Animal Influenza Surveillance: Strengthening Activities in Latin America

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Not Limited to H5N1 and H7N9…
Not Just Avian Influenza! Swine Influenza

Nat Commun 2015
Influenza in Animals and Birds in Latin America?
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Updated 3/2014
Avian Surveillance Locations

Swine Surveillance Locations

AFRICA

USA

Colombia

Chile

China

Hong Kong SAR

Vietnam
Why Colombia and Chile?

South American Surveillance

Original Goal: to determine the prevalence and diversity of influenza viruses in Colombia and Chile. Initiated 2010 and 2015 respectively.

Locations: 4 Colombian sites (Santa Marta, Medellin, Bogota, Los Llanos). 15 Chilean sites around Santiago.

Species: Wildbirds (environmental samples), swine, domestic birds (live animal markets, backyard, industry, captive). Have done equine, canine, exotics, anything that moves…
Risk Assessment Pipeline at St Jude

Risk to humans
- H5, H7, H2
- Antigenically novel H1 or H3

Risk to specific group
- Poultry – H5, H7 and spill over events
- Swine – novel virus

- Molecular determinants of virulence (full genome)
- Receptor binding specificity
- Growth in primary human (swine) respiratory cells
- Antiviral susceptibility
- Pathogenesis in mice, chickens, swine, ferrets
- Transmission in ferrets
- Population-wide immunity

Algorithm to predict risk
(CDC IRAT)
Influenza In Colombia?

- Is there influenza virus?
- If yes,
  - Species?
  - Prevalence?
  - Diversity?
  - Source?
  - Epi/ecology?
  - Co-infections?
  - Risk?

Collaborators: Facultad de University of Wisconsin Veterinary School (US), Medicina Veterinaria y Zootecnia, Universidad de los Llanos, Villavicencio, Salud Tropical, Universidad de Antioquia
Avian Influenza In Colombia?
Limited but…

LBM H11

<table>
<thead>
<tr>
<th>Table 1 Prevalence of influenza viruses by species as determined by RT-qPCR</th>
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<tbody>
<tr>
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<tr>
<td>Order Anseriformes</td>
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<tr>
<td>Domestic goose (<em>Anser anser domesticus</em>)</td>
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<tr>
<td>Domestic duck (<em>Anas platyrhynchos domesticus</em>)</td>
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<tr>
<td>Order Galliformes</td>
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<td>Common quail (<em>Coturnix coturnix</em>)</td>
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<td>Indian peafowl (<em>Pavo cristatus</em>)</td>
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<td>Common pheasant (<em>Phasianus colchicus</em>)</td>
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<td>Helmeted guineafowl (<em>Numida meleagris</em>)</td>
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<td>Japanese quail (<em>Coturnix japonica</em>)</td>
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<td>Turkey (<em>Meleagris gallopavo</em>)</td>
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<td>Domestic chicken (<em>Gallus gallus domesticus</em>)</td>
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<td>Unknown (environmental)</td>
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<td>Total</td>
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</table>
Influenza In Colombia

Yes

SWINE
Primarily pdm H1N1 Until Recently...

2015 classical Swine H1

H3N2 Humano y porcino

pdm H1N1

H1N1
What About Chile?

**Goal:** to determine the prevalence and diversity of influenza viruses in Chile. 2013 – 2014 quarterly. 2015 – present monthly

**Locations:** Risk-based surveillance. 15 sites Santiago. Expanding to Arica and Punta Arenas

**Species:** *Focus wild birds and BPS*

**Results to date:**
128 isolates!
Many more sequences

Yellow-billed teal
Stilt
Gulls
Avian Influenza in Chile!
### Chilean AIV are Reassortants

<table>
<thead>
<tr>
<th>Virus</th>
<th>Subtype</th>
<th>PB2</th>
<th>PB1</th>
<th>HA</th>
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Red, North American avian; blue, South American avian; gray, Eurasian; yellow, equine. Alleles for the NS gene indicated as “A” or “B”.
AIV Latitudinal Segment diversity (SA vs NA)

- 0% SA (0/16) (COL)
- 0% SA (0/16) (BR)
- 1.3% SA (3/232) (PE)
- 62.5% SA (5/8) (BOL)
- 55% SA (11/20) (CHI)
- 76.7% SA (43/56) (ARG)
- 73.7% SA (101/137) (CHI)
- 77.7% SA (7/9) (CHI)
- 100% SA (8/8) (ARG)
“High Risk” Subtypes and Spill-Over Events

1. H2, H5, H7, H9 – Mammalian risk = low
   Ferret antisera

2. Spill over BPS
   H7N6 outbreak
SIV in Chilean Swine in BPS?

Unique H1N2

HA – human seasonal H1 1980s
NA – human seasonal N2 early 90s
Internal - pandemic

Bravo-Vasquez N. et al
EID. 2017 Feb;23(2):241-251.
Table. Antigenic characteristics of swine influenza virus (H1N2) from Chile and control viruses *

<table>
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<th>Virus</th>
<th>Subtype</th>
<th>Major clade</th>
<th>Subclade</th>
<th>Mem/87</th>
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<td>δ</td>
<td>640</td>
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<td>160</td>
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</table>


Bravo-Vasquez N. et al
EID. 2017 Feb;23(2):241-25
What’s Next?
Animal-Human Interface
Colombian AHI Studies

Seroepi Disease surveillance
Conclusions

- AIV and SIV are present in South America
- Diversity and prevalence
- Linking AIV in the Americas
- Spill-over events
- SA swine?
- AHI
  - LOTS OF OPPORTUNITIES for collaborations
  - Expand within South America
  - TRAINING
  - CAPACITY BUILDING
Nicolas Bravo  
Sean Cherry  
Val Cortez  
Pam Freiden  
Ginna Hargest  
Rebekah Honce  
Pedro Jimenez  
Cydne Johnson  
Erik Karlsson  
Brandi Livingston  
Victoria Meliopoulos  
Bridgett Sharp

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Jorge Osorio  
Karl Ciuoderis  
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