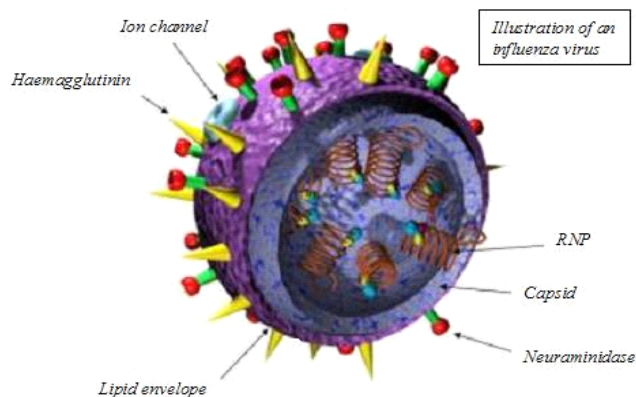


Bird Flu Research at the Center for Tropical Research
by John Pollinger, CTR Associate Director

Avian Influenza Virus – An Overview

The UCLA Center for Tropical Research (CTR) is at the forefront of research and surveillance efforts on avian influenza virus (bird flu or avian flu) in wild birds. CTR has led avian influenza survey efforts on migratory landbirds in both North America and Central Africa since spring 2006. We have recently been funded by the National Institutes of Health (NIH) to conduct a large study in North, Central, and South America on the effects of bird migration and human habitat disturbance on the distribution and transmission of bird flu. These studies take advantage of our unique collaboration with the major bird banding station networks in the Americas, our extensive experience in avian field research in Central Africa, and UCLA's unique resources and expertise in infectious diseases through the UCLA School of Public Health and its Department of Epidemiology.

CTR has ongoing collaborations with four landbird monitoring networks: the Monitoring Avian Productivity and Survivorship (MAPS) network, the Monitoring Avian Winter Survival (MAWS) network, and the Monitoreo de Sobrevivencia Invernal - Monitoring Overwintering Survival (MoSI) network, all led by the Institute for Bird Populations (IBP), and the Landbird Migration Monitoring Network of the Americas (LaMMNA), led by the Redwood Sciences Laboratory (U.S. Forest Service).



Bird flu has shot to the public's consciousness with the recent outbreaks of a highly virulent subtype of avian influenza A virus (H5N1) that has recently occurred in Asia, Africa, and Europe. This virus appeared in eastern Asia in 2003, rapidly infected poultry in Cambodia, China, Indonesia, Japan, Laos, Malaysia, South Korea, Thailand, and Vietnam, and acquired the alarming ability to infect humans. The geographic distribution of H5N1 continues to expand, and outbreaks have now been reported in Croatia, Kazakhstan, Mongolia, Romania, Russia, Turkey, Iraq, Greece, Italy, France, Germany, Sweden, Nigeria,

and Cameroon. To date, more than 140 million domesticated birds have been killed by the virus or culled to stop its spread. In addition, more than 250 people have been infected in Vietnam, Thailand, Indonesia, Cambodia, China, Azerbaijan, Egypt, Iraq, and Turkey, and 148 people have died.

The existence of multiple lineages of H5N1 suggests that poultry are not the only disseminators of the viruses. Indeed, evidence is accumulating to suggest that migratory birds may be spreading influenza variants around the globe. For example, in August 2005, highly pathogenic H5N1 killed thousands of migratory waterfowl around Lake Qinghai in western China and 89 migratory birds on two lakes in Mongolia. These events have strongly implicated migratory birds in the dissemination of the H5N1 strain along the east coast of Asia and, recently, to Siberia, Kazakhstan, Turkey, and Iraq. In addition, three different H5N1 lineages were detected in infected poultry from the February 2006 outbreak of H5N1 in Nigeria, also potentially implicating migratory birds. This is of great concern since some of the wild bird species that may become infected migrate to India, thereby increasing the risk of triggering a pandemic in a densely-populated region in which humans live in close proximity to domesticated animals and poultry. Alarmingly, although little is known about the role of migratory waterfowl in the ecology and epidemiology of influenza, even less is known about the role of the passerine species (perching birds and most songbirds) in the spread of the disease.

Formal evidence is accumulating of the ability of H5N1 to infect landbirds, including migratory passerines. Research conducted by The U.S. Department of Agriculture (USDA) Agricultural Research Service tested H5N1 pathogenicity among four passerine species and the Budgerigar (a type of parakeet). The virus caused high morbidity and mortality among Zebra Finches (*Taeniopygia guttata*), House Finches (*Carpodacus mexicanus*), and Budgerigars (*Melopsittacus undulatus*), but exhibited low pathogenicity among infected House Sparrows (*Passer domesticus*) and European Starlings (*Sturnus vulgaris*). In China, a new genotype of H5N1 was discovered in Tree Sparrows (*Passer montanus*), which is non-pathogenic to ducks and mice but pathogenic to chickens. Recent monitoring in Thailand also found H5N1 in sparrows and pigeons.



House Sparrows



European Starling



Brown-headed Cowbird

Several passerines have been identified that could potentially facilitate the initial spread of new influenza genotypes, including H5N1, from Asia to North America. For example, Yellow Wagtails (*Motacilla tschutschensis*) frequent agricultural land, commonly breed in western Alaska, and winter in southeast China and Indonesia. Arctic Warblers (*Phylloscopus borealis*) breed in central and western Alaska and winter from southern Myanmar, Thailand, southeast China, Taiwan, and the Philippines south to Andaman Island, the Malay Peninsula, and Indonesia, and east to the Moluccas. Other passerines that breed in Alaska and overwinter in Asia include the Bluethroat (*Luscinia svecica*), Northern Wheatear (*Oenanthe oenanthe*), and the White Wagtail (*Motacilla alba*).

It is likely that Nearctic-Neotropical migrant landbirds, such as the thrushes, wood warblers, and American Pipits (*Anthus rubescens*), share breeding and/or migration stopover habitats with individuals of other species that migrate to and from northern latitudes where contact with Eurasian species carrying the H5N1 subtype may occur. In turn, North American resident species, such as sparrows, starlings, blackbirds, and the nest-parasitizing Brown-headed Cowbird (*Molothrus ater*), could become infected with avian influenza variants from contact with migrating passerines and become the primary vectors of avian influenza into human-populated areas. Cowbirds are of special interest because they forage among livestock and poultry but lay eggs in the nests of Neotropical migrants.

The Center for Tropical Research is conducting three studies on avian influenza in migratory birds, two in the Americas and one in Central Africa. The three other articles posted on the web page provide summaries of those efforts:

- **Avian Flu Surveillance Sampling of Migratory Passerines in North America during the Spring/Summer of 2006**
- **Evaluating Transmission Pathways of Avian Influenza (H5N1) by Domestic and Wild Birds in Central Africa**
- **Effects of Avian Migration and Human-induced Change on the Distribution and Transmission Risks of Avian Influenza**