Psittacosis Infection from Feral Populations of Rosy Faced Love Birds, Maricopa County, Arizona, 2013

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Objectives

- Psittacosis in humans
- Chlamydirosis in birds
- Rosy Faced Love Birds overview
- Tracking an invasive avian species
- Bird die-off investigation
- Human case investigation
- Next Steps
Background

- **Chlamydophila (Chlamydia) psittaci**
  - Gram negative, coccoid, obligate intracellular bacterium
  - Reservoir: birds
  - Avian Chlamydiosis in birds
  - A.k.a. ‘Ornithosis’ & ‘Parrot Fever’
  - Zoonotic agent → human causes ‘Psittacosis’
    - Infection is acquired by inhaling dried droppings or secretions from infected birds.
    - The incubation period is 5 to 19 days, up to 4 weeks
    - Pet birds and poultry are most frequently involved in transmission to humans
    - Avg ≤50 human cases/year in U.S.
Psittacosis in Humans

At risk are:
- Bird owners
- Pet shop employees
- Zoo staff
- Poultry workers
- Veterinarians
- Slaughterhouse workers

More Susceptible are:
- Weakened immune system
- Elderly
- Organ transplant patients
- HIV/AIDS
Psittacosis in Humans

Common Symptoms
- Fever & chills
- Headache
- Dry cough
- Myalgia
- Weakness/Fatigue
- Rash
- Upper or lower respiratory illness
- N/V/D sometimes

Lab Findings
- Thrombocytopenia
- Leukopenia
- Moderately elevated liver enzymes
Psittacosis in Humans

- Psittacosis should be suspected in patients with compatible sx after exposure to birds and/or droppings.
- Serologic testing is most commonly used. Note: serologic testing is cross reactive w/ other *Chlamydia*, including *C. pneumoniae* & *C. trachomatis*.
- Chest X-ray may show pneumonia.
- Treatment: tetracycline / doxycycline.
Prevention

- Most human infections are acquired from indoor pet birds
- Clean-up of droppings frequently to prevent accumulations
- Use wet disinfection methods
- Use PPE if aerosolization is unavoidable
- Take sick pet birds to DVM for dx & rx
- Don’t kiss your parrot!
- For wild birds – do not concentrate birds around feeders. Disperse the seed to disperse the birds to minimize transmission, or, don’t feed them.
Avian Chlamydiosis

Infections in birds:
- Chronic infection w/ intermittent shedding
- Infections can be subclinical
- Clinical disease may occur/increase during times of stress
- Sx: poor appetite, ruffled feathers, discharge from eyes & nose, diarrhea, death
Chlamydia infections in birds occur worldwide and infect a wide variety of species. Different serovars have been isolated from different bird groups. Different serovars show differences in virulence among different hosts.

<table>
<thead>
<tr>
<th>Serovar</th>
<th>Bird Source</th>
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<tbody>
<tr>
<td>A</td>
<td>Parrot Order</td>
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<tr>
<td>B</td>
<td>Pigeons, Turkeys</td>
</tr>
<tr>
<td>C</td>
<td>Ducks, Swans, Geese</td>
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<tr>
<td>D</td>
<td>Turkeys, Egrets</td>
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<tr>
<td>E</td>
<td>Pigeons, Ratites, Turkeys</td>
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<tr>
<td>F</td>
<td>Parakeets</td>
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<tr>
<td>G</td>
<td>New Serovar ? Raptors</td>
</tr>
<tr>
<td>WC</td>
<td>Bovine (Mammal)</td>
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<tr>
<td>M56</td>
<td>Muskrat, Snowshoe Hare</td>
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Rosy Faced Love Birds

- **Species**: *Agapornis rosiecollis*
- **A.k.a.**: *Peach faced love birds*
- **Small colorful parrots native to southwestern Africa**
- **Popular in the pet trade**
- **U.S. birds captive bred**
Rosy Faced Love Birds (RFLBs)

- Adapted to drier climates
- Can rear up to three broods per year with 4-5 eggs per clutch
- Very social with large flocks
- Very noisy
- Life span – 15-25 years
Maricopa County, AZ

- 9,224 square miles
- Phoenix Metro
- Pop 3.8 million
- 4th most populous county in the U.S.
- Desert climate w/ ~ 7 inches of rain per year
- Suburban landscape = subtropical
RFLBs in Maricopa County

- Phoenix is the only known feral population of RFLBs in the U.S.
- For 20+ years RFLB populations have been multiplying & expanding
- MC RFLBs are descendants of domestic “pet shop” stock
- Rare sightings have been seen in Tucson but not believed to be established
RFLBs in Maricopa County

- Nest in un-trimmed palm fronds (especially date palms) and hollow saguaro cavities
- Mostly live in residential areas – especially older neighborhoods with tall trees
- Food: backyard bird feeders, palm fruits, cactus fruits, mesquite & palo verde seeds, etc.
- RFLBs have no natural predators in MC
Greater Phoenix Area map (reproduced from Mirror-Pole website) of reported Rosy-faced Lovebird locations in 1999-2005. Yellow balloons indicate sightings of 1-10 individuals and red balloons = flocks of >10 individuals.

Source: www.azfo.org/journal/Rosy-facedLovebird2011.html
Greater Phoenix Area map (reproduced from Mirror-Pole website) of reported Rosy-faced Lovebird locations in 1999-2010. The red border shows the initial known boundary of the species

Source: www.azfo.org/journal/Rosy-facedLovebird2011.html
Arizona Field Ornithologist Census

- One half-day bird census in 2011
- 61 teams scouted for RFLBs in an area approximately 24 miles in diameter
- RFLB sightings were mapped
- 948 RFLBs were recorded within census area
- Taking into account areas with previous reports/sightings not covered in the census, AzFO estimates the RFLB numbers to be at least 2500 individuals
Figure 1: Census Data Points with Lovebird Detections (triangles): Light Blue = 1-5 birds, Red = 6-10 birds, Dark Blue = 11-20 birds, Green = 21-50 birds. Source: Az Field Ornithologist website.
Bird Die Off Investigation
Multi-Agency: ‘One Health’

- Prior to 2013, there had been no known adverse impacts from RFLBs
- Late August 2013, Arizona Game and Fish Department (AZGFD) was notified of die-off of ~30 lovebirds in local community in the East Valley
- Other lovebirds in area showing signs of illness; no other species affected
- Bird carcasses sent to USGS National Wildlife Health Center (NWHC) for testing
Necropsy Findings

Four RFLBs were necropsied at USGS–NWHC

- Hepatosplenomegaly
- Diffusely congested lungs
- Air sacs mildly thickened
- Nares w/ yellow discharge
- Histopathologic lesions in liver & spleen
- Liver: multifocal coalescing hepatocellular necrosis
- Spleens heavily infiltrated by macrophages & plasma cells
- Many macrophages contained small intracytoplasmic cocci which stained positively with PVK & Gimenez stains consistent w/ C. psittaci
Laboratory Results: RFLBs

- RFLB liver, lung, spleen, brain tested positive for *Chlamydophila psittaci* by PCR
  - Negative for other pathogens, including avian influenza and paramyxoviruses. Salmonella cultures were negative. Nasal swab was negative for *Mycoplasma* sp.

- *C. psittaci* was isolated by culture from lung & brain at the NVSL in Ames, Iowa
Human Case Investigation

- AZGFD was called by the same person (adult female) that reported the die-off - she had developed high fever and respiratory disease
- ~2 weeks after bird mortality event
- Public health was notified by AzGFD
- PH investigation: patient interview revealed that she cleaned-up bird droppings from porch w/ leaf blower
Onset: September 7, 2013

Sx: fever (104° F), chills, frontal headache, chest pain, cough, myalgias, sore throat, drenching sweats (nighttime), tinitis, fatigue

Seen at 1\textsuperscript{st} UC on 9/8

Seen at 2\textsuperscript{nd} UC on 9/9

Chest was clear by auscultation

Positive for leukocytes on UA

Dx: UTI

Rx: Amoxicillin & Augmentin

At neither UC was blood drawn or x-ray done.
Laboratory Results: Human Case

- Single convalescent blood sample was collected from the human case patient 20 days after initial clinical signs.
- Results tested positive for *Chlamydia sp* IgG at two different laboratories.
Psittacosis Timeline

- Aug 18-24: Onset of bird mortality
- Aug 21-26: Resident collected bird carcasses
- Aug 25-31: Cleaned droppings with leaf blower
- Sept 1-7: Human case illness onset
- Sept 8-14: Visited urgent care A
- Sept 9: Seen at urgent care B
- Sept 10: Public health contacted individual about possibility of Chlamydia infection
- Sept 12: Started on doxycycline per MCDPH recommendation
- Sept 15-21: Blood drawn for convalescent sample
- Sept 22-28
- Sept 29 - Oct 5
Discussion

2013 investigation = strong case for psittacosis transmission from feral RFLBs

- *C. psittaci* confirmed as cause of RFLB mortality
- Human case had significant exposure to aerosolized bird droppings at the same site as bird die-off
- Human case had onset of psittacosis like sx within incubation period
- Human case tested positive w/ high IgG titers to *Chlamydia*
Discussion

- Risk for psittacosis transmission to humans is highest for indoor pet birds due to more intimate exposures in confined spaces.
- Risk is lower in outdoor open air environment.
- 2013 investigation demonstrated that infected outdoor feral RFLBs do pose a disease risk to humans.
- How likely is it that may occur again?
Discussion

- LOTS!!! of people feed birds
- Bird feeders attract and concentrate lots of birds
- Congregating birds share pathogens
- RFLBs are very popular among people feeding birds
- Lots of birds = lots of droppings
- Sooner or later, someone has to clean-up the mess
Limitations of the Investigation

- Acute blood samples were never collected for the case patient at either of two UCs.
- Dx of psittacosis was based on a single convalescent blood.
- Without paired sera, you cannot confirm that there was recent infection w/ psittacosis (case classified as ‘probable’).
- Serologic tests for psittacosis cross react with other *Chlamydia*, such as *C. pneumoniae* and *C. trachomatis*. The patient tested positive for all three.
More RFLB Mortality

- June 17, 2014 – another die-off of RFLBs was reported in a new location
- Bird carcasses were collected. Lab testing is pending.
- # RFLBs in flock = 50+
- RFLBs co-mingling with at 7+ bird sp
Next Steps

- Perform serovar testing of the dead RFLBs to see what direction the infection is coming from:
  \[ \text{RFLBs} \leftarrow \, ? \, \rightarrow \text{wild bird species} \]
- Do additional *Chlamydia* testing of RFLBs in new locations around MC to see how common & widespread
- Do outreach to the medical & veterinary medical community to increase awareness & enhance surveillance
- Do prevention outreach to the public?
Questions?