Retroviral Infections of the Nervous System in Peru

Joseph R. Zunt, MD, MPH
Silvia M. Montano, MD, MPH
Outline

• Epidemiology of HTLV-1 and -2 infections
• Etiology of encephalitis
• Supplemental funding projects
• Best practices in preparing for R01
  – Research methodology training
  – Building research capacity
HTLV-I Infection in high-risk groups, pregnant women and young adults

Key
Blue - men who have sex with men (MSM)
Red - female sex workers (FSW)
Green - pregnant women
Black - young adults

Alarcon JOV, Friedman HB, Montano SM, Zunt JR, Holmes KK, Quinnan GV. JAIDS 2006;42(5):604-9


HTLV-II Infection in MSM

2,703 Peruvian MSM:
-35 (1.3%) HTLV-II positive

Infection associated with:
- Older age
- Unprotected receptive anal intercourse
- Syphilis
- HSV-2 infection


HTLV Infection in FSW

PREVEN Network
- 4,325 FSW
- 24 Cities
- pop: 20,000+

Results:
- HTLV-I positive: 77 (1.8%)
- HTLV-II positive: 13 (0.3%)
- HTLV-I and -II: 10 (0.2%)
- Indeterminate: 7

Infections associated with:
- Older age
- Longer duration as FSW
- Jungle

HTLV in Indigenous Communities

- 638 subjects
- 27 villages; 10 ethnic groups

Results
12 (1.9%) HTLV-1 positive
6 (0.9%) HTLV-2 positive

Infection associated with:
- living in villages farther from port city
- Shipibo-Konibo ethnicity
- No association with age, gender or sexual experience

Surveillance for Infectious Causes of Encephalitis in Perú
Meningoencephalitis Surveillance in Peru

Objectives:

● Determine infectious etiologies of encephalitis in Peru

● Describe risk factors and clinical presentation for encephalitis

● Enhance laboratory capacity for assessment and treatment of patients with CNS infection
### Table 2. Possible etiologic agents of encephalitis based on epidemiology and risk factors.

<table>
<thead>
<tr>
<th>Epidemiology or risk factor</th>
<th>Possible infectious agent(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agammaglobulinemia</strong></td>
<td>Enteroviruses, <em>Mycoplasma pneumoniae</em></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>Herpes simplex type 2, cytomegalovirus, rubella virus, <em>Listeria monocytogenes</em>, <em>Treponema pallidum</em>, <em>Toxoplasma gondii</em></td>
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<tr>
<td><strong>Neonates</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>Murray Valley encephalitis virus</em> (rare in infants), <em>influenza virus</em>, <em>La Crosse virus</em></td>
</tr>
<tr>
<td><strong>Infants and children</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>Murray Valley encephalitis virus</em> (rare in infants), <em>influenza virus</em>, <em>La Crosse virus</em></td>
</tr>
<tr>
<td><strong>Elderly persons</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>St. Louis encephalitis virus</em>, <em>West Nile virus</em>, <em>sporadic CJD</em>, <em>L. monocytogenes</em></td>
</tr>
<tr>
<td><strong>Animal contact</strong></td>
<td>Rabies virus, <em>Nipah virus</em></td>
</tr>
<tr>
<td><strong>Bats</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>Murray Valley encephalitis virus</em> (rare in infants), <em>influenza virus</em>, <em>La Crosse virus</em></td>
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<td><strong>Birds</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>Murray Valley encephalitis virus</em>, <em>influenza virus</em>, <em>La Crosse virus</em></td>
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<td><strong>Cats</strong></td>
<td>Rabies virus, <em>Coxiella burnetii</em>, <em>Bartonella henselae</em>, <em>T. gondii</em></td>
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<tr>
<td><strong>Dogs</strong></td>
<td>Rabies virus</td>
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<tr>
<td><strong>Horses</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>St. Louis encephalitis virus</em>, <em>Hendra virus</em></td>
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<tr>
<td><strong>Old World primates</strong></td>
<td><em>B virus</em></td>
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<tr>
<td><strong>Racoons</strong></td>
<td>Rabies virus, <em>Baylisascaris procyonis</em></td>
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<tr>
<td><strong>Rodents</strong></td>
<td><em>Herpes simplex encephalitis virus</em> (South America), <em>Japanese encephalitis virus</em>, <em>tickborne encephalitis virus</em>, <em>Powassan virus</em> (woodchucks), <em>La Crosse virus</em> (chipmunks and squirrels), <em>Bartonella quintana</em></td>
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<tr>
<td><strong>Sheep and goats</strong></td>
<td><em>C. burnetii</em></td>
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<tr>
<td><strong>Skunks</strong></td>
<td>Rabies virus</td>
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<td><strong>Swine</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Nipah virus</em></td>
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<td><strong>White-tailed deer</strong></td>
<td><em>Borrelia burgdorferi</em></td>
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<td><strong>Immunocompromised persons</strong></td>
<td><em>Varicella zoster virus</em>, <em>cytomegalovirus</em>, <em>human herpesvirus 6</em>, <em>West Nile virus</em>, <em>HIV</em>, <em>JC virus</em>, <em>L. monocytogenes</em>, <em>Mycoplasma tuberculosis</em>, <em>C. neoformans</em>, <em>Coccidioides species</em>, <em>Histoplasma capsulatum</em>, <em>T. gondii</em></td>
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<tr>
<td><strong>Ingestion items</strong></td>
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<tr>
<td><strong>Raw or partially cooked meat</strong></td>
<td><em>T. gondii</em></td>
</tr>
<tr>
<td><strong>Raw meat, fish, or reptiles</strong></td>
<td><em>Gnathanostoma species</em></td>
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<tr>
<td><strong>Unpasteurized milk</strong></td>
<td><em>Tickborne encephalitis virus</em>, <em>L. monocytogenes</em>, <em>C. burnetii</em></td>
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<tr>
<td><strong>Mosquitoes</strong></td>
<td><em>Herpes simplex encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>Murray Valley encephalitis virus</em>, <em>tickborne encephalitis virus</em>, <em>Powassan virus</em> (woodchucks), <em>La Crosse virus</em> (chipmunks and squirrels), <em>Bartonella quintana</em></td>
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<td><strong>Ticks</strong></td>
<td><em>Bartonella bacilliformis</em>, <em>Rickettsia rickettsii</em>, <em>Ehrlichia chaffeensis</em>, <em>Anaplasma phagocytophilum</em>, <em>C. burnetii</em> (rare), <em>B. burgdorferi</em></td>
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<tr>
<td><strong>Tssete flies</strong></td>
<td><em>Trypanosoma brucei gambiense</em>, <em>Trypanosoma brucei rhodesiense</em></td>
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<tr>
<td><strong>Occupation</strong></td>
<td>Rabies virus, <em>C. burnetii</em>, <em>Bartonella species</em></td>
</tr>
<tr>
<td><strong>Exposure to animals</strong></td>
<td>Rabies virus</td>
</tr>
<tr>
<td><strong>Exposure to horses</strong></td>
<td><em>Hendra virus</em></td>
</tr>
<tr>
<td><strong>Exposure to Old World primates</strong></td>
<td><em>B virus</em></td>
</tr>
<tr>
<td><strong>Recent vaccination</strong></td>
<td><em>Acute disseminated encephalomyelitis</em></td>
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<tr>
<td><strong>Recreational activities</strong></td>
<td><em>All agents transmitted by mosquitoes and ticks (see above)</em></td>
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<tr>
<td><strong>Camping/hunting</strong></td>
<td><em>HIV</em>, <em>T. pallidum</em></td>
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<tr>
<td><strong>Sexual contact</strong></td>
<td><em>Reabies virus</em>, <em>H. capsulatum</em></td>
</tr>
<tr>
<td><strong>Spelunking</strong></td>
<td><em>Enteroviruses</em>, <em>Naegleria fowleri</em></td>
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<tr>
<td><strong>Swimming</strong></td>
<td><em>All agents transmitted by mosquitoes and ticks (see above)</em></td>
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<td><strong>Seasone</strong></td>
<td><em>influenza virus</em></td>
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<tr>
<td><strong>Transfusion and transplantation</strong></td>
<td><em>Cytomegalovirus</em>, <em>Epstein-Barr virus</em>, <em>West Nile virus</em>, <em>HIV</em>, <em>tickborne encephalitis virus</em>, <em>rabies virus</em>, <em>iatrogenic CJD</em>, <em>T. pallidum</em>, <em>A. phagocytophilum</em>, <em>R. rickettsii</em>, <em>C. neoformans</em>, <em>Coccidioides species</em>, <em>Histoplasma capsulatum</em>, <em>T. gondii</em></td>
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<tr>
<td><strong>Travel</strong></td>
<td><em>All agents transmitted by mosquitoes and ticks (see above)</em></td>
</tr>
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<td><strong>Africa</strong></td>
<td><em>Rabies virus</em>, <em>West Nile virus</em>, <em>P. falciparum</em>, <em>T. brucei gambiense</em>, <em>T. brucei rhodesiense</em></td>
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<td><strong>Australia</strong></td>
<td><em>Murray Valley encephalitis virus</em>, <em>Japanese encephalitis virus</em>, <em>Hendra virus</em></td>
</tr>
<tr>
<td><strong>Central America</strong></td>
<td><em>Rabies virus</em>, <em>Eastern equine encephalitis virus</em>, <em>Western equine encephalitis virus</em>, <em>Venezuelan equine encephalitis virus</em>, <em>St. Louis encephalitis virus</em>, <em>R. rickettsii</em>, <em>P. falciparum</em>, <em>T. brucei</em></td>
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<td><strong>Europe</strong></td>
<td><em>West Nile virus</em>, <em>tickborne encephalitis virus</em>, <em>A. phagocytophilum</em>, <em>B. burgdorferi</em></td>
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<td><strong>India, Nepal</strong></td>
<td><em>Rabies virus</em>, <em>Japanese encephalitis virus</em>, <em>P. falciparum</em></td>
</tr>
<tr>
<td><strong>Middle East</strong></td>
<td><em>West Nile virus</em>, <em>P. falciparum</em></td>
</tr>
<tr>
<td><strong>Russia</strong></td>
<td><em>Tickborne encephalitis virus</em></td>
</tr>
<tr>
<td><strong>South America</strong></td>
<td><em>Rabies virus</em>, <em>Eastern equine encephalitis virus</em>, <em>Western equine encephalitis virus</em>, <em>Venezuelan equine encephalitis virus</em>, <em>St. Louis encephalitis virus</em>, <em>R. rickettsii</em>, <em>B. bacilliformis</em> (Andes mountains), <em>P. falciparum</em>, <em>T. solium</em></td>
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<td><strong>Southeast Asia, China, Pacific Rim</strong></td>
<td><em>Japanese encephalitis virus</em>, <em>tickborne encephalitis virus</em>, <em>Nipah virus</em>, <em>P. falciparum</em>, <em>Gnathanostoma species</em>, <em>T. solium</em></td>
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<tr>
<td><strong>Unvaccinated status</strong></td>
<td><em>Varicella zoster virus</em>, <em>Japanese encephalitis virus</em>, <em>poliovirus</em>, <em>measles virus</em>, <em>mumps virus</em>, <em>rubella virus</em></td>
</tr>
</tbody>
</table>
Results

Total subjects enrolled 586
Etiologies Identified

- Desconocida: 407 cases
- Herpes - confirmed: 92 cases
- Herpes - possible: 24 cases
- Tuberculosis - probable: 15 cases
- Bacterial Meningitis: 9 cases
- Coxsackie: 6 cases
- Enterovirus: 6 cases
- Cryptococcus: 4 cases
- Neurotoxoplasmosis: 3 cases
- Cryptococcus, Tuberculosis - probable: 3 cases
- Cryptococcus, Herpes - confirmed: 3 cases
- Adenovirus: 1 case
- Cryptococcus, Tuberculosis - suspected: 1 case
- Herpes - probable, Coxsackie: 1 case
- Tuberculosis - confirmed: 1 case
- Tuberculosis - confirmed, Enterovirus: 1 case
- Tuberculosis - suspected: 1 case
- Tuberculosis - suspected, Enterovirus: 1 case
- Neurosyphilis: 1 case
- Tuberculosis - probable, Enterovirus: 1 case
- Cryptococcus, Herpes - possible: 1 case
**Clinical case definition of acute encephalitis:**

Any person, of any age, admitted to hospital with encephalopathy (altered level of consciousness persisting for >24 hours and including lethargy, irritability or a change in personality and behavior) with ≥2 of following:

- Fever or history of fever (≥38°C)
- Seizures and/or focal neurological findings
- Cerebrospinal fluid pleocytosis (>5 WBC/ml)

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**CSF Evidence**

<table>
<thead>
<tr>
<th>Yes</th>
<th>N=221</th>
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</table>

<table>
<thead>
<tr>
<th>Positive</th>
<th>N = 42</th>
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</thead>
</table>

**42 CONFIRMED HSV CASES**

- 31 HSV-1
- 4 HSV-2
- 7 inconclusive on HSV type

**Negative or inconclusive CSF results**

| N=179 |

**IgG positive in acute samples or IgM positive in acute samples for infants**

| Positive | N = 24 |

**24 PROBABLE HSV CASES**

- 22 HSV-1
- 2 HSV-2

**Negative or inconclusive CSF results**

| N=155 |

**IgM positive**

| Positive | N = 2 |

**2 PROBABLE HSV CASES**

- 2 HSV-1
- 0 HSV-2

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*positive for HSV by PCR
Summary of Findings - Herpes

- HSV responsible for 20% of encephalitis in Peru
- Patients with HSV encephalitis had more nausea, cranial nerve disorder, and genital discharge
- HSV-2 was responsible for 9% of confirmed and probable HSV infections
- Patients with HSV-2 were younger and more likely to be from Lima/Iquitos
Expansion of the Network

• Laboratory proficiency testing:
  – ensures laboratory assays performed correctly
  – promotes development of capacity at new sites
• Addition of new study sites:
  – study personnel visit to explain study and answer questions
  – IRB modifications required for each site addition
• Nested studies:
  – provide opportunities for trainees and young investigators
Supplemental Funding

- R03 Supplement: HPV and HTLV Infection in Female Sex Workers in Peru
- Supplements to train neurologists in Fogarty International Scholars Program
- Supplement “Cerebrovascular Disease in Peru”
- R25 grant: Global Health Fellows Consortium
- Application: Peruvian Cerebrovascular Diseases Research Training Program (NCD Lifespan)
- Application: IRIDA: Tuberculous Meningitis in Peru
HTLV and HPV


Fogarty International Scholars and Fellows

**Scholars:**
- Peggy Martinez: neuropathy in HIV-infected children
- Yesenia Nuñez: neuropathy and cognitive impairment in HIV-infected men with and without HTLV coinfection
- Marie Wang: IRIS in HIV-infected children
- Nicanor Mori: neurologic manifestations of HTLV-2 infection in indigenous community, meningoencephalitis
- Christina Chao: otologic manifestations in HIV-infected children

**Fellows:**
- Magaly Blas: HPV infection in indigenous women with and without HTLV
- Peggy Martinez: prevalence of cognitive disorders in HIV-infected children


Cerebrovascular diseases in Peru


## 2011 Stroke epidemiology Course in Tumbes, Peru: Proposed Curriculum

<table>
<thead>
<tr>
<th>Time</th>
<th>Day 1* February 28 Monday</th>
<th>Day 2 March 1 Tuesday</th>
<th>Day 3 March 2 Wednesday</th>
<th>Day 4 March 3 Thursday</th>
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</thead>
<tbody>
<tr>
<td>8AM</td>
<td>Intro to course <em>Montano, Zunt</em></td>
<td>A Review of Stroke Pathophysiology <em>Tirschwell</em></td>
<td>Developing a research protocol (problems &amp; solutions) <em>Alarcon</em></td>
<td>Development of Standardized Database: Data Elements for Stroke Research <em>Input from Participants</em></td>
</tr>
<tr>
<td></td>
<td>Stroke in Peru: Report from Lima <em>Abanto, Quispe</em></td>
<td>Study design: epidemiology &amp; biostats <em>Alarcon</em></td>
<td>Population-based study designs <em>Fitzpatrick</em></td>
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<tr>
<td>9:45AM</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
<td>11:00 Leave Punta Sal Lunch in Tumbes Fieldwork site visit Tumbes <em>(led by Garcia)</em></td>
</tr>
<tr>
<td></td>
<td>Stroke in Peru: Report from Iquitos <em>Donayre</em></td>
<td>Developing Questionnaires <em>Fitzpatrick</em></td>
<td>Population-based studies in Atahualpa <em>del Brutto</em></td>
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<tr>
<td>12PM</td>
<td>Lunch</td>
<td>Lunch</td>
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<tr>
<td>4PM</td>
<td>Studies of Stroke Surveillance in the US <em>Fitzpatrick</em></td>
<td>Interactive session: Excel &amp; Stata for Management/Analysis <em>Ton</em></td>
<td>Standards of Care for Acute Stroke: “Get with the Guidelines” <em>Tirschwell</em></td>
<td></td>
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<tr>
<td>5PM</td>
<td>Practical Tips in Data Management <em>Ton</em></td>
<td></td>
<td>Linking stroke care to stroke research <em>Tirschwell</em></td>
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</tbody>
</table>
INTERNATIONAL INSTITUTIONAL PARTNER DIRECTORS

• China: Yangfeng Wu, MD, PhD
• Ghana: Peter Donkor, BDS, MS, MDSc.
• Kenya: John Kinuthia, MBCHB, Mmed, MPH
• Peru: Silvia M. Montano, MD, MPH
• Thailand: Jintanat Ananworanich, MD, PhD
• Uganda: Sarah Kiguli, MBChB, Mmed
<table>
<thead>
<tr>
<th>University</th>
<th>Scholars</th>
<th>Fellows</th>
<th>Country</th>
<th>US Mentor(s)</th>
<th>Site Mentor(s)</th>
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<tbody>
<tr>
<td>Hawaii</td>
<td>Nitiya Chomchey*</td>
<td>Nittaya Phanuphak</td>
<td>Thailand</td>
<td>Vivek Nerurkar, Cecilia Shikuma</td>
<td>Jintanat Ananworanich, Jantatrakul Chongsri</td>
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<td>Hawaii</td>
<td>Ching-Ping Lin</td>
<td></td>
<td>China</td>
<td>Kai Zheng, Amy Huang, Joseph Kolars</td>
<td>Yangfeng Wu, Yanfang Wang</td>
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<td>Michigan</td>
<td>Xiuying Zhang*</td>
<td>Constance Opoku*</td>
<td>Ghana</td>
<td>Elizabeth Speliotes, Amy Huang, Joseph Kolars</td>
<td>Lioung Ji, Yanfang Wang</td>
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<td>Michigan</td>
<td>Nauzley Abedini</td>
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<td>Ghana</td>
<td>Cheryl Moyer, Katherine Gold, Joseph Kolars</td>
<td>Richard Adanu, Pamela Martey, Gyikua Plange-Rhule</td>
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<td>Minnesota</td>
<td>Lindsey Law</td>
<td></td>
<td>Uganda</td>
<td>Chandy John, Sarah Cusick</td>
<td>Robert Opoka, Paul Bangirana</td>
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<tr>
<td>Minnesota</td>
<td>Sylvia Wanzala*</td>
<td></td>
<td>Uganda</td>
<td>Katey Pelican, Dominic Travis</td>
<td>Jessica Nakavuma</td>
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<td>Uganda</td>
<td>Chandy John, Gregory Park</td>
<td>Moses Joloba, Robert Opoka</td>
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<td>Abdu Musubire*</td>
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<td>Uganda</td>
<td>David Boulware, Paul Bohjanen</td>
<td>Andrew Kambugu, Elly Katabira</td>
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<td>Minnesota</td>
<td>Bartholomew Ondingo*</td>
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<td>Kenya</td>
<td>Chandy John, Gregory Park</td>
<td>Ayub Ofulla, George Ayodo</td>
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<td>Washington</td>
<td>Rose Bosire*</td>
<td></td>
<td>Kenya</td>
<td>Carey Farquhar, Grace John-Stewart</td>
<td>Ruth Nduati</td>
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<tr>
<td>Washington</td>
<td>Mario Cornejo*</td>
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<td>Peru</td>
<td>Cyrus Zabetian, Timothy O’Connor</td>
<td>Pilar Mazzetti, Silvia Montano</td>
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<tr>
<td>Washington</td>
<td>Jaime Soria*</td>
<td></td>
<td>Peru</td>
<td>Joseph Zunt**, Tom Hawn</td>
<td>Eduardo Ticona, Silvia Montano</td>
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</table>
Global Health Fellows in Peru

- **Jaime Soria**
  - Tuberculosis Meningitis in HIV infected and Non-infected Patients: Diagnostic and Prognostic Factors

- **Mario Cornejo**

- **Segundo Leon**
  - Implementation of the genotypic resistance testing using oligonucleotide ligation assay (OLA) in Lima, Peru.
Best Practices in Preparing for the R01

- Expand on R21 pilot projects
- Survey neurologists regarding perceived research and training needs
- Sponsor IRB site visits to enhance responsible conduct of research
- Sponsor workshops regarding neurologic conditions and research methodology
- Develop a sustainable clinical and epidemiologic research and training program (with mentors) for neuroscientists.
- Assess and enhance research training infrastructure
- Strengthen collaborative relationships between U.S. and international institutions
- Build a website with educational resources (basic epidemiology, research methodology, responsible conduct of research)
Survey of Neurologists

15,616 physicians in Peru (2004)  
258 (1.7%) registered as specialist in neurology

Neurologists in Peru (n=254)

Navarro-Chumbes GC, Zunt JR, Montano SM, Díaz-Vásquez M.  
Responsible Conduct of Research

- **Bioethics training in clinical research:**
  - 2005 conference for 190 people in Lima and 90 in Iquitos
  - 2007 conference for 300 in Lima and 80 in Arequipa
- **Mentor Training Conference: Feb 2010:**
  - Brain Disorders
  - ICOHRTA-AIDS/TB
  - AIRTP-Peru
  - AIRTP-UW
  - CFAR-UW
  - Bioinformatics (Quipu)
  - FICRS/F – UW and JHU
  - Audience: Fogarty Scholars and Fellows, Peruvian trainees of NIH-funded training programs, mentors from 10 South American countries (CTU network)


Building Research Capacity: Training Peruvian Neurologists

NIH Fogarty Scholars
Marizabel Rozas
Peggy Martinez
Antero Peralta
Carlos Abanto
Yesenia Nuñez
Nicanor Mori
Mario Cornejo
Luzma Moyano
MPH (in Peru)
Guillermo Donayre
Genaro Ipanaque
Yrma Quispe
Yesenia Nuñez
Carlos Abanto
Isidro Gonzalez
Nicanor Mori
Martha Calderón

Epi Training at UW
Yrma Quispe
Marizabel Rozas
Nicanor Mori
Patricia Gutierrez
Erik Guevara
Mario Cornejo
Maria Aguilar
Cayetano Heredia
San Marcos
Silvia Montano

INCN
National Reference Center
For Neurologic Diseases

NAMRU-6
"Streptomycin"
Mentoring: Training the next generation

Building Research Infrastructure
Universidad Nacional Mayor de San Marcos
Building Capacity: Sustainability

- Memorandums of Understanding
  - Resident exchange
  - Medium term training
  - Access to UW electronic journals (14,000 journals)

- Electronic classroom at UNMSM
  - Site for training MPH students
  - Site for training public health officers from entire country
  - Distance education modules in research methodology, biostatistics
# Difficulty Transferring Funds

## Part I

### 1. NAME (last or family, first, and middle)
- Zunt, Joseph Raymond

### 2. IDENTIFICATION NO. (See instructions)
- 474-86-8359

### 3. DATE OF BIRTH (Month/Day/Year)
- 07/08/1963

### 4. PERMANENT ADDRESS IN UNITED STATES OR ABROAD
- 5246 Seward Park Ave S

### 5. YOUR COUNTRY OF CITIZENSHIP
- USA

### 6. ADDRESS WHILE IN THE UNITED STATES
- 5246 Seward Park Ave S

### 7. PASSPORT NO. & 0
- 07580730

### 8. PLACE UNITED STATES VISA WAS ISSUED
- A

### 9. U.S. VISA DATE (MM/DD/YY)
- 05/12/2012

### 10. IMMIGRATION ALIEN
- A

### 11. IF CURRENCY OR MONETARY INSTRUMENT IS ACCOMPANYING A PERSON, COMPLETE 11A OR 11B

### 12. A. EXPORTED FROM THE UNITED STATES
- No

### 13. B. IMPORTED INTO THE UNITED STATES
- No

### 14. DATED PERMITTED TO ENTER U.S.
- 05/12/2012

### 15. PLACE OF DEPARTURE
- Houston, Texas

### 16. PLACE OF ARRIVAL
- Lima, Peru

### 17. RECEIVED FROM (Name and Address)
- Zunt, Joseph Raymond

## Part II

### A. IDENTIFICACION DEL VIAJERO o JEFÉ DE FAMILIA

#### Nombres (s) y Apellidos:
- JOSEPH RAYMOND ZUNT

#### Pasaporte/DNI/Cart. N°:
- 476760796

#### Nacionalidad:
- EEUU

#### Dirección en Perú (Calle/distrito/provincia):
- MONREAL MIRAFLORES

#### Dirección en país de residencia:
- 5246 Seward Park Ave S, Seattle, WA 98118

#### Cta. transportadora/ N° Vuelo/Nombre nave/ N° Matrícula:
- CO 1950

#### N° miembros de familia que viajan con Ud.:
- 0

#### N° de Bultos:
- 1

## Part III

### 1. TOTAL AMOUNT OF CURRENCY/MONETARY INSTRUMENTS

#### Currency and Cents
- $ 20,000

### 3. FUE OTRO QUE US

#### CURRENCY NAME

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**DECLARACION JURADA DE EQUIPAJE**

Bienvenidos al Perú

Decreto Supremo N° 016-2006-EF
Next Steps

- Expand collaborative partnerships
  - Develop research and training hubs
- Enhance research and training infrastructure
- Activate Uworld Peru
  - Increase efficiency of funds transfer
  - Improve hiring, supervision
Building Capacity

• Improved infrastructure:
  – Development of CSF reference laboratory at INCN
  – Development of internet-based NetLab system for CSF results

• Training opportunities:
  – FICRS/F, Fulbright/Fogarty, Global Fellows and Scholars
  – ethical conduct of human subjects research

• Increased research capacity:
  – two-week research methodology course developed jointly by Peruvian and U.S. collaborators via Adobe Connect
  – workshop on cerebrovascular diseases research methodology
Thank You

- Universidad Nacional Mayor de San Marcos
- Universidad Peruana Cayetano Heredia
- IMPACTA/INMENSA
- Peruvian Ministry of Health
  - CERETS Iquitos
  - CERETS “Alberto Barton” del Callao
- Dirección General de Epidemiología
- U.S. Naval Medical Research Center Detachment
- Wellcome Trust
- NIH/NINDS/Fogarty International Center

Pablo Campos, MD, MPH  Luis Suarez, MD
Patricia Garcia, MD, MPH  Claudia Buendia, MD
Silvia Montano, MD, MPH  Pilar Jarama, MD
Gloria Chauca, MS  King Holmes, MD, PhD
Merly Sovero, MS  Manuel Villaran, MD, MPH
Jorge Sanchez, MD, MPH  Josefina Garcia, PhD
Meningoencephalitis in Peru
Working Group

• Dr. Joseph R. Zunt (UW)
• Dra. Silvia Montano (NAMRU-6)
• Dr. Nicanor Mori (UW/NAMRU-6)
• Dra. Christina Nelson (UW/NAMRU-6)
• Dr. Drake Tilley (NAMRU-6)
• Dr. Matthew Kasper (NAMRU-6)
• Lab. Tec. Ada Romero (NAMRU-6)
• Lab. Tec. Nilda Gadea (NAMRU-6)
• Dr. Eduardo Ticona (H2M)
• Dr. Jaime Soria (H2M)
• Dra. Violeta Celis (HBT)
• Dr. Firdusi Pereda (HBT)
• Dr. Simeón Ugaz (HBT)
• Dr. Grimaldo Ramirez (HEP)
• Dra. Isabel Reyes (HEP)
• Dra. Juana Antigoni (HNERM)
• Dr. David Huanca (HNERM)
• Dr. Eduardo Sánchez (HHU)

× Dr. Enrique Vasquez (HHU)
× Dra. Pamela Muñoz (HHU)
× Dra. Maria Leyva (HMA)
× Dra. Alda Rivara (HNERM)
× Dr. Armin Delgado (HNERM)
× Dr. Roberto Romero (HNDAC)
× Dr. Jaime Tam (HNDAC)
× Dr. Moises Sihuincha (HAI)
× Dr. Guillermo Donayre (HRI)
× Dr. Juan Celis (HRI)
× Dra. Maria Rivas (HSB)
× Dra. Maria Stiglich (HSB)
× Dr. Martin Tipismana (HCH)
× Dr. Iván Espinoza (HCH)
× Dra. Marizabel Rozas (HRC)
× Dr. Jorge Galdos (HRC)
× Dr. Antero Peralta (HCAS)