

Avian Influenza Research preliminary 2005 results & 2006 plans

University of Alaska Fairbanks

This presentation - Jon Runstadler, Falk Huettmann,
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Also at UAF - Kevin Winker

Also at UAA - Douglas Causey



NIH National Center for Research Resources Award to University of Alaska

July 2004 - June 2009

<http://www.alaska.edu/inbre>

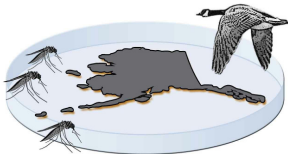
Denali Biomedical Workshop (2004) “Emerging pathogens at high latitudes”

40 investigators, 25 Alaska, 15 outside

- 1) Create “Center for Study of Zoonotic Disease”
- 2) Two research questions/approaches
 - Microbial agents - molecular ecology and epidemiology
 - Vectors - pathogenesis, physiology, immunology



Alaska Zoonotic
Disease Center





Brevig Mission, Alaska



Brevig Mission, December 2005

Denali Biomedical Workshop (2004) Final Report Recommendations for AI Research

- Seroarcheology and retrospective genomics of human samples (H1N1, H2N2, H3N2)
- Retrospective genomics of animal samples (collaboration with Slemons at Ohio State)
- Prospective surveillance for AI of Pacific Rim (collaboration with Slemons) & genomic sequencing
- Develop direct molecular subtyping protocols for genomic sequencing and HA-NA subtyping w/o serology
- Develop universal influenza genotyping chip
- Model receptor binding of HA-sialic acids (collaboration) (UAF, Scripps, AFIP)

Denali workshop Animal-related questions

- Are Eurasian AIVs brought to North America via Alaska?
- Do Eurasian and NA lineages mix in Alaska?
- Are particular subtypes or strains host-species adapted?
- How much reassortment takes place in the wild?
- Is there phylogenetic support for the 15 HA and 9 NA subtypes?

2005 UAF-INBRE AIV goals 1

- Weekly teleconference -
 - Jon Runstadler, Tom Marr, Sue Hills, George Happ,
 - Jeff Taubenberger, Richard Slemons
- Expand survey – use alcohol and viral transport media
- Molecular and classical screening in collaboration
 - Jeff Taubenberger (AFIP) alcoholic specimens
 - Richard Slemons (Ohio State) viral transport media
- Establish and validate molecular screening at UAF
 - <http://www.alaska.edu/inbre/avianflu/>

2005 UAF-INBRE AIV goals 2

- Develop molecular subtyping for samples (AFIP)
- Use real-time PCR for subtyping at AFIP and at UAF
- Taubenberger's aim is to develop automated genomic sequencing from alcoholic specimens
- Port the automated sequencing protocols to TIGR
- All sequences to be immediately deposited on GenBank

– <http://www.alaska.edu/inbre/avianflu/>

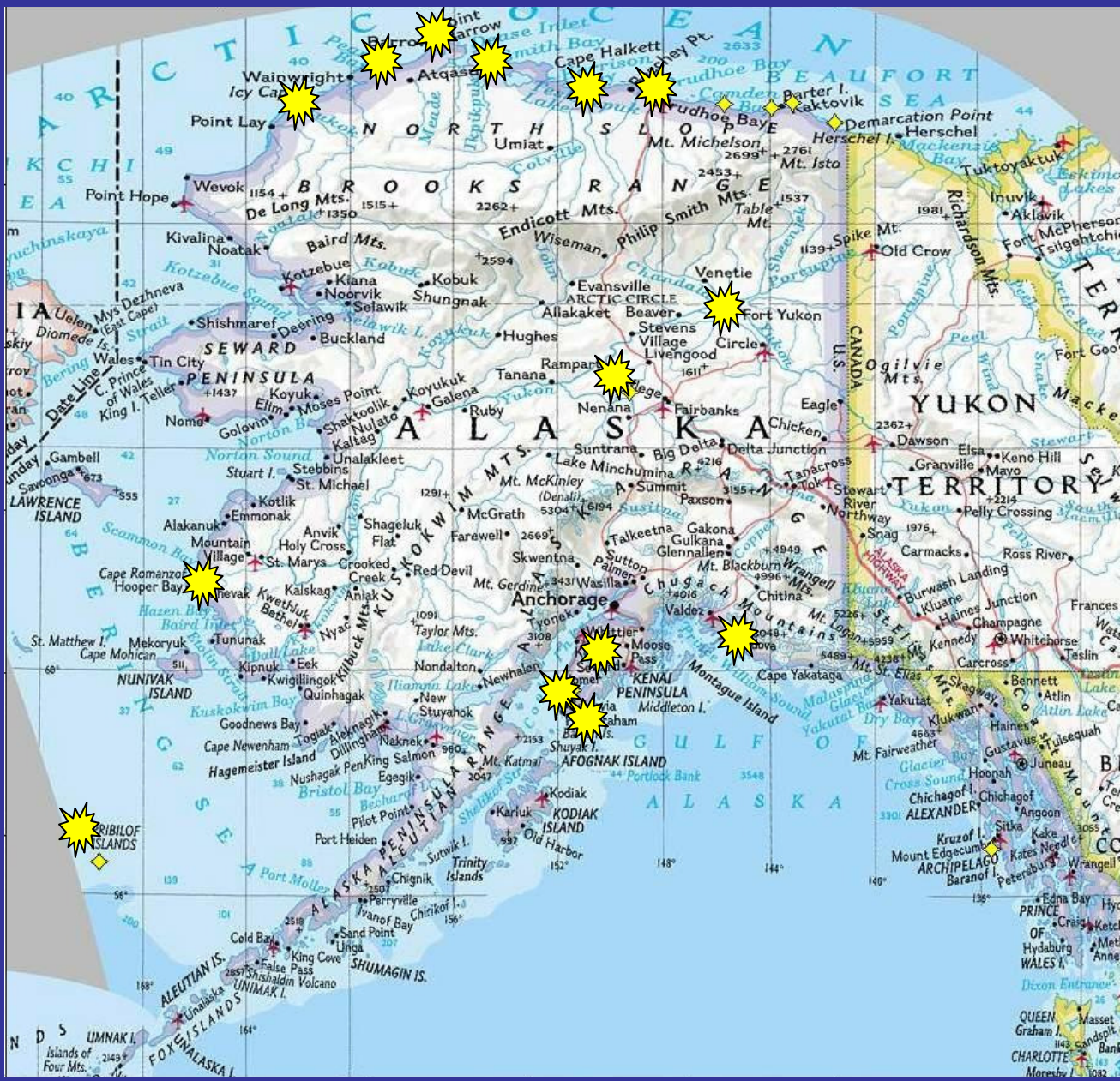
Waterfowl return in early May



2005 Survey

What influenza viruses are present in Alaska's wild birds?

- Ducks, geese, shorebirds, seabirds, cranes, small passerines, etc
- Minto Flats, Copper River Delta, Chevak, Yukon Flats, Fairbanks, North Slope, others
- All samples collected and archived by standard protocols
- Screening in collaboration with Armed Forces Institute of Pathology, Ohio State, USDA Ames
- Environmental sampling
- Goal - Augment AK sampling as basis for research







2005 UAF – INBRE Samples with M Petrula, J Sedinger, many others

- ~ 80% alcohol, ~ 20% viral transport media
- Ducks (1152)
 - MF- 738 Pintail, 119 Mallard, 19 GW Teal
 - & 57 C Merganser, 74 Harlequin, 90 Lesser Scaup, etc.
- Geese (1340)
- Shorebirds (77)
- Gulls and Terns (39)
- Other Waterbirds (61)
 - 61 DC Cormorant, 13 Cranes
- Other Wild Birds (1500)
- Domestic Birds (350)

2005 - What influenza viruses are present in Alaska's wild birds?

- ~ 4500 samples (80% in alcohol)
- Preliminary results - 880 alcohol, 508 media from Minto Flats
- PCR screening at AFIP
 - 576 screened for matrix and H5 by molecular subtyping
 - 97/576 (16.8%) were matrix protein positive
 - None were positive for H5 or H7
- Egg inoculations - Slemons at Ohio State
 - 37 of the positives were influenza A isolates
 - 15 of the 37 have been subtyped at NVSL
 - 22 of the 37 now at NVSL for antigenic subtyping

2005 - What influenza viruses are present in Alaska's wild birds?

- Other samples now being screened by PCR at AFIP & UAF
- Method development continues - Taubenberger
- Small planning and communication workshops
 - October – statewide communication
 - February – Eurasian collectors
 - Selection of key locations for repeated sampling across seasons and years

2006

Questions/aims

- Continued development of PCR detection/subtyping at AFIP, validation at UAF
- Automated sequencing at AFIP (Taubenberger) –
- Continued survey – expand to Eurasia
- Immunological health of wild birds - Runstadler
- Modeling of bird distribution/movement - Sharpton & Huettmann
- Correlate bird survey with human seroprevalence
- Computer modeling of viral evolution - Marr

2006 - 1

What viruses are in Alaska?

- 10,000 samples the goal
- Propose to emphasize target species –
 - pintails, green-winged teal, black brant
 - glaucous-winged gulls, arctic terns, stint/dunlin, wagtails
- Sample locations in Alaska and Eastern Asia
- First year of Russian - US collaboration
- Compare genotypes in species, year, season, location, ecological setting.
- Molecular screen at UAF – refine screen in collaboration with Taubenberger and Slemons.

2006 – 2 – Bird Movement and Migration - Modeling

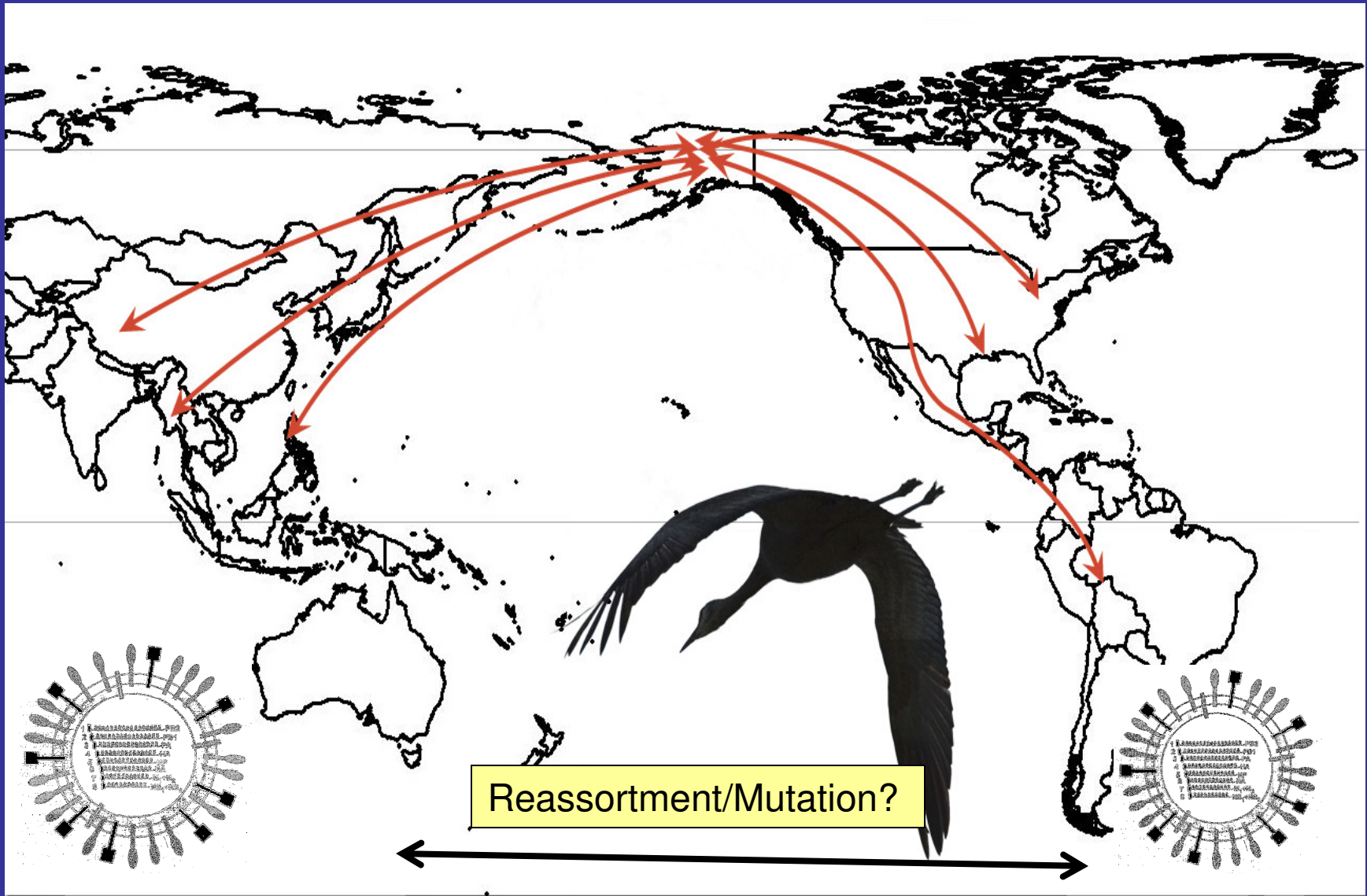
- Project leaders are Buck Sharpton at UAF's GINA and Falk Huettmann at UAF IAB
- Use bird surveys, banding recoveries, telemetry, expert knowledge
- Embed bird data in GIS-based datastores
 - GINA (Geographic Information Network Alaska)
 - Overlay layers with habitat & landscape features
- Link existing data on bird movements with the data on viruses
- Develop predictive models that just might tell us what to worry about
- Link existing data on bird movements with the data on viruses

2006 – 3 Wild Bird Immunology

- Leader is Jon Runstadler
- Why don't infected wild birds die?
- How do birds combat viral disease? – mucosal and systemic immunology
- What are the genetic indicators of virulence for a wild bird virus?
- What are the criteria for compromised immunocompetence in wild birds?
- Then - can we predict which birds are especially susceptible?
- Can we refine the models about birds spreading virus to include sickly birds spreading virus?

Potential 2007 Project Response to NIH BAA UCD, UCLA, UAF, Los Alamos

- Led by UCD & UCLA
- Surveillance in California, Alaska, Russia
- Surveillance in SE Asia (Wildlife Conservation Society)
- Major screening/sequencing of LPAI at UCLA Center
- Research Projects including Pilots from Runstadler and Huettmann



Reassortment/Mutation?