were averted. The RAFT clinic also averted an average of 17 repeat malaria screens in the ER per month, as these were now being performed in the RAFT clinic, rather than utilizing ER resources. Common diagnoses were: non-specific viral syndrome (N=4, 23.5%), influenza-like illness/URTI (N=3, 17.6%), laboratory-confirmed influenza (N=2, 11.8%), and acute urinary tract infection (N=2, 11.8%).

**Conclusions:** In addition to provision of more timely care to ambulatory febrile returned travelers, we have reduced ER bed-usage by providing an alternate setting for follow-up malaria screening, and treatment of infectious diseases that can be managed in an outpatient setting, but require specific therapy.

PO13.04
Screening the (Asymptomatic) Returning Traveler after a Stay in Sub-Saharan Africa: Experience in a Military Cohort

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Travelers to developing countries may be exposed to several infectious pathogens sometimes leading to complications after a long latency period. However, literature on the usefulness of screening the asymptomatic traveler is scarce. Recommendations exist but the evidence to support them is weak.

**Objective:** To determine the diagnostic yield of commonly used screening tests in asymptomatic returning travelers. Secondary objective: To describe malaria cases during the mission and after return in relation to the prophylactic treatment.

**Method:** All military personnel that participated in a training mission in RDC (2013) were seen in the outpatient clinic three months after return or earlier when symptomatic. The mission consisted of training local recruits. Intensive soil and freshwater contact was often inevitable. Strongyloides serology (ELISA) and IGRA (Quantiferon-TB Gold) were performed in all patients, serology of Schistosoma (ELISA and IHA) in those who had contact with freshwater. Malaria was diagnosed by the attending physician using microscopy and rapid diagnostic tests.

**Results:** 389 persons (median age= 33 years (range 21-59)) were seen after a stay in RDC (median duration= 60 days (range 7-210)). Risk exposure included intensive contact with soil in 90%, and with freshwater in 33% of the screened individuals. Serology of Strongyloides was positive in 3.1 % (none of them having eosinophilia) and Schistosoma in only 2 persons (0.5%, none having eosinophilia). Abnormal Quantiferon was found in 11 leading to treatment for latent TB infection in 2 patients. Malaria prophylactic treatment consisted of doxycycline (77%), mefloquine (13%) or atovaquone (10%). Adherence to correct prophylactic treatment was 73%. Ten persons had confirmed malaria after return (P.falciparum; n= 5, P.ovale; n= 5) and 3 additional persons were treated for a suspicion of malaria during the mission. Noncompliance to prophylactic treatment was associated with an increased risk for malaria (Relative Risk 4.2; 95% CI 1.42-12.72).

**Conclusions:** Although diagnostic yield for Strongyloides serology is limited, the systematic screening in asymptomatic persons seems appropriate in order to prevent future complications. Continuous efforts to enhance compliance to malaria prophylactic treatment are mandatory in military cohorts to prevent malaria cases.

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**PO13.05 Health Problems among Thai tourists Returning from India**

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**Background:** The numbers of Thai tourist visiting India are increasing year by year. Although health problems among international travelers to India had been conducted in several studies, most were conducted among travelers from Europe or North America. So the applicability of previous information to Asia travelers was not known.

**Objective:** This study aimed to assess the health problems among Thai tourists returning from India

**Material and Method:** This study was a cross-sectional study. All data were collected from Thai tourists who just completed their trips in India. The questionnaire asked about their demographic data, travel characteristics, pre-travel health preparation and their health problems they experienced during their trips in India. All participants were also invited to fill the follow up questionnaire 15 days after their arrival.

**Result:** Four hundred and thirty-four (434) Thai tourists were included in this study during October to December, 2014. Sixty-six percent of tourists were female. Median age of all participants was 51 years. The median length of stay was 9 days. Almost of them were traveling as package tourists. Fifty-nine percent (256 out of 434 participants) were reported some sort of health problems during their trip in India. The most common reported health problems were cough, running nose, sore throat (35%), followed by musculoskeletal problems (30%), fever (16.4%), diarrhea (11.1%), and skin problems (7.1%). Other reported health problems were eyes/ears problems (3.5%), animal exposure (2.1%), and accident (0.9%). The follow up questionnaire showed that 11.8% of participants reported new or
additional symptoms which developed after their arrival. Respiratory symptoms were still the most common health problems in this 15 days period.

**Conclusion:** 59% of Thai tourists experienced some health problems during their trips in India. The most common health problems among this group were not travelers' diarrhea as previously believed. On the other hands, respiratory problems and musculoskeletal problems were the most common symptoms among Thai travelers to India. This information will be useful in pre-travel assessment and could imply that health risks among travelers from different nationalities may not be the same.

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**PO13.06**  
Respiratory Pathogens Surveillance in Returning South African Pilgrims after the 2013 Hajj: Johannesburg OR Tambo International Airport

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**Background:** Potential Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) spread was a concern at the 2013 Hajj. Airborne respiratory droplet spread at the largest annual mass gathering on earth has been documented previously for meningococcal meningitis and influenza. Direct contact with nasal and oral secretions occurring during the extreme congestion at rituals sites increases the risk of disease spread. The first respiratory pathogens surveillance was initiated in returning South African pilgrims.

**Objectives:** At least one third of pilgrims will have respiratory infections during or just after hajj. The surveillance was initiated to firstly ascertain whether returning pilgrims carried MERS-CoV, which, at the time when the survey was undertaken, has close to a 50% mortality rate and was associated with travel to the Middle East, especially Saudi Arabia. Secondly, pilgrims were screened for pathogens associated with hajj travel; *Neisseria meningitidis*, *Bordetella pertussis* as well as influenza viruses.

**Methods:** Two thousand South Africans were accredited to perform Hajj in 2013. A number of pre-travel and during travel strategies informed pilgrims of the post-hajj surveillance. OR Tambo International Airport in Johannesburg is the largest in South Africa, and 1471 pilgrims landed there on their return. Voluntary screening was offered to all symptomatic returnees.

**Results:** A total of 273 pilgrims were screened, of whom 179 had upper respiratory tract infections (URTI). Only 139 of symptomatic permitted specimen collection with 40 refusing. Of the 94 without URTI symptoms, 32 had specimens taken. Of the specimens taken from the 171 participants, oropharyngeal (OP) only were taken from 105 pilgrims whilst OP and sputum was taken from 66. No MERS-CoV or *Bordetella pertussis* pathogens were identified in any specimens. Six of the specimens tested positive for *Neisseria meningitidis* on sodC testing, 5 of which which could not be grouped and one that was Group B. All pilgrims were vaccinated with the meningococcal ACWY vaccine. Influenza was identified in 16 pilgrims. Seven were H3N2, two were H1N1, six were influenza B and one had both H3N2 and H1N1. Correlation with vaccination status was not done.

**Conclusion:** No MERS-CoV was detected. Influenza carriage was documented. Future surveillances are planned.

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**PO13.07**  
Workplace Response to the Ebola Virus Disease (EVD) Outbreak in Nigeria and Returning Travelers - The ExxonMobil Experience

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Background: On July 25, 2014, the Nigerian Federal and State Health authorities confirmed the death of a Liberian, an Ebola patient who had traveled to Lagos, Nigeria. This one case marked the onset of EVD outbreak in two major cities (Lagos and Port Harcourt), where ExxonMobil operates in Nigeria. The Ebola Virus Disease is a highly infectious disease that can spread quickly at an alarming rate, mostly amongst close family members and health care workers. In the workplace setting of a global Company like ExxonMobil, where there is a close interface amongst personnel from both the local and international communities at various levels, there is also an increased risk that EVD could spread rapidly, if brought into the work place.

Objective: Implement prompt and proactive Company response actions that will effectively:
- “Keep Ebola Out of Our House” - Protect our people, families and domestic staff from the virus
- Maintain business activities to the full extent possible without compromising Safety, Security, Health and the Environment
- Demonstrate Company’s preparedness to respond and protect our workforce every step of the way and honor the interest of our stakeholders
- Influence our industry and government to respond positively through interactions and exchange of information

Method: As a group of Companies, ExxonMobil (EM) affiliates in Nigeria promptly established a multi-tiered preparedness and response program for its employees and contractor personnel, to address the threat posed by the outbreak of the Ebola Virus Disease in the country. This standard and efficient approach is built on Company’s existing global pandemic flu plans, site infectious disease outbreak management measures and infection prevention and control guidelines. Specific guidelines for returning travelers developed where communicated to all sites at local, national, regional and global levels.

Summary of Results: This outbreak response model represents an effective and scalable approach to mitigate at similar work settings, the threat posed by EVD or any other infectious disease outbreak.

Conclusions: The Company used a pragmatic approach in response to the EVD outbreak in Nigeria. These efforts paid off and no EVD case was recorded amongst the workforce or returning travelers.

PO13.08
Tick-borne Encephalitis (TBE) in Israeli Travelers: Case Reports and its Prevention

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Tick-borne encephalitis (TBE) virus is a zoonotic, Flaviviral agent of encephalitis that can cause severe neurologic damage and even death. The TBE vector - *Ixodes ricinus* lives in forested areas and its range may be growing, perhaps due to climate changes. TBE is endemic through much of Europe, Siberia and the Far East: it is reported from Finland to Albania and from France to Japan. In the last 40 years the incidence of TBE in Europe has increased by more than 400 percent. The number of travel associated cases of TBE is unknown and there is little awareness of TBE in non-endemic countries.

In the last 3 years there were 3 proven cases of TBE in Israeli travellers to Western Europe. The demographical and clinical features as well as date and place of acquisition will be presented. The risk of TBE can be decreased by the implementation of tick-bite prevention measures, and by the administration of a vaccine. The vaccines available (FSME-IMMUN, Encepur) are - with limitations - both safe and effective, but costly. In the past, post-exposure prophylaxis was practiced, but is no longer recommended.

Estimating the risk for TBE for travelers is difficult. Data regarding TBE epidemiology in endemic areas, among travelers and risk calculation according to Israeli data will be presented, and current vaccine recommendations reviewed.
PO13.09
Analysis of Travel Related Behaviors of Dengue Infected Returning Missionaries from Haiti

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Nearly three hundred missionaries travel to La Croix, Haiti to perform various services. Over a ten year period of time prior to December of 2013, we had only two missionaries become infected with dengue fever. In the past year, we have had nine cases of dengue among our missionary travelers. Many missions rely on travelers to perform needed educational, medical and construction duties along with providing financial support for their mission. Dengue fever causes significant morbidity among missionaries and also impacts the effectiveness of the mission by limiting those willing to travel and support the mission. Behaviors of missionaries during their trip may increase their risk of dengue fever. We studied nine returned travelers from La Croix, Haiti who contracted dengue fever to identify behaviors that might increase their risk of infection.

We interviewed each returned traveler from Haiti regarding their behaviors to determine if there are points of intervention to improve protection from dengue fever for future missionaries. Use of permethrin treated clothing, use of topical skin repellents, sleeping arrangements, evening and daytime behaviors, and the use of bed nets were reviewed. Dates of travel and travel activities were discussed.

All of the missionaries recognized times when they did not apply insect repellents. As time passed during their trip, they were more likely not use repellents. Permethrin was not used by any of the infected travelers. Eight of the nine infected travelers became infected in December and January, La Croix’s peak mosquito season. Six of the nine used a shower where standing water was present.

When there is a significant increase in dengue incidence among missionaries, careful evaluation of behavior may help identify risk factors for future missionaries. Meticulous use of personal protective measures should be emphasized, particularly if the trip extends past one week. Permethrin appears to be an important intervention recommendation. Mission trip planning should consider times of increased mosquito populations. Finally, missionaries should be given information regarding high risk environments that may increase the risk of mosquito bites such as free standing water containers.

PO13.10
Colonization of Returning Travellers with Extended-spectrum Beta-lactamase Producing Escherichia coli: Prevalence and Risk Factors

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Background: International travel is a known risk-factor for colonization with Extended-Spectrum-Beta-Lactamase (ESBL) producing Escherichia coli. However, the systematic screening of returning travellers is generally not recommended, except for patients who have been hospitalized abroad in the previous year.

Objective: The objective was to assess prevalence and risk factors for colonization with ESBL-producing E. coli among international travellers.

Methods: This prospective study was conducted between May 2012 and October 2014 at Military Hospital Bégin (France). All patients hospitalized in the Infectious Diseases Unit who reported a history of travel abroad over the previous two months were included. Patients were asked to complete a questionnaire on potentiell travel-associated risk factors, and rectal swab samples were collected and tested for ESBL-producing E. coli.
Results: A total of 133 travellers (mean age 40.8 years, mean delay from return 16.5 days) were included. Among them, 34 (26%) were positive for ESBL-producing E. coli. In multivariate analysis, the factors associated with ESBL-producing E. coli colonization were antimicrobial treatment in the two previous months (odds ratio (OR) 5.8, 95% CI 1.7-19.9, p=0.006), a travel duration superior to 14 days (OR 5.6, 95%CI 1.1-28.4, P=0.036) and an hospitalization in the two previous months (OR 3.8, 95%CI 1.0-14.1, P=0.05). The destination, purpose of the trip, housing conditions, military status, occurrence of gastroenteritis, hospitalisation or antimicrobial treatment in the last 6 months were not associated with ESBL-producing E. coli colonization.

Conclusion: Our study confirms the high prevalence of ESBL-producing E. coli colonization among international travellers. A systematic screening of hospitalized travellers could be recommanded to prevent transmission in case of duration of travel > 14 days, recent antimicrobial treatment (< 2 months) or recent hospitalization (< 2 months).

PO13.11
Case-report: Vomiting a «Worm» Long after a Trip to Tunisia

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Description of case: A 48-year old previously healthy woman presented with a four-year history of non-specific symptoms (arthralgia, vision impairment, tinnitus, weight gain and vague digestive symptoms), following a trip to Tunisia where she experienced an episode of acute gastro-enteritis. Her GP and gastroenterologist had her undertake multiple investigations, of which all the results were normal. In March 2013, she consulted a doctor specialized in nutrition who diagnosed a Candida intestinal hyperinfection. As a result, she began a strict diet without dairy products, starchy food and sugar, and took nystatin for three weeks. She was also prescribed various food supplements. The symptoms transiently improved but deteriorated again, and she then experienced two separate episodes of vomiting a "worm" after a meal, accompanied by persistent diarrhea and bloating. She was referred to our consultation of tropical diseases for further investigations in June 2013. Her physical examination was non contributory.

Discussion: The "worm" was brought to the laboratory of parasitology for examination. Microscopically, there were no signs of parasite components. Macroscopically, the "worm" could be unfolded and looked like a 2cm long white structure, evocating the envelope of a soft-shelled capsule. We asked the patient to bring us samples of all her food supplements and the culprit was identified. To confirm our suspicion, we addressed the « worm » and the capsules for infrared spectrometry analyses. It revealed that the spectral polysaccharide profiles of the « worm » and the suspected capsule (containing primrose oil) were closely similar (graph 1).
The patient had misunderstood the instructions and has swallowed the whole capsule several times per day for several weeks, instead of opening the tip of the capsule and drink its content. Once correct use of the supplements was implemented by the patient, the symptoms resolved.

PO13.12
Multiple Painful Pruritic Papules on the Skin after a 'Missionary Journey' to Lagos, Nigeria
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Background: An unusual presentation of tropical myiasis is described along with the management of the case within a primary care setting.

Case History: A 21 old male who had recently travelled to Lagos on a volunteer mission with his local church presented for the second time to a primary care clinic after self-referring to the local Accident and Emergency department. During this visit he was found to have at least half a dozen intensely painful erythematous papules mainly distributed on his posterior trunk. By this time he had already completed a seven-day course of Flucloxacillin prescribed by A&E for "septic spots". Closer examination of the lesions showed that some of them were either centrally umbilicated or had a punctum. All the lesions were surrounded by a 2-3 cm area of erythema which faded outwards. At this point a diagnosis of cutaneous myiasis was made. Management consisted of placing a blob of petroleum jelly over each lesion and covering them first with cling film and then plastered down loosely with mepore dressings. Upon removing the dressings half an hour later, all the larvae had migrated to the skin surface and were easily extracted or simply picked up with forceps. Patient felt immediate pain relief, and all lesions were formally cleaned with antiseptic and left to dry.

Discussion: The extracted larvae were sent off to the Liverpool School of Tropical Medicine and Hygiene for positive species identification, and in just a few weeks the final report came back as Cordylobia anthropophaga. Cutaneous myiasis may present in primary care as well as in secondary care, and the importance of taking a travel history cannot be over-emphasized. The diagnosis literally jumps out of the box as soon as a history of travel to the relevant geographical area is elicited.

Conclusion: Cutaneous myiasis should be considered in all returning travellers presenting with unusual subcutaneous lumps and bumps. Initial presentation may be to secondary or primary care and a travel history is the key to prompt diagnosis.

Commercial interests: None.
PO13.13
Management of Two Humanitarians Presenting with Ebola Virus Disease Following their Medevac to a French Isolation Facility

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Background: Since the onset of the Ebola virus disease (EVD) outbreak in Guinea, Liberia and Sierra Leone, numerous healthcare workers have been infected by the Ebola virus on the field. As of January 15, 2014, 12 confirmed EVD-infected patients were medevaced to Europe (Germany [n=3], Spain [n=3], France [n=2], UK [n=1], Norway [n=1], Italy [n=1], Switzerland [n=1]).

Objective: To review the clinical course of two EVD cases medevaced from Liberia and Sierra Leone respectively.

Results:
Case 1: A 25-year-old French nurse was medevaced from Liberia on September 19, 2014, five days after presenting with EBOV. She had been working in Monrovia since September 1, 2014. The diagnosis was confirmed by RT-PCR. She had severe form with high fever, deep asthenia, diffuse rash, conjunctivitis, diarrhea, and bleeding from intravenous (IV) puncture sites. EBOV viral load was high (> 1 million copies/ml). Elevated transaminases (ASAT > 500 UI), coagulation disorders and late low antibody levels were observed. Outcome was favorable under aggressive supportive care (IV rehydration, fresh frozen plasma, parenteral nutrition) and experimental therapies (favipiravir, monoclonal antibodies, siRNA).

Case 2: A 37-year-old male UNICEF executive originating from Sierra Leone was medevaced on November 1, 2014, for an EBOV infection. The diagnosis was confirmed eleven days earlier by RT-PCR in Freetown. He had a mild form with fever, conjunctivitis and diarrhea. No bleeding disorders were reported. Viremia was low and coagulation tests were normal. High and early EBOV specific antibodies were detected. Outcome was favorable under favipiravir and parenteral rehydration. Viremia was undetectable 17 days after the onset. The virus was excreted in the urines until the 33rd day of the disease.

Conclusion: These two cases highlight the two typical forms of Ebola virus disease. The quality of supportive care (intensive nursing care, IV rehydration, bloodtransfusion) and use of innovative therapies are critical for improving prognosis of EVD.

Special Needs Travellers (Pregnancy, Pediatrics, Elderly, Immunosuppressed)

PO14.01
Enquiries to the National Travel Advice Helpline by Healthcare Professionals Regarding Travellers with Immunocompromise

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Background: The National Travel Health Network and Centre (NaTHNaC) Advice Helpline in the UK receives a high number of calls from healthcare professionals requesting advice on vaccines and malaria chemoprophylaxis in travellers with immunocompromise.

Objectives: To identify the most common enquiries to the helpline to inform the production of a Frequently Asked Questions document for the NaTHNaC website, and to identify training needs of healthcare professionals seeking advice.

Methods: Documentation for all helpline calls taken by travel health advisers at the London office during 2013 were reviewed.
Summary of results: During 2013 there were 7839 enquiries, approximately 60% were taken in London and reviewed. Three hundred and ninety-seven calls were regarding travellers with immunocompromise (8.4%). The median age of the traveller was 48 years (range 6 months - 85 years), 54% were female. The majority of travel was to sub-saharan Africa (53%) and most were travelling for tourism (40%). Sixty-seven per cent of enquiries were regarding vaccine use, 11% were about malaria chemoprophylaxis, 20% were about both, and 2% were for other reasons. The most common type of immunocompromise was an immunomodulating condition such as inflammatory bowel disease, the majority of whom were also on immunosuppressive drugs. Enquiries regarding travellers with other conditions are shown in Chart 1.

Chart 1

Conclusions: The most frequent enquiries were around live and inactivated vaccine use in travellers with a wide range of conditions and treatments which cause immunocompromise. There were also frequent enquiries regarding malaria chemoprophylaxis. The majority of travellers were on medications for their conditions, highlighting the importance of drug-drug interaction considerations. This research has informed the production of a FAQ document for the NaTHNaC website and will enable future educational activities to be more appropriately focused.

PO14.02
Chinese Students Abroad: An Important Category of Travelers

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Background: According to public comprehensive statistics from national cultural and education section of the embassy, at present, Chinese 1.27 million students studying abroad are distributed in more than 100 countries around the world. Chinese students abroad are increasing in numbers and importance with regard to travel health.

Method: We summarize special travel health considerations for Chinese Students Abroad.

Results: To some degree, students abroad are similar to all travelers to such destinations, but the differences require some modifications of travel health guidance because they must submit the following forms required by the school prior to enrollment, include emergency contact and insurance information form, school health record, medical history form, medication form, tuberculosis skin test/X-ray results form, physician's report of physical evaluation form, student immunization form. And some forms must be completed and signed by a physician. Without the completed forms, the school will not be able to obtain medical care for students and registration will be restricted. In addition, mental disorder remains a problem among long-term travelers, especially teenager students abroad. During their stay abroad, some students suffered from post-traumatic stress disorder due to major life events. Several students faced difficulties in life or study. Some cases had sexual problem.

Conclusion: The pre-travel consultation for students abroad should provide background on health issues in the host country, including country health information and school's requirements prior to
enrollment. And we suggest that special attention should be given to the prevention and intervention of mental problems among Chinese students abroad.

PO14.03
Travel Characteristics and Pre-Travel Health Care among Pregnant or Breastfeeding Women Preparing for International Travel: Analysis from the U.S. Global TravEpiNet Consortium

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Objective: To investigate the demographics and travel characteristics of and preventive interventions provided to pregnant travelers (PT) or breastfeeding travelers (BFT) seen at U.S. travel clinics participating in Global TravEpiNet (GTEN).

Methods: We collected demographic and travel characteristics, vaccines administered, and medications prescribed to PT and BFT receiving pre-travel care at a GTEN clinic between January 1, 2009, to December 31, 2013. Non-pregnant/non-breastfeeding female travelers of childbearing age (aged 18-49 years) (NPNBT) were used as a comparison group.

Results: Of 17,223 travelers, 136 were (0.8%) PT, 110 (0.6%) BFT, and 16,977 (98.6%) NPNBT. PT traveled mostly for leisure (43%), business (26%), or to visit friends and relatives (VFR) (21%). Likewise, BFTs’ leading reason for travel was leisure (39%), business (30%) or VFR (33%). In contrast, only 16% and 8% of NPNBT traveled as business or VFR, respectively. Most PT (96%) and BFT (94%) traveled to a malaria-endemic country. One-third of PT (35%) and almost half of BFT (45%) planned to visit a yellow fever-endemic country. Of PT and BFT preparing to visit a yellow fever-endemic country, pre-existing immunity was reported for 40% and 35%, respectively, and 17% of PT and 37% of BFT were vaccinated with the yellow fever vaccine. Of those visiting a malaria-endemic country, 54% of PT and 67% of BFT were provided with chemoprophylaxis; the most commonly prescribed medications were mefloquine (71%) in PT and atovaquone/proguanil (61%) in BFT. For almost all PT (94%) and BFT (99%)Td/Tdap pre-existing immunity or vaccination at clinic visit was reported while for only two-thirds of PT (63%) and BFT (67%) influenza pre-existing immunity or vaccination at clinic visit was reported.

Conclusions: PT and BFT seen at GTEN clinics travel predominantly to high-risk destinations. Although both pregnancy and breastfeeding are considered precautions for vaccination, many PT and BFT had pre-existing immunity or were vaccinated. While there was almost complete immunity to Td/Tdap, approximately one-third traveled without protection against influenza. A better understanding of the current pre-travel preparation of pregnant and breastfeeding international travelers may help inform public health policy and improve the clinical care of future travelers.

PO14.04
Traveling with HIV - Centro Hospitalar do Porto Experience in Is Travel Medicine Center Unit - July 2013 to December 2014

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**Background of the Study:** During the last 18 months, this Travel Medicine Expert Unit, performed about 5,000 Travel Medicine consultations and more than 14,000 vaccines. From these, 29 travelers present in our Unit were HIV positive.

**Objectives:** Profile of the HIV travelers observed in our Unit.

**Methods:** Twenty nine travelers HIV positive were observed in our Unit, from July 2013 to December 2014. The authors did a descriptive study and collected demographic data, HIV status and trip information. Statistical analysis were performed.

**Results:** Twenty nine travelers participate in the study, the average age was 44.1 years; 79.3% (23) of them were male. From the total 48.3% and 31% traveled to Angola and Mozambique respectively; 55.2% of the for working purpose overseas and 20.7% of the to VFR. The average permanence was 60 days. Twenty eight travelers were under HAART therapy; the most prescribed HAART scheme was TDF/FDC+EFV in 25% of them.

82.7% present undetectable viral load and the average Lymphocytes TCD4 counts were 761 (mx.2397, min.236). Eleven YF and 3 MMR vaccines were performed without adverse events.

**Conclusions:** The HIV patients can easily travel safely to underdeveloped countries if the expertise advise were done wisely and if the immunological status of the patients allow them to travel.

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**Trauma, Security, Disasters and Conflicts**

**PO15.01 Health Screening for an Escalating Ebola Response**

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**Background:** West Africa is experiencing the largest outbreak of Ebola ever known. Many UK staff from government, charities and the National Health Service responded and deployed to the affected areas. InterHealth Worldwide responded to the escalating Ebola crisis by providing medical, psychological and travel health clearances and support to many of those responders from the UK and some internationally. InterHealth is a small health charity with a base in London, and now supported by a team in Nairobi.

**Objective:** This study examines the data on the Ebola responders seen by InterHealth to give a glimpse of the UK's response to the outbreak and highlight the clearance process and support given to those responding to the crisis.

**Method:** The clinic database at InterHealth was used to pull information and statistics on the Ebola responders seen by the doctors, travel health nurses and psychological health team pre-deployment. Consent was gained.

**Results:** From 01 September 2014 to 24 March 2015 InterHealth dealt with a total of 1105 Ebola responders. Figure 1 shows a breakdown of how many were seen in each month and which affected country they were deployed to. 71% had pre-departure medical clearance, 50% had a psychological health clearance and the majority were assessed by the travel health nurses, time permitting. Job roles ranged from administration and management roles to laboratory technicians and direct patient care. The average length of deployment in Ebola regions was 5 weeks (median). The average preparation time that the Ebola responders had was 14 days (median). The minimum preparation time recorded was 0 days and the maximum time recorded was 128 days.
Conclusion: The numbers of responders and roles they performed give a glimpse into the UK's response to the Ebola crisis. The responders often had little time to prepare for deployment and for InterHealth to clear them as fit. There is a great need for assessment of suitability and for support - both physical and psychological, which was provided by InterHealth in response to the escalating crisis.

Travel Medicine Practice

PO16.01
Incorporating Comprehensive Travel Health Services in Primary Care

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Background: International tourism and business travel is a growing industry - according to the World Tourism Organization, there were over 1 billion international travelers in 2013. Many new destinations have emerged and travel to such destinations requires specific preparation to avoid illness. Primary care providers are often called upon to prepare their patients for travel and to treat them afterward. Unfortunately, many primary care providers find it difficult to stay up-to-date on the constantly changing world of travel medicine and subsequently refer the client to external travel health clinics. However, due to the additional cost, or lack of access, many clients do not seek further travel health consultation and thus are unprepared for a multitude of health and safety risks while abroad.

Objective: To provide high quality, individualized, comprehensive travel health services using an experienced multidisciplinary team across three primary care clinics in Alberta and British Columbia.

Methods: Training the multidisciplinary team (nurse practitioners, physicians, nurses) to provide comprehensive travel health consults
Obtaining the Yellow Fever Vaccination Centre designation (Public Health Agency of Canada) and completing the Yellow Fever Vaccine Course (CDC)
Developing travel health standards of care
Creating standardized EMR templates for travel screen and consults
Antimalarial decision making tool
Ongoing educational in-services for providers
Complimentary seminars for patients about general travel health
Regular updates about emerging diseases and travel advisories

**Results:** Clients who completed pre-travel risk assessment, received recommended vaccines and anticipatory guidance regarding illness prevention reported:

- Increased awareness about health risks abroad
- Decreased anxiety and improved knowledge and skills required for disease prevention
- Improved continuity of care with the primary care provider
- Higher satisfaction with care

Dedicated and well-trained primary care team with expertise in travel medicine improved timely access to travel health services and reported:

- Increased competence and confidence in providing travel health services in primary care setting
- Improved work satisfaction

**Conclusions:** Provision of comprehensive, individualized travel health services within a primary care setting increases travelers’ access to pre-travel assessments and counseling and travel-specific immunizations. There is an improvement in clients’ knowledge, skills and attitude towards illness prevention while abroad.

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**PO16.02**

**International Travelers from New Jersey: Piloting a Travel Medicine Module in the 2011 Behavioral Risk Factor Surveillance System Survey**

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**Background:** In 2011, the Centers for Disease Control and Prevention and New Jersey Department of Health and Senior Services used the Behavioral Risk Factor Surveillance System (BRFSS) to pilot a travel medicine module designed to collect population-based data on New Jersey residents traveling internationally.

**Objective:** To use population-based travel medicine information to serve as a baseline to evaluate trends in US travelers.

**Methods:** A representative sample of New Jersey residents was identified through a random-digit-dialing method and administered the travel medicine module. The module asked five questions: if respondents traveled outside of the US in the past 12 months; travel destination; if they visited a health care provider before traveling; reason for traveling; and whether they became sick during or upon returning from their trip. Additional health variables from the larger BRFSS survey for respondents were included in analyses that included bivariate analyses and multiple logistic regression; weights were assigned to variables to account for survey design complexity.

**Results:** Of 4,029 participants, 841 (21%) traveled internationally. Overall, 493 (59%) travelers were female; mean age was 52 years. Top destinations included Mexico (10%), Canada (9%), Dominican Republic (6%), Bahamas (5%), and Italy (5%). One-fifth of travelers visited friends or relatives (VFR), one quarter of travelers were foreign-born. Forty-eight (6%) of 837 travelers reported illness during travel or within one week of returning; 21 (44%) of the 48 with illness had visited high-risk countries. One hundred fifty travelers (18%) of the 841 went to high-risk destinations; 40% of these were VFRs and 30% sought pre-travel health care. Independent variables associated with any international travel in logistic regression modeling included foreign birth, ≥$75,000 annual household income, college education, and no children living in the household.

**Conclusions:** Approximately 1 in 5 New Jersey BRFSS respondents traveled internationally during the previous year, a sizeable proportion to high-risk destinations. Few reported becoming ill as a result of travel, but almost half of those ill had traveled to high-risk destinations. Population-based surveillance data on travelers can be useful in determining a baseline that can be later used to evaluate trends and the effectiveness of prevention programs.
PO16.03
Travellers’ Profile and Travel Clinic Vaccine Practices: A 10-year Prospective Study in Switzerland

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Background: The travel clinic in Lausanne serves a catchment area of 700,000 of inhabitants. It provides pre- and post-travel consultations and offers preventive measures (vaccines and antimalarials).

Objectives:
1) To describe the profile and travel patterns of attending travellers before departure,
2) to describe the travel clinic practices in terms of vaccination overtime.

Methods: We included all pre-travel first consultation data recorded between November 2002 and December 2012 by a custom-made program DIAMM/G version 6 that helps the clinician in decision-making. We analysed clients profile, travel characteristics, and vaccinations prescribed overtime.

Results: 65,046 client-trips were recorded. 51% were female; mean age was 32 years (4 days-91 years). 0.1% were aged less than 1y and 0.2% ≥80y. 46% were travelling to Africa, 35% to Asia, 20% to Latin America, and 1% (each) to Oceania and Europe; 19% visited more than one country. India was the main destination (9.6% of travellers) followed by Thailand (8.6%) and Kenya (6.4%). 91% were planning to stay less than 3 months. The main reasons for travel were tourism (75%) and VFRs (18%). Pre-booked hotel was the most common type of accommodation (54%). 16% were backpackers. Pre-travel advice was sought a median of 29 days before departure. 46% of travellers had pre-existing medical conditions. 99% received vaccine(s). The most frequently administered vaccines were hepatitis A (53%), tetanus-diphtheria (46%), yellow fever (39%), poliomyelitis (38%) and typhoid fever (30%). The most important changes of vaccine recommendations made by the Federal Office of Public Health (FOPH)’s and travel expert group over the 10-year period were for routine vaccinations. These changes were reflected in the travel clinic practice with a drop from 41% of travellers vaccinated against di-Te to 25% after spacing the booster dose and an increase from 15% to 38% for those vaccinated against measles, mumps and rubella after introduction of a second dose.

Conclusion: The profile of Swiss international travel clinic attendees was different to that of the general population. They were younger people planning to visit tropical areas as tourists. Travel clinic professionals complied well with changes of the national vaccine recommendations.

PO16.04
Risk Assessment for an Early Hospital Readmission

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Travel Insurance contracts often have a repatriation clause, after a first hospital admission, if the traveler is high risk for a second hospital admission. The Insurance Company Medical Officers often have different opinions assessing the risk of a second hospital admission. To bring more uniformity in our medical risk assessments, we reviewed the medical literature to develop, at time of discharge, evidence-based algorithms to predict an early (4 to 6 weeks) second hospital admission. In the USA, 20% of patients are readmitted within 30 days, 34% within 90 days and 56% within 1 year. Diagnosis, acute admission, age of the patient, comorbidity, length of stay during the first admission, ER visits or hospital admission during the 6 months preceding the travel and AMA discharges are predictors for an early hospital readmission.
We developed more precise predictors for the 18 most frequent main diagnoses related to a hospital admission while traveling abroad. Based on recent publications, we established low and high risk categories for an early hospital readmission for all these medical conditions.

Smoking multiplies by 4 the 4% risk of a rapid readmission after an acute coronary syndrome. Female gender, diabetes, incomplete revascularization, renal failure, arrhythmias and heart failure increase the 16% risk of readmission after coronary artery surgery. Quality and completeness of revascularisation lower the 25% risk of readmission after a coronary angioplasty. Sophisticated procedures and age increase the 4% risk of readmission after a cardiac defibrillator.

Older age, comorbidity and incomplete investigation increase the 8 to 12% rate of early readmission after a Transient Ischemic Attack. Diabetes increases by 27% the 9% risk of readmission after a stroke.

Pneumonia is by far the medical conditions with the best published predictors for its high 18% early readmission rate. Age, comorbidity, number of unstable vital signs at discharge, and a high Pneumonia Severity Index increase significantly the risk of early readmission.

Conservative treatment triples the 10% risk of readmission after a first admission for diverticulitis; age and comorbidity also increase the risk of readmission.

Evidence based risk assessments are necessary to give uniform repatriation advices after a first hospital admission.

PO16.05
Managing Travellers Seeking Treatment Abroad: Experiences from a Host Country
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Background: Illness among travellers is well documented in recent studies with a primary focus on returned travellers. On the contrary, scarce information is available on illness during travel and what causes the traveller to access local healthcare.

Objective: To assess illness in travellers and comparing them with health problems among expatriates seeking local health care in a travel clinic out-patient setting in a host country.

Method: Retrospective analysis of case records from a Kolkata clinic during a 18 month period from July 2013 to December 2014 totalling 508 clients of which 180 (35%) were expatriates. Travellers were grouped by main reason for travel. Illness recorded due to or exacerbated by travel. Diagnosis was mostly syndromic but etiologic attempts made where laboratory work-up was possible. Teleconsults, travel health study clients and cross referrals from medical colleagues were excluded. Retrospective methods and voluntary access leading to underestimations are limitations.

Results: Among travellers, 122 (24%) were tourists with those between 21 -30 years and > 70 years of age seeking health advice compared to expatriates who were across all ages. Acute gastrointestinal symptoms was the commonest in 225 (44%) travellers followed by respiratory illness in 86 (17%) travellers. Travellers diarrhoea was the commonest afflicting 80 % of the travellers compared to 20% in expatriates. Among VFR travellers, 66% reported travellers diarrhoea. Respiratory illness was commonest among business travellers (26%) and expatriates (20%). Expatriates commonly sought advice for dermatologic reasons. Five cases of dengue and two of P. vivax malaria was detected. Psychological illness reported among 8 expatriates and 7 travellers.

Conclusion: Travellers diarrhoea is common among travellers compared to expatriates who reported equally both diarrhoea and respiratory illnesses. Respiratory illness common in business travellers. Such studies improve our understanding of travel medicine practice in resource-poor host destinations and help provide insights into what motivates travellers seek local health-care.

PO16.06
The Development of the Travel Medicine in Hungary - Retrospection 10-years after the Country Has Joined the EU
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In 2004 Hungary among with eight other Eastern European countries joined the European Union. In 1989 after the end of the Cold War when democratic state law emerged and the old travel related restrictions ceased to exist, in the Eastern European countries the number of tourists, who wanted to travel abroad became unprecedentedly high. Unfortunately this increasing desire for traveling wasn't followed by a similar increase in traveler's pursuit of medical safety. Only in the aforementioned year of Hungary's EU joining and when the first articles and announcements connected to travel medicine appeared in the country did the people become more and more aware of travel related illnesses. The state's vaccination centers which ones were in monopoly till then had to give some space to the first private clinics providing vaccination and pre-travel advices. An important step on this road was the vaccination for yellow fever's liberalization in 2008 which accelerated the increase of private clinics' number. Another boost for the travel medicine's appreciation in Hungary was ISTM's Budapest congress in 2009, where international professionals could familiarize themselves with the traveling customs of the Eastern European population, the region's specific demands to the new discipline (travel medicine) and travel medicine's Hungarian structure and its professionals.

In the universities the education of travel medicine started in 2008, and in 2011 the first textbook this time for physicians was published. In 2013 the first travel medicine department in Hungary was founded.

Authors along with the presentation of the travel medicine's Hungarian development - which can serve as a model for other Eastern European countries - are providing an analysis of the travel medicine clinics' increasing number, these clinics' distribution in different Hungarian regions and vaccination activities and figures connected to sharing pre-travel advices as well. They also analyze the Hungarian travel features which the Hungarian travel medicine's body of knowledge needs to be taken into account.

Authors found that the appearance of the travel medicine discipline in Hungary created a more effective prevention for travel-related illnesses and it also raised the quality of pre-travel advices for the population.

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PO16.07
A Portrait of Travel Health Services in Canada in the Midst of a Changing Regulatory Environment

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**Background:** There has not been an updated portrait of Canadian travel clinics since 2003. Recent changes in professional regulations in many provinces may have had an impact on travel health practices.

**Method:** We surveyed travel clinics across Canada on various organizational aspects as well as availability of vaccines and antimalarials.

**Results:** We had a 32.8% (270/824) response rate. Private clinics (nurse or physician-run) represent 51.0% of all the respondents. Of all clinics that responded, 44.7% have been in operation for only 5 years or less, 47.1% see 500 or fewer pre-travel consultations per year and 30.0% have only one health care provider. Services are available predominantly by appointment (71.9%), with 51.9% clinics open during evenings and 25.2% on weekends. There are large disparities in the availability of routine vaccines in travel clinics between provinces.
**Conclusion:** Diversity of practice settings in which pretravel care is provided in Canada ensures wide coverage and accessibility, but the large number of smaller and of more recently established clinics underlines the need for ongoing training and maintaining of competency for travel health practitioners.

PO16.08

**Analyze the Situation of Travel Medicine in China by SWOT**

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**Objective:** To analyze the current situation of Travel Medicine in China, and discussion the methods that can improve the practice of Travel Medicine.

**Methods:** SWOT analysis was used to investigate the strength, weakness, opportunity, and threat of the current practice of Travel Medicine in China.

**Results:** There were three strength, three weaknesses, 3 opportunities, and 2 threats. The interactions between of strength-opportunity (S-O), weakness-opportunity (W-O), strength-threat (S-T), weakness-threat (W-T) were analyzed by a SWOT matrix and strategies were established.

**Conclusions:** Both opportunities and threats exist in the current practice of Travel Medicine. It is helpful to take the advantages and avoid the disadvantages to improve the practice of Travel Medicine in China. Several personalized measures should be taken, such as the development different approaches for health education, smart online system for travel medicine consultation, the improvement of the online sharing network on infectious diseases monitoring system, and the establishment a three-level professional model.

**Keywords:** travel medicine; infectious diseases; SWOT analysis

PO16.09

**Improving Oral Typhoid Vaccine Adherence in a Travel Clinic**

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**Background:** Oral typhoid, a live-attenuated vaccine, requires refrigeration, schedule compliance, adherence to directions, and self-administration. Travelers seen in the Travel Medicine Center (TMC) have reported various problems while taking the oral vaccine, which may alter treatment plan and require staff time in responding to requests for further directions and replacing the vaccine. A quality improvement project was conducted at the TMC in 2014 by retrospective chart review of travelers who reported problems with oral typhoid vaccine and identified reasons for difficulties in completion. To address the problems in adherence, the TMC implemented 2 measures to improve the completion of oral typhoid vaccine and to assess the effectiveness of these interventions: 1) assist the traveler to set up scheduled reminders on his/her smart phone at the time of visit; 2) provide the box of vaccine capsules in a large paper bag with bright refrigeration sticker to remind travelers to refrigerate the capsules.

**Objective:** To assess whether implementing two new interventions during the pre-travel consultation lead to improvement in successful completion of oral typhoid vaccine. To obtain feedback from travelers regarding the effectiveness of our teaching on oral typhoid administration.

**Method:** At the time of visit, adult travelers receiving oral typhoid vaccine will be invited to participate in a survey (via email or paper) to examine vaccine completion and the effectiveness of our teaching method. Data will be entered into an Excel database and frequencies and proportions will be used to analyze data and compare results to our previous Quality Improvement Project.
Results: Baseline data from 2009-2013 found a mean non-completion rate of 3.5%, ranging from 5.6% in 2009 to 3.1% in 2013. The decline in non-completion was attributed to additional verbal instructions. This survey explored whether the additional reminder measures reduce the occurrence of 3 reasons that accounted for the challenges in adherence:
1) capsules left out of refrigeration,
2) forgetting to take a pill,
3) schedule obsthrough April 2015tacles.
The study is being piloted; approximately 50 surveys are expected to be analyzed through April 2015.
Conclusion: Data generated from the survey may inform whether our additional measures improve vaccine completion.

Vector-borne Infections (Excluding Malaria)

PO17.01
Role of Leishmania RNA Virus-1 in the Pathogenesis of Tegumentary Leishmaniasis

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Background: Tegumentary leishmaniasis (TL) is an emerging disease among travelers, and case reports suggest that TL among travelers may be particularly severe. Leishmania RNA virus-1 (LRV1) has been implicated in the pathogenesis of severe TL in murine models, though whether this extends to humans is unknown.

Objective: We screened 5 New World ATCC reference strains of Leishmania (L. amazonensis, L. mexicana, L. (V.) braziliensis, L. (V.) panamensis, and L. (V.) guyanensis) and 22 clinical specimens from 17 individual cases of TL for presence of LRV1.

Methods: Two real time PCR assays for detection of LRV1 were performed with LRV1 set A and set B primers. Amplification of Leishmania kinetoplastid membrane protein 11 (kmp11) served as a quantification and extraction control. LRV1 positive specimens were confirmed by sequencing. Abundance of LRV1 was calculated with 2^ΔΔCt formula relative to ATCC L. (V.) guyanensis strain MHOM/BR/75/M4147 known to harbour LRV1, which was used as a positive reference control.

Results: Causative species for the 17 individual cases were as follows: L. chagasi/infantum (N=3), L. mexicana (N=1), L. (V.) braziliensis (N=5), L. (V.) guyanensis (N=1), L. (V.) panamensis (N=2), L. major (N=2), and L. tropica (N=3). Primary clinical specimens included: bone marrow (N=1), whole blood (N=2), skin biopsy (N=4), skin scraping (N=3), cytology brush (N=11), and unspecified (N=1). In addition to the reference L. (V.) guyanensis strain, 2 clinical samples (9%) were found to harbour LRV1: 1 strain of L. (V.) guyanensis causing both skin and mucosal ulcerations, and 1 strain of L. (V.) braziliensis causing a large cutaneous ulcer without mucosal involvement. LRV1 abundance ranging from 0.01 - 1.1 relative to ATCC L. (V.) guyanensis and sequence heterogeneity of 16% in a ~400bp region were observed. None of the other New World Viannia strains or Old World species were found to harbour LRV1.

Conclusions: Detection of LRV1 and single nucleotide polymorphisms from clinical strains of Leishmania may become relevant to clinicians in the future for patient management.

PO17.02
Dengue During Travel in Singapore: Severe Dengue is Associated with Longer Residence in Endemic Regions

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**Background:** Dengue causes substantial morbidity and mortality in international travelers. Case ascertainment during travel is useful because of the short incubation for dengue. There is also limited data regarding whether duration of exposure in dengue-endemic areas is associated with severe disease.

**Objective:** This study aims to determine the factors associated with severe dengue among symptomatic travelers diagnosed with dengue infection while abroad.

**Methods:** We analyzed records of 2082 symptomatic travelers diagnosed with dengue infection in Singapore and entered into the GeoSentinel database from February 2005 through January 2014. GeoSentinel is an international network of tropical/travel medicine centers conducting sentinel surveillance for travel-related disease. The cases included foreign workers and expatriates residing in Singapore, as well as temporary visitors, all diagnosed during travel, mostly with dengue acquired in Singapore. We examined demographic and travel characteristics, duration of stay in Singapore, and seasonal patterns during outbreak and non-outbreak years. Chi-square and Wilcoxon rank-sum tests were used to analyze the data when appropriate.

**Results:** Of 141 travelers diagnosed with severe dengue compared to 1941 with uncomplicated disease, significantly more were male (91% vs 77%, p< 0.0001), older (median 33 years vs 31 years, p < 0.05), and had resided previously in a dengue-endemic country (66% vs 48%, p < 0.0001). Patients with severe dengue had a longer duration of stay in Singapore (median 36.4 months vs 24.2 months, p = 0.0003). The data also showed a strong seasonal peak in dengue diagnoses in June and July, corresponding to the summer monsoon in Southeast Asia. This seasonal pattern is more distinctly seen during outbreak years, such as 2005.

**Conclusions:** Multiple serotypes circulate in Singapore, with the predominant strain alternating between DEN-1 and DEN-2 over the past decade. Travellers residing in dengue-endemic regions for longer durations are more likely to get infected a second time with a different serotype, which may result in severe dengue through antibody-dependent enhancement of disease. Clinicians need to counsel long-term expatriates more extensively about mosquito precautions. Travellers with prior dengue infection should also be aware of increased seasonal risk for dengue transmission during outbreaks.

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**PO17.03 Double Dengue Serotypes in Asymptomatic Populations Living in an Area of Thailand Endemic for Dengue Hemorrhagic Fever**

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**Background of the Study:** Dengue virus infection remains a major health problem worldwide. Understanding dengue infections and characterizing circulating viruses are essential for disease prevention and control as well as vaccine development.

**Objectives:** To identify dengue virus in healthy people living in area endemic for dengue disease. Data from this study provide increased understanding of dengue virus circulation in the environment that could be used for future development of dengue control measures.

**Methods:** Blood samples were collected from 52 healthy local subjects living in a dengue-endemic area of Thailand. Viral RNA was detected using nested reverse transcription polymerase chain (RT-PCR) that amplified the E gene. Phylogenetic trees were constructed by neighbor-joining method using MEGA6.06.

**Summary of Results:** Dengue virus was detected in 5 of 52 samples (9.62%). Double virus serotypes were identified in two samples. Viral sequence analysis showed mutations, including those in stop codons; sylvatic dengue serotype 1 genotypes were also observed. Serotype 4 belonged to genotype II. Both genotypes I and II were found in one serotype 3 sample.
Conclusions: These preliminary results may provide better understanding of dengue infections and viral transmission between populations and mosquitoes. Furthermore, these findings may be significant for epidemiological studies of dengue hemorrhagic fever.

PO17.04
Molecular Evidence of *Rickettsia* spp. in Human and Dogs Blood in Bangkok

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Background: Rickettsioses are important zoonosis diseases. We have been reported *Rickettsia* sp. related to *Rickettsia felis* in 67.4% flea specimens from dogs that come from various sites in Bangkok. Dogs reservoir competence for this pathogen and human infection have remained poor understood. Therefore, this study detected *Rickettsia* spp. in human and dogs blood by real-time PCR and DNA sequencing.

Objective: We investigated the rickettsial DNA in blood from dogs and human in Bangkok.

Method: Human buffy coat of patients with fever of unknown origin (n = 107) and blood samples form dogs with fever in Bangkok (n = 321) during 2010-2014 were studied. DNA were extracted. The presence of rickettsial DNA was investigated by detection of citrate synthase (gltA) gene of *Rickettsia* genus by real-time PCR and probe. All positive samples was confirmed by DNA sequencing analysis.

Results: Rickettsial DNA was detected in 13 of 321 (4.05%) dog blood specimens and in 7 of 107 (6.54%) human buffy coat. Five of positive from human and 8 from dogs were identical to *Rickettsia felis* strain Brisbane (GenBank accession number: KF242471.1). Whereas, the other 2 positive form human and 5 from dogs were identical to those of *Rickettsia* sp. PU01-02 (GenBank accession number: KF666472.1).

Conclusion: This finding specify a new emerging rickettsiosis in dogs in Bangkok. In addition this *Rickettsia* could be a zoonotic transmission by dog's fleas to human as an accidental hosts. Therefore, differential diagnosis of the diseases in tropical countries and in travelers, and the implications for this disease control should be concern.

PO17.05
Interagency and Commercial Collaboration Utilized during an Investigation of Chikungunya and Dengue among Returning Travelers to the United States

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Objectives/background: To describe the U.S. government interagency and commercial collaboration utilized during an investigation of service organization volunteers and staff transiting through the Miami International Airport (MIA) during the summer of 2014. Volunteers/staff were returning from the Dominican Republic, where dengue virus is endemic and chikungunya virus was recently introduced. The organization reported several suspected chikungunya illnesses among volunteers/staff while in-country.
**Methods:** Volunteers/staff returned through MIA primarily on three dates and most were minors. To ensure that safety and investigation protocols were followed in entirety and flight connections were made, collaboration between multiple groups was necessary, including the on-site quarantine station; U.S. Customs and Border Protection (CBP); a commercial airline; and the service organization. Plans were customized each arrival day based on numbers of arriving volunteers. Participants, on all dates, completed a questionnaire and provided a blood sample; the process needed to be completed within 45 minutes to ensure participants made flight connections.

**Results:** The service organization reported that 147 volunteers/staff served in the Dominican Republic; 20 returned on dates other than the investigation dates and 106 (83%) of the remaining 127 participated. CBP and CDC personnel secured a location inside the international terminal to ensure privacy for volunteer participation. Airline staff escorted participants from the arrival gate to this secure location where CBP first performed the normal immigration process. CDC ensured consent/assent and questionnaire completion, and both CDC and contracted phlebotomists obtained blood samples. CBP, with airline staff, then escorted participants to baggage claim, through security checkpoints, and to connecting flights. In total, 106 completed questionnaires, 102 provided blood samples, and none missed their connecting flights.

**Conclusion:** Conducting a public health investigation in an international airport with passengers requires extensive collaboration; this was successfully demonstrated in this effort. Most eligible volunteers/staff participated, with all participants successfully completing questionnaires during their windows between flights and none missing connecting flights. This investigation also demonstrates the use and effectiveness of on-site CDC facilities and personnel for public health investigations involving travelers.

**PO17.06**

**Myiasis in Travelers**

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**Background:** Cutaneous myiasis is a well-established diagnosis in returning travelers from tropical countries. The most common form of myiasis seen in this population is localized furuncular myiasis caused by Dermatobia hominis and Cordylobia anthropophaga. There is limited data of the disease course and outcome in travelers to tropical countries.

**Objective:** Defining Myiasis characteristics among travelers.

**Methods:** A retrospective observational study of patients who presented with myiasis between 1999 to July 2014 in the post-travel clinics in Israel. Data regarding exposure history, travel duration, clinical presentation, treatment and parasitological identification were collected and analyzed.

**Results:** Among 6,867 ill returning Israeli travelers, 1,419 (21%) had a dermatologic complaint, 90 (6.3%) of them were diagnosed as myiasis. Myiasis was acquired in Latin America by 72 (80%) patients, mainly (54%) in the Madidi National Park, Amazonas Basin, Bolivia; 18 cases (20%) were acquired in Africa. In 76% of cases manual extraction was sufficient to remove the larva; 24% required surgical intervention. Despite the fact that most patients did not receive antibiotic treatment, only one developed secondary infection, upon partial removal of the larva.

**Conclusions:** This is the largest myiasis case-series in ill returning travelers. Myiasis is not a rare dermatologic complaint with most Israeli cases imported from Latin America and specifically the Madidi National Park in Bolivia. Treatment is based on full extraction of the larva and then no antibiotic treatment is needed. Myiasis is a preventable disease and travelers should be informed of the different preventive measures according to their travel destination.

**PO17.07**

**Importance of Working with the Travel and Tourism Industries for Dengue Prevention and Control in Bali, Indonesia - A World-famous Tourist Destination**
Background: Bali is one of the most popular tropical tourist destinations in the world. Despite efforts made by the health authorities to improve awareness of dengue - a mosquito-borne viral infection - amongst the local people, this infectious disease is endemic in Bali province (6,813 reported cases of severe dengue in 2013, Ministry of Health). Other countries like Japan continue to report dengue cases amongst travelers returning from this island. Given the widespread movement of people, including international and domestic tourists, increased knowledge of dengue prevention and control in the travel and tourism industries is essential.

Objectives: The purpose of this study was to investigate the levels of knowledge on dengue amongst hotel employees, and to understand what prevention and control measures are implemented by hotels in Bali, in order to:

1) recommend more effective strategies for mosquito control; and
2) engage the hotel industry in disseminating practical information on dengue prevention to tourists.

Methods: We conducted a one-day workshop: “Preventing Dengue Outbreaks at International Hotels”, in Bali in November 2014. Thirty-two hotel representatives (managers and staff, from non-rated to 5-star hotels) filled in the questionnaire (23 questions) prior to the workshop.

Results: 81% understood that dengue can be a life-threatening disease; 72% answered that the disease is not currently preventable by a vaccine; more than 80% reported a mosquito nuisance problem at their hotels. In addition to other control measures for reducing mosquito bites experienced by hotel guests, 78% utilised fogging as often as: once a week (16%), twice a week (66%) and thrice a week (6%), with 75% outsourcing the operations. None mentioned the conduct of larval surveillance or control.

Conclusions: The hotel employees surveyed seemed to have basic knowledge of dengue. However, they could benefit from more in-depth scientific information, as well as practical and accurate advice on effective mosquito and dengue prevention and control measures - such as source reduction in place of routine fogging. For improving public health intervention in such a tourist destination, our follow-up actions will include visiting participating hotels to empower them with further knowledge and advocate their outreach to hotel guests.

PO17.08
Establishment of a Multiplex Liquid Bead Array for Detection and Genotyping of Dengue Virus

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Objective: To establish a method for detecting and genotyping of multiple dengue virus based on a liquid bead array in order to rapidly detect and identify four subtypes of dengue virus.

Methods: Primers and probes were designed and synthesized according to genomic sequences in the NCBI Genbank database. Viral RNA was extracted and reverse-transcribed and target sequences were amplified. PCR products were hybridized with coupled nucleic acid probe beads set and detected by the Bio-Plex™ 200 system.

Results: Multiplex PCR conditions were optimized, and the limits of detection for each subtype virus were about 9DNA copies for DV1 and 90DNA copies for DV2, DV3, DV4. 15 clinical samples were detected by the established assay, 9 out of the 15 samples were confirmed to be positive. The results compared with the specific fluorescence real-time PCR had the very high consistency. However, it had advantages in detecting complex samples rapidly.

Conclusions: A liquid bead array method for detecting and genotyping of dengue virus was developed, which was a highly specific and saving time way, and had no cross-reaction to
simultaneously detect four subtypes of dengue virus, and may play a new and important role in rapid screening and identification of dengue virus. 

**Keywords:** dengue virus, liquid bead array, multiplex PCR

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**PO17.09**

**Chikungunya Virus in the Americas: Impact on Tourism**

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In December 2013, the first case of locally transmitted Chikungunya virus (CHIKV) in the Americas occurred in St. Martin. The virus has since spread rapidly, with cases in most countries of the Western Hemisphere. Nearly a million cases have been reported to the Pan America Health Organization (PAHO). The Caribbean is the world’s most tourism-dependent region, and CHIKV outbreaks in other regions have caused dramatic losses in tourism revenue. We seek to estimate the impact of the CHIKV outbreak on international arrivals and tourism revenue in the Caribbean islands. Islands were categorized as severely afflicted, moderately afflicted, or minimally afflicted based on PAHO reports. Using public data, international arrivals will be assessed on an island-by-island basis, and compared to historical baselines. Correlation between the attack rates of CHIKV and changes in tourist arrivals will be assessed, and estimated economic impact will be calculated. Results and conclusions pending availability of 2014 data.

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**PO17.10**

**Molecular Survey of Head Louse *Pediculus humanus capitis* in Thailand and its Potential Role for Transmitting *Acinetobacter* spp.**

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Head lice infestation is spread throughout the world, the disease is caused by *Pediculus humanus capitis*. By the advent of molecular techniques, head lice have been classified into three clades. Recent reports demonstrated that pathogenic organisms could be found in head lice. However, information of head lice and its pathogenic bacteria in Thailand have never been investigated. In this study, we determined genetic diversity of head lice collected from various areas of Thailand and demonstrated the presence of *Acinetobacter* spp. in the head lice. Total DNA was extracted from 275 head louse samples which were collected from several geographic regions of Thailand. PCR was used to amplify the COI gene of head lice and for detection of *Bartonella* spp. and *Acinetobacter* spp.. The amplified PCR amplicons were cloned and sequenced. DNA sequences were analyzed by Neighbor-joining method using Kimura's 2-parameter model. Phylogenetic tree constructed base on COI gene revealed that head lice in Thailand were clearly classified into two clades (A and C). *Bartonella* spp. was not detected in all samples while *Acinetobacter* spp. were detected in 10 samples (3.6%) which consisted of *A. baumannii* (1.45 %), *A. radioresistens* (1.45 %), and *A. schindleri* (0.7%). Moreover, the relationship of *Acinetobacter* spp. and clade of head lice showed that *Acinetobacter* spp. was found both on clade A and C. Head lice in Thailand were classified into clade A and B based on the
COI gene sequences. Pathogenic *Acinetobacter* spp. was detected in both clades. Data obtained from the study may assist to develop effective strategies for head lice control in the future. Moreover, detection of pathogenic bacteria in the head lice could raise awareness of head louse as a source for nosocomial bacterial infection.

**PO17.11**

**ZIKKA Virus (ZIKV) Infection in an American Recreational Traveler**

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**Case report:** We report the case of a 48 year-old American traveler who presented to our clinic with diffuse rash, malaise, fatigue, fever, arthralgia, low back pain, and bilateral exudative conjunctivitis. (See photo) Prior to his acute illness he traveled to the highlands of Ecuador, Peru and Bolivia as well to urban areas of Chile, Easter Island, French Polynesia (Tahiti and Moorea) and Hawaii. Onset of symptoms began shortly after leaving French Polynesia where he reported numerous mosquito bites. The patient had an extensive vaccination history notable for prior receipt of yellow fever vaccine and extensive travel or residence in Dengue, Chikungunya and West Nile virus endemic areas. Laboratory findings were consistent with *Zika virus* (ZIKV) infection.

**Discussion:** ZIKV is considered an emerging arboviral disease because of its expanding geographic distribution. ZIKV outbreaks have been reported in tropical Africa, Southeast Asia and more recently in the Pacific Islands (1,2). Since late 2013, an epidemic of over 28,000 infected patients has been reported in French Polynesia, including popular vacation destinations of Tahiti and Bora Bora (2,3). *Zika virus* can be identified by PCR to detect ZIKV RNA in patient who present with exposure < 10 days prior by collecting acute-phase specimens. Convalescent specimens can be useful 5 days post-onset of fever by ELISA serology for the detection of specific IgM antibodies to ZIKV (4). Serological cross-reactivity with other flaviviruses is possible (3,4). In the absence of serologic confirmation, a clinical diagnosis is warranted. Our patient's clinical course was self-limiting and he recovered fully from the infection with no clinical sequelae. Recent cases of ZIKV-associated Guillain-Barré syndrome have been reported from the French Polynesian epidemic and illustrate the importance of accurate diagnosis and clinical follow-up (5).

**Conclusion:** Our report highlights the need to include *Zika virus* infection in the differential diagnosis of travelers with fever and rash returning from affected areas.
### [Acute and Convalescent Serologies]

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### References

Seasonal Active Surveillance of Dengue and Chikungunya Viruses-infected Aedes Mosquitoes in Dengue-endemic Provinces, Thailand

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Dengue and chikungunya are mosquito-borne diseases which *Aedes aegypti* and *Ae. albopictus* act as vectors. As known, these mosquitoes are climate-sensitive species and climate changes affect human health, especially the increasing spread of vector-borne diseases. Therefore, a number of actions for climate change mitigation and adaptation are required for prevention and control of the diseases emergence and to achieve in long term of health protection solutions. This study aimed to detect dengue and chikungunya viruses in *Ae. aegypti* and *Ae. albopictus* mosquitoes collected seasonally from dengue-endemic 8 provinces of Thailand for early warning system. Aedes mosquitoes were collected in 3 seasons of 4 northeast provinces from 2013 to 2014; Buri Ram (BRM), Khon Kaen (KKN), Nakhon Ratchasima (NMA), Roi Et (RET) and in 2 seasons of 4 southern provinces; Chumphon (CPN), Songkhla (SKA), Surat Thani (SNI) and Trang (TRG). The mosquitoes collected were detected for dengue and chikungunya viruses by one step real time RT-PCR technique. The infected mosquitoes were determined for infection rate which was expressed as percentage (%). In northeast provinces, dengue and chikungunya infection rates (%/%) of Aedes mosquitoes collected from BRM, KKN, NMA, and RET in winter were 0%/11.5%, 0%/3.7%, 2%/7.8%, 0%/2%, in hot season were 9.8%/0%, 0%/0%, 0%/0%, 0%/0% and in rainy season were 0%/1.7%, 1%/10.9%, 0%/8.3%, 0%/3.8%, respectively. In southern provinces, dengue and chikungunya infection rates of the mosquitoes (%/%) obtained from CPN, SKA, SNI and TRG in hot season were 1%/7%, 0%/20%, 1.7%/2%, 0%/6.3%, and in rainy season were 1%/1%, 0.9%/2%, 3.3%/0.7%, 7%/4%, respectively. In this study, the mosquitoes collected seasonally from the 8 provinces were infected with the viruses. However, the virus infection rates of the Aedes mosquitoes were generally decreased or constant after data on virus infection rates obtained were reported to the provincial public health offices, other relevant health offices and the homeowners for timely outbreak response. In a currently climatically changed world, active surveillance will need to be strengthened as the climatic change receptivity for prevention and control of the consequent mosquito-borne diseases.

Development of Lethal Ovitrap with Natural Attractants to Control DHF Vectors

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Ovitraps are artificial breeding containers attracting gravid female mosquitoes to lay eggs and they have been used for surveillance of dengue haemorrhagic fever (DHF) and chikungunya vectors for years; however, these ovitraps could be also modified as tools for integrated vector control. To obtain an effective lethal ovitrap, evaluations of attractants to *Aedes aegypti* (L.) and *Ae. albopictus* Skuse to ovitraps treated with larvicides were then carried out under laboratory and field conditions. To obtain candidate oviposition attractants, we used a water rinse of 3 mollusk species: blood cockle (*Anadara granosa*), carpet shell (*Paphia undulata*), sea mussel (*Mytilus smaragdinus*), and the giant tiger prawn (*Penaeus monodon*) compared with tap water. The rinse water of carpet shell and giant tiger prawn showed higher attractiveness for oviposition than the other candidate attractants. Regarding larvicidal
comparison, the mean number of eggs laid in ovitraps containing temephos and *Bacillus thuringiensis israelensis* (Bti) were significantly higher than those laid in ovitraps containing novaluron and untreated ovitraps. No ovicidal effect of the larvicides used in ovitraps was observed since hatching of eggs occurred; however, all larvae died eventually. Attempts have been also made to identify the most essential attractive parts of the rinse water of carpet shell and giant tiger prawn for further commercial synthetic attractants. In field experiments, evaluations of lethal ovitraps having rinse water of carpet shell and giant tiger prawn as attractants treated with temephos compared with the untreated ovitraps were carried out in rubber plantation habitats in Trang province, southern Thailand. There was no significant difference between the mean number of eggs laid in the lethal ovitraps and those laid in the untreated ovitraps. This clearly indicated that no repellent effect was observed in the lethal ovitraps. The lethal ovitrap obtained from this study could possibly be used as an effective, economical and simple mean of DHF vector control.