ARIZONA DEPARTMENT OF HEALTH SERVICES
VECTOR-BORNE & ZOONOTIC DISEASE
ANNUAL REPORT 2009

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RABIES

ARIZONA RABIES SUMMARY 2009

From a rabies standpoint, 2009 was not a good year for Arizona.

Reason #1: The state experienced record breaking rabies activity with intense epizootics involving skunks and/or foxes occurring in five counties. 2009 not only set a new state record for the number of rabid animals (280), it shattered the previous record (176) set in 2008. Several dramatic attacks by rabid animals made national news.

Reason #2: The budget crisis lead to the permanent closure of the State Laboratory in Tucson in March 2009. As a result, the Arizona State Health Laboratory (ASHL) in Phoenix was quickly over loaded with rabies specimens. To make matters worse, public health officials were also responding to the H1N1 flu pandemic, and ASHL Virology staff were deluged with thousands of flu specimens.

Reason #3: In June 2009, the Arizona Department of Health Services (ADHS) initiated a new policy for the submission and testing of rabies specimens to help alleviate some of the specimen load at the ASHL. The new policy was not very popular among many of the local programs and veterinarians as it set new restrictions on the submission of rabies specimens. The new policy was designed to significantly reduce the numbers of low risk animal submissions (primarily dogs and cats), and it forced local programs to use other options (e.g. 10 day quarantine or out-of-state testing) to rule-out rabies risk.

Reason #4: In June 2009, ADHS lost an irreplaceable member of the rabies response team. Our Public Health Veterinarian (PH-DVM) – Dr. Elisabeth Lawazceck – left Arizona to become the new PH-DVM for the State of Colorado. Elisabeth had been with ADHS since 2000, first as an Epidemiologist and Special Projects Coordinator with the Office of Bioterrorism and Epidemic Preparedness and then as the PH-DVM (since 2003) in the Office of Infectious Disease Services. During her nine years with the Department, Elisabeth contributed much to the disease surveillance and response effort and forged many new partnerships within, and outside Arizona. She has been sorely missed.

Rabies Stats website: http://www.azdhs.gov/phs/oids/vector/rabies/stats.htm

RABIES

LABORATORY TESTING

In 2009, a total of 2,421 animals were tested for rabies in Arizona, including 1,829 tested by Direct Fluorescent Antibody (DFA) at the Arizona State Health Laboratory (ASHL) and 592 animals tested by Direct Rapid Immunohistochemistry Test (dRIT) by USDA-Wildlife Services. Animals representing 40 species were submitted for testing. A total of 280 (11.6%) animals tested positive for rabies, including 144 skunks, 69 bats, 51 foxes, 8 bobcats, 3 horses, 2 coyotes, 1 cat, 1 cow, and 1 ringtail (see Table 1). Rabid animals were reported steadily in all months of the year (see Table 2). The animals most commonly submitted for testing were skunks (674), dogs (627), bats (420), cats (323), foxes (156) and coyotes (100). For the first time in Arizona history, skunk submissions surpassed dog submissions. Wild animal species (especially bats and certain carnivores) were much more likely to test positive than domestic animals (see Table 3). As stated above, a new specimen submission policy was enacted in June 2009 to reduce unnecessary and/or low risk specimen submissions. Animal tests performed by the ASHL in 2009 (1,829) dropped by 32% compared to 2008 (2,688 animals) partly due to the new rabies specimen submission policy and also due to the diversion of many 'non-exposure' wild animals to the USDA for dRIT testing. ADHS-Vector-Borne & Zoonotic Diseases (VBZD) and ASHL staff are grateful to the local programs that made the necessary changes to adhere to the new policy and to the USDA for their dRIT testing support! The new policy will remain in effect indefinitely. For a nut-shell summary of the new submission policy – see Page 5.

RABIES EXPOSURES

47 human exposures and 166 domestic animal exposures (mostly dog exposures to rabid skunks) were reported in 2009. Of the 47 human exposures, at least 41 were significant enough to warrant post exposure prophylaxis (see below for definition of "exposure")***. Among the 41 higher risk exposures, eleven involved contact with bats (people handling bats and/or bat bites), eight involved rabid bobcats (mostly bites/ attacks), six involved foxes (bites/attacks), six involved skunks (four with bites, one with direct contact/handling, and one with fluids/splatter exposure), six with horses (saliva contact – mostly veterinary staff), three with a rabid cow (saliva contact – veterinary staff), and one with cat exposure (bite).

****A rabies exposure is defined as a bite, or saliva contact to broken skin or mucous membranes (e.g. eyes, nose, mouth), or potential contact with central nervous system tissues. For bats – an exposure includes handling bats so as to have direct contact with head and mouth.*

RABIES IN FLAGSTAFF

The outbreak of spillover rabies that has been ongoing in the Flagstaff area since 2001 took a new turn in the fall of 2008 when a gray fox tested positive for rabies. Variant typing results showed that the fox had the same Big Brown Bat rabies variant that had been, up to now, circulating in local skunks. With the rabies spillover into foxes, the risk for human exposure was increased dramatically as was the potential for rapid spread to new locations. From the fall 2008, through December 2009, 30 cases of animal rabies were reported in the Flagstaff area, including 23 foxes, six skunks, and one ringtail. Coconino County imposed a rabies quarantine from April to August which required that all dogs and cats be vaccinated and kept confined in yards or on leashes. The USDA applied for emergency funding to implement an Oral Rabies Vaccine (ORV) bait program in the area. This would be the first ORV program ever conducted in the State of Arizona.

The ORV baits (called Raboral V-RG) consisted of small fish meal coated packets/ sachets containing rabies vaccine and an attenuated vaccinia virus carrier. The ORV baits were designed to inoculate the foxes orally when they attempted to eat the baits. In July 2009, over 129,000 ORV baits were distributed over an 1,100 square mile area surrounding, and including, the outbreak epicenter. Most of the baits were dropped over rural areas by twin engine aircraft. In urban/suburban areas the ORV baits were more selectively applied by ground crews to reduce the chances for human and pet exposure. Blood samples were collected from foxes before and after the ORV program to test for seroconversion (presence of rabies antibody) to assess efficacy of the ORV effort. Post ORV bleeding and testing results showed 64% seroconversion in foxes, compared to approximately 5% in the pre-ORV samples. The first ORV program in Arizona was considered to be a great success. Credit goes to USDA Wildlife Services and Coconino County for organizing and implementing the program. Other participating agencies include City of Flagstaff, Arizona Game & Fish, ADHS, Coconino National Forest, Kaibab National Forest, National Park Service, Camp Navajo, and Naval Observatory.

ORV programs have been done successfully in other states to immunize raccoons, coyotes and foxes. Unfortunately, ORV baits do not work for immunizing skunks. To address the skunk rabies problem, a trap, vaccinate and release (TVR) program was re-initiated in August 2009. Urban skunks were live trapped, immunized with parenteral (injectable) vaccine, ear tagged and released. 113 skunks were immunized. The TVR program was carried out by the United States Department of Agriculture, Coconino County, and a CDC EIS Officer that was assigned to ADHS.

RABIES

RABIES SPECIMEN SUBMISSION POLICY OVERVIEW

State Lab Virology staff test a bat

In June 2009, a new specimen submission and testing policy went into effect to take some of the pressure off of the Arizona State Health Lab (ASHL). The purpose of the new policy was to substantially reduce the number of unnecessary and/or low risk animal submissions (especially dogs and cats). In a nutshell, biting pet animals (dogs, cats or ferrets) will not be accepted for testing unless they meet certain criteria, including (1) showing neurologic signs/symptoms, or (2) the animal could not be placed under the appropriate post-bite quarantine (10 days for dogs and cats, 14 days for ferrets) due to injury and/or suffering of the animal. Healthy biters (dogs, cats and ferrets) that are euthanized without a follow-up quarantine will have to be shipped to an outside laboratory, and costs (shipping and testing) will be paid by the submitting agency. Wild animal species (especially carnivores and bats) should be submitted for testing if there is human, pet or livestock exposure. Wild species with no-exposures can be submitted if showing suspicious signs/symptoms, but need not be submitted in all cases. If lab testing does not contribute new information for surveillance or response purposes – we request that you do not submit. Non-exposure wild animals with suspicious signs/symptoms can be submitted if the lab results are critical for surveillance purposes (e.g. suspicious animal in a new location).

DRIT TESTING

For many of the non-exposure wild species, the United States Department of Agriculture's Wildlife Services staff can perform Direct Rapid Immunohistochemistry Testing (dRIT). When in doubt, local animal control officers and veterinarians are urged to call ADHS-VBZD staff (602-364-4562) prior to submitting specimens. Rodents and rabbits have never posed a rabies risk in Arizona and should not be submitted for rabies testing without prior consult with VBZD staff.

Table 1. Rabies Summary, Arizona, 2009
Lab Confirmed Rabies Positive Animals by Type and County

County	Bat	Skunk	Fox	Other	Total
Apache					
Cochise	4	30	4	(1) bobcat	39
Coconino	4	5	24	(1) ringtail (1) coyote	35
Gila	4		2	(1) bobcat	7
Graham					
Greenlee			3		3
La Paz	1				1
Maricopa	11		1	(1) horse	13
Mohave					
Navajo					
Pima	32	43	9	(2) bobcat	86
Pinal	7	3		(1) bobcat	11
Santa Cruz	3	62		(1) cow, (2) horse, (1) coyote, (1) cat	70
Yavapai	3	1	8	(3) bobcat	15
Yuma					
Total	**69**	**144**	**51**	**16**	**280**

- CDC performs variant testing on domestic and wild animals that are not the usual reservoirs for rabies.
- Most of the foxes, skunks and ringtail from Coconino County have been found to be infected with the Big Brown Bat variant.
- The horse from Maricopa County was found to be infected with North Central skunk variant.
- The two horses from Santa Cruz County were infected with South Central skunk variant.
- Most rabid bobcats are infected with grey fox variant.

Table 2. Rabies by Month, Arizona, 2009

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Bat	0	0	0	5	9	6	15	18	9	4	2	1	69
Skunk	8	15	19	20	5	8	4	6	7	14	17	21	144
Fox	5	7	13	8	2	6	3	0	1	1	2	3	51
Other	0	0	5	2	3	2	0	0	0	0	2	2	16
Total	13	22	37	35	19	22	22	24	17	19	23	27	280

Table3. Percent of Animals Testing Positive for Rabies by Type, Arizona, 2009

ANIMAL TYPE	TOTAL # TESTED*	# POSITIVE	% POSITIVE
Bats	420	70	16.7
Bobcats	19	8	42.1
Cats	323	1	0.3
Cows	9	1	11.1
Coyotes	100	3	3.0
Dogs	627	0	0
Foxes	156	57	36.5
Horses	26	3	11.5
Raccoons	34	0	0
Skunks**	674**	172	25.5**

Total # Tested: Number reflects the total # animals tested (ASHL + USDA). Only the top ten most commonly submitted/tested animal types are listed in the table.

**The numbers in the table reflect total numbers of skunks tested (ASHL + USDA). If you look at ASHL samples only which emphasizes skunks with pet or human exposures, the numbers change to 127 positive out of 303 tested (i.e., 42% positive).*

BRUCELLOSIS

Brucellosis is a febrile illness characterized by night sweats, fatigue, anorexia, weight loss, headache and arthralgia. Four species of *Brucella* with different animal reservoirs cause infections in humans: *B. abortus* (cattle), *B. melitensis* (goats), *B. canis* (dogs) and *B. suis* (pigs). Although there are only about 100 to 200 Brucellosis cases in the United States each year, it is of increased public health concern due to growing demand for raw or unpasteurized dairy products.

In 2009 three brucellosis cases were reported in the state: two (1 confirmed, 1 probable) from Maricopa County and one (confirmed) from Yuma County. The Maricopa County cases were both linked to unpasteurized *queso fresco*, a Mexican style soft cheese. Unsafe *queso fresco* is made with raw milk, in unsanitary conditions, sold door-to-door in non-refrigerated containers or home-made in Mexico and sent to family members living in Arizona.

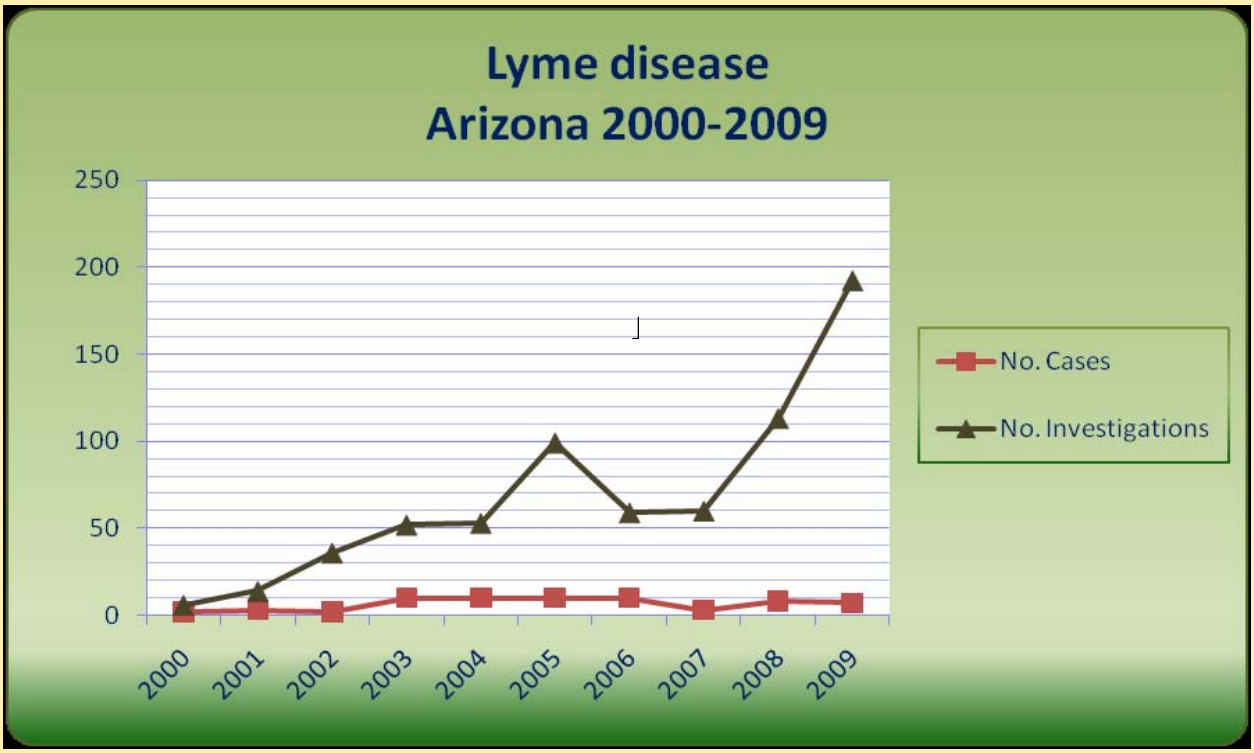
In the Yuma County case the causative agent was *B. canis*. The patient was exposed to infectious tissues while their dog was having puppies.

ADHS Brucellosis Website: http://www.azdhs.gov/phs/oids/vector/brucella

LYME DISEASE

Lyme disease is caused by the bacterium *Borrelia burgdorferi* and is transmitted to humans by the black legged tick (*Ixodes scapularis*) and the western black legged tick (*Ixodes pacificus)*. The black legged tick is commonly found in the northeast and upper Great Lakes regions of the U.S., particularly in areas with dense deer populations. The western vector is mainly found in California, Oregon, and Washing State. *Ixodes pacificus* ticks have also been found in the higher elevations of the Hualapai Mountains in Northwest Arizona. Lyme disease is not endemic in Arizona. Although cases have been reported here, case patients have always had travel to an endemic area prior to onset.

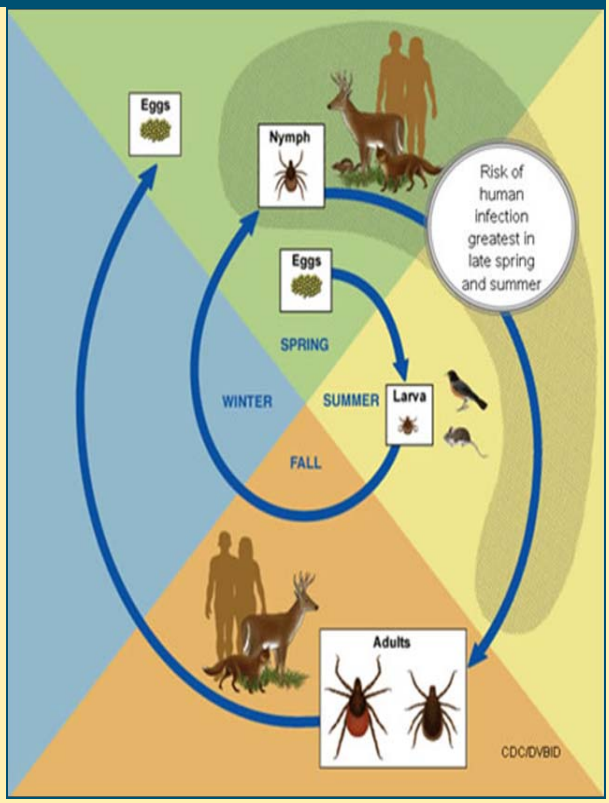
In Arizona, there are typically less than ten cases of Lyme disease reported each year. There are many more laboratory-positive tests reported than are found to be actual cases. Only 3.7% of all reported cases in 2009 could be classified as confirmed or probable using the CDC and state case definition. This is because only 7 cases fit the definition out of 192 reported. As comparison, in 2008 there were 113 reports and 8 confirmed or probable (7%).



LYME DISEASE

For Lyme disease to be accurately diagnosed and to be counted as a case per definition, symptoms, exposure in an area of endemicity, and laboratory testing must be compatible. It is important to note, a Western blot performed without first doing a screening ELISA increases the potential for false positive results. If the person has been ill longer than one month and is IgM positive, this is likely a false positive.

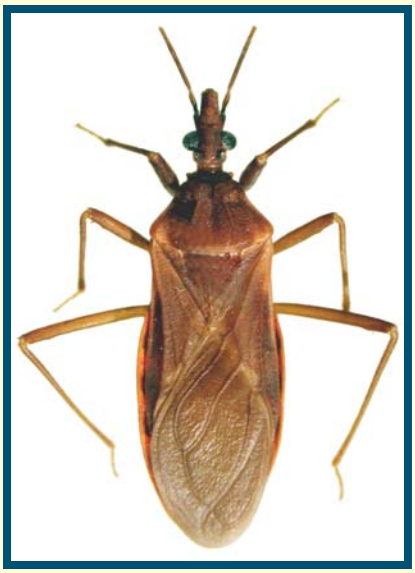
Ticks that transmit Lyme disease can take three or more days to feed fully. If the tick is infected with *B. burgdorferi,* the chances of transmission increases with time from 0% at 24 hours, 12% at 48 hours, 79% at 72 hours and 94% at 96 hours. This is the reason it is important to conduct tick checks and to remove any ticks you find promptly when travelling in an area that is endemic for Lyme disease.



Life cycle of the black-legged tick

CHAGAS' DISEASE

(American Tyrpanosomiasis)



Chagas' disease is caused by the protozoan parasite *Trypanosoma cruzi*, and is transmitted to animals and people by insect vectors called triatomine bugs, or more commonly, kissing bugs or conenose bugs. It may also be transmitted by the use of contaminated blood products, tissue transplants and even ingestion of infective bugs. Chagas' disease is found only in the Americas with most cases occurring in rural areas of South America. This disease is also endemic in parts of southern Mexico and Latin America.

In 2007 Chagas' disease became a reportable disease in Arizona so local and state health officials could assess the impact the disease has on the state's residents. Because *T. cruzi* infections may be acquired through contaminated blood products, blood banks began screening the state's blood supply in order to detect possible infections among their donors. In 2009 five *T. cruzi* positive blood donors were reported: one from La Paz County, three from Maricopa County and one from Pima County. All of the individuals had either come from or visited areas of Mexico were the disease is endemic and were not currently symptomatic or showed signs of the chronic stage of Chagas' disease.

DENGUE

Dengue is an acute febrile viral infection caused by four distinct serotypes (Den-1, 2, 3 and 4). It is characterized by sudden onset of fever (generally lasting 3-5 days, sometimes 7), headache, muscle and joint pain, retro-orbital pain, anorexia, GI disturbances and rash.

First time infections are not necessarily life-threatening. However, while infection with one-serotype provides lifelong immunity to that particular virus, it does not provide protection against the other serotypes. Subsequent infections with a different serotype can result in Dengue Hemorrhagic Fever or Dengue Shock Syndrome which are more serious, even fatal, illnesses.

Table 1. Dengue Cases, Arizona, 2000-2009.*

Year	Number of Cases
2000	3
2001	1
2002	2
2003	1
2004	1
2005	5
2006	9
2007	8
2008	6
2009	5
Total	41

* *All cases imported.*

The dengue viruses are transmitted by two mosquito species of the genus *Aedes*, *Ae. aegypti* and *Ae. albopictus*. Both mosquitoes are found in the United States, but *Ae. albopictus* has not been able to establish itself in Arizona. *Ae. aegypti* on the other hand, was present in the state in the 1930s and 1940s and subsequently re-emerged in Arizona in the early 1990s. It is now endemic in several communities in Cochise, Maricopa, Pima, Pinal, Santa Cruz and Yavapai counties.
During the period 2000-2009, 41 confirmed or probable cases of dengue were reported in Arizona residents (Table 1). All of the cases were classified as "imported", i.e., acquire in endemic areas outside the United States. In 2009 five imported cases of dengue (4 confirmed, 1 probable) were reported in Arizona (Table 2). These cases were associated with travel histories to Asia, the Caribbean and Central America.

Table 2. Arizona Dengue Cases 2009.*

Date of Onset	Patient Age	County of Residence	Race	Travel History	Status
1/4/09	Adult	Maricopa	A	India	confirmed
1/14/09	Adult	Maricopa	U	Costa Rica & Panama	confirmed
1/18/09	Adult	Maricopa	U	Curacao	probable
10/15/09	Adult	Maricopa	U	Haiti	confirmed
10/26/09	Adult	Maricopa	W	Haiti	confirmed

* *All cases imported.* *A= Asian, U=Unknown, W=White*

MALARIA

Malaria is a parasitic, mosquito-borne disease causing acute febrile illness in humans characterized by periods fever followed by intervals of good health. Infections in humans are caused by four distinct species of plasmodia: *P. falciparum*, *P. malariae*, *P. ovale* and *P. vivax*. Falciparum and vivax malaria are responsible for most cases of malaria worldwide whereas ovale followed by malariae malaria occur less frequently. While the majority of cases are due to infection with only one plasmodia species, concomitant mixed infections by two strains can occasionally occur.

The four types of human malaria produce similar symptoms including fever, chills, sweats, malaise, diarrhea and headache. Because of this, and the fact that the initial stages of illness may resemble other diseases, confirming a diagnosis of malaria requires microscopic demonstration of plasmodia in the patient's blood while specific identification of the plasmodia species will verify the type of malaria involved.

While the different forms of human malaria may share similar symptoms, they differ in their severity. In cases of falciparum malaria, for example, there are often a variety of serious complications including respiratory distress, renal and liver failure, coma and even death. In contrast, malariae, ovale and vivax malaria cases are generally not life-threatening.

A fifth species of *Plasmodium, P. knowlesi* is a parasite of Old World monkeys which has recently been documented as a cause of human infection in Southeast Asia. The extent of transmission and infection in humans is still unknown.

Table 1. Malaria Cases, Arizona, 2000-2009.*

Year	Number of Cases
2000	11
2001	19
2002	14
2003	17
2004	19
2005	19
2006	24†
2007	11
2008	16
2009	10
Total	160

* *All cases imported*
† *Two cases fatal*

MALARIA

According to the CDC, 350-500 million cases of malaria occur each year with over one million associated deaths, primarily due to *P. faciparum*. Although most infections occur in sub-Saharan Africa, the disease remains endemic in other parts of Africa as well as in Asia, Central and South America, the Pacific Islands, and Mexico. Although malaria was once a major cause of morbidity in the United States, and parts of Canada, indigenous malaria foci of plasmodia no longer exist in North American north of Mexico. None-the-less, residents of the U.S. who travel to endemic areas can contract malaria infections and become symptomatic upon returning home.

During the period 2000-2009,160 confirmed cases of malaria were reported in Arizona residents with two fatalities (Table 1). All of the cases were classified as 'imported', i.e., acquired in malaria-endemic areas outside the United States. Both fatalities occurred in 2006 (the first malaria-related fatalities in Arizona in decades) and were both the result of *Plasmodia falciparum* infections acquired while traveling in Africa. It should also be noted that the highest number of cases (24) reported in this ten-year period was also in 2006.

In 2009 ten confirmed cases of malaria (Table 2) were reported in Arizona residents. All cases were classified as 'imported' (i.e., not contracted in the U.S.). Five cases had contracted *falciparum* malaria, three *vivax* malaria, one was a probable *vivax* infection and one was *ovale* malaria. Seven patients had travel histories to Africa, while three had visited Asia. No malaria-related deaths were reported.

Table 2. Arizona Malaria Cases 2009*

Date of Onset	Patient Age	County of Residence	*Plasmodium* Species	Race	Travel History
3/14/09	Adult	Maricopa	*P. falciparum*	W	Uganda
6/19/09	Adult	Maricopa	*P. falciparum*	B	Kenya
7/13/09	Adult	Maricopa	*P. falciparum*	B	Nigeria
7/15/09	Adult	Maricopa	*P. falciparum*	B	Sudan
7/22/09	Juvenile	Maricopa	*P. vivax*	B	Ivory Coast
8/14/09	Adult	Maricopa	*P. vivax*	A	India
8/30/09	Adult	Coconino	*P. falciparum*	W	Ghana
9/5/09	Adult	Maricopa	*P. vivax*	W	India
10/19/09[R]	Infant	Maricopa	*P. vivax* (?)	B	Ethiopia
11/10/09[R]	Adult	Maricopa	*P. ovale*	A	Burma

* *All cases imported unless stated otherwise.*
[R]: *refugee*

W=White, B=Black, A=Asian

ROCKY MOUNTAIN SPOTTED FEVER

Rocky Mountain spotted fever (RMSF) is a severe and potentially life threatening tick-borne disease caused the bacteria *Rickettsia rickettsii*. Incubation period for RMSF is 3-14 days after tick bite. In the case of "classic RMSF" initial symptoms can include sudden onset, fever, chills, severe headache, nausea, vomiting, deep muscle pain, anorexia and blood-shot eyes. Later symptoms can include rash (maculopapular and/or petechial), abdominal pain, joint pain, and diarrhea. Not all RMSF infections manifest with "classic" symptoms which can lead to delayed diagnoses, delayed treatment and fatal outcomes.

The principle tick vectors in the U.S. are the American Dog Tick (*Dermacentor variabilis*) and the Rocky Mountain Wood Tick (*D. andersoni*). These vector ticks are either very rare (*D. andersoni*) or non-existent (*D. variabilis*) in Arizona. Prior to 2003, RMSF cases in Arizona were very rare. In 2003-2004, an unusual outbreak of RMSF occurred in the White Mountains Region of eastern Arizona. Studies conducted by the Centers for Disease Control & Prevention (CDC) involving the collecting and testing of ticks, testing dog bloods, and human case follow-up lead to the identification of a new tick vector for RMSF – the Brown Dog Tick (*Rhipicephalus sanguineus*). The conditions which lead to increased parasitism of Brown Dog Ticks on humans included an over abundance of stray dogs, ample amounts of peridomestic tick habitats (e.g. untrimmed grass/weeds, outdoor furniture and mattresses, piled wood, etc.) and excessive tick populations on pets and around homes. Since 2004, local, state and federal public health officials have collaborated annually to reduce RMSF transmission through (1) prevention education campaigns, (2) controlling ticks on dogs with tick collars and sprays, (3) controlling ticks around homes with pesticide applications, and (4) community clean-up campaigns. In spite of mitigation efforts, over 90 cases of RMSF have been reported in eastern Arizona during the years 2002 through 2009. Cases were reported in Gila, Graham, Navajo, and most recently, Pinal counties. Eastern Arizona is now considered to be endemic for RMSF.

Twenty-three cases were reported in 2009. Seventeen cases (74%) were in children. Twelve cases were female. Ages range from <1 – 70 years with a median of eight years. One case was fatal. Of the 23 cases reported in 2009, 21 cases occurred on Tribal Lands in eastern Arizona and two cases occurred in a new location on Tribal Lands in south central Arizona. Both of the cases in south central Arizona occurred in the same household and were locally acquired. As to how or when RMSF was moved to this new location is not certain. However, so long as there is intense RMSF activity in one part of the State, RMSF has the potential to be introduced into new locations anytime tick infested dogs are moved from one location to another.

TICK-BORNE RELAPSING FEVER

Tick-borne relapsing fever (TBRF) is a tick vectored bacterial disease that occurs sporadically in western states. The causative agents are spirochetes in the Genus *Borrelia*, including *B. hermsii, B. parkeri* and *B. turicatae*. The vectors are "soft ticks" (Family *Argasidae*; Genus *Ornithodoros*) which are secretive, quick night time feeders (usually < 30 minutes) and can sometimes be found in rodent nests (e.g. squirrels, chipmunks, packrats, etc.) in rustic cabins or caves. The incubation period for TBRF is 2 – 18 days with an average of 7 days. The illness is characterized by fever (often with high fever spikes), headache, chills, sweats, body aches, fatigue, nausea, and vomiting, and sometimes photophobia, cough, rash, neck pain, dizziness and confusion. As the name implies, TBRF can having relapsing episodes of febrile illness lasting 2-9 days, interspersed with afebrile periods of 2-4 days. Most case patients acquire infection when being bitten by soft ticks during overnight stays in rustic cabins or caves. Or, less commonly, people may inadvertently bring ticks into the home in loads of firewood. Diagnosis is usually made when spirochetes are observed in thick or thin blood smears, and it is most productive to collect blood (via. finger stick) during a fever spike. Specific treatment for TBRF infection is tetracyclines.

In August 2009, an ill woman in Maricopa County was diagnosed with "borreliosis" after spirochetes were seen on blood smears at a local hospital. The woman's symptoms were typical of classic TBRF. Prior to her illness she had stayed overnight with three friends in a rustic cabin north of Flagstaff. Coconino County health officials contacted the proprietors of the cabin, conducted an inspection of the premises and placed dry ice baited ticks traps in the cabin overnight. No soft ticks were collected. However, County officials did find evidence of rodent activity and several gaps and holes around the cabin allowing for rodent access. County staff applied pesticide (deltamethrin dust) around the outside of the cabin, and the cabin proprietors took measures to seal up gaps and holes and arranged for inside pest control. Since the cabin was a rental, over 25 groups (90+ people) had stayed in the cabin during the season. Coconino County staff obtained the guest registration lists and county officials (Coconino, Maricopa, and Yavapai) and ADHS staff contacted previous cabin guests. Three additional epi-linked cases of TBRF were identified, including two adult residents of Yavapai County and one teenage boy from California. All of the TBRF case patients had stayed in the cabin sometime during the period of mid- July to mid-August. Information about TBRF will be available to all future guests of the cabin to facilitate early reporting and diagnosis should this problem reoccur.

HANTAVIRUS PULMONARY SYNDROME

Hantavirus pulmonary syndrome (HPS) is caused by rodent-borne viruses which are shed in the urine, feces and saliva of rodent reservoirs. In Arizona, the specific hantavirus responsible for most (if not all) human infections is the *Sin Nombre virus* which is carried primarily by deer mice and related species (Genus *Peromyscus*). People usually become exposed to the virus through the inhalation route when disturbing / aerosolizing dust in mouse contaminated environments. People living in rural areas are at greater risk for exposure to infected wild mice.

The incubation period for HPS is a few days to six weeks. Prodromal symptoms commonly include fever (usually 101º degrees F or greater), myalgias, abdominal pain, cough, nausea and vomiting. Flu-like symptoms are followed in 1-10 days by rapid onset of respiratory distress. Most HPS case patients require admission to the hospital ICU, intubation / mechanical ventilation and intensive hemodynamic monitoring. Case fatality rate of HPS cases nationwide is approximately 35%.

During the ten year period 1999-2008, 38 cases of HPS were reported in Arizona. Cases were reported in six counties, including Apache (15), Coconino (4), La Paz (1), Maricopa (7), Navajo (10), and Pinal (1). Ages have ranged from 13 to 71 with a median of 36. Twenty-three (61%) were male. Fourteen cases (37%) were fatal.

In 2009, one case of HPS was reported in Arizona in a 9 year old female in Apache County. This is the youngest HPS case ever reported in Arizona. Onset of flu-like symptoms (fever, abdominal pain, headache, myalgia and vomiting) occurred in early July and was followed in five days by the development of chest pain and shortness of breath. Chest radiograph showed bilateral interstitial infiltrates consistent with ARDS, and laboratory findings included thrombocytopenia, elevated hematocrit and elevated WBC count. The patient was transported by air to a hospital in New Mexico where she was intubated. The patient received extracorporeal membrane oxygenation (ECMO – pediatric heart/lung machine) for four days, and remained on a ventilator an additional six days. The child recovered after three weeks+ of hospitalization. The HPS diagnosis was confirmed by laboratory testing. This case patient lived in a very rural area in northern Arizona. Investigation by public health officials identified at least three different locations where the child could have been exposed to mice droppings, including family home, grandparents' home, and a sheep camp where the child would often play in an underground dug-out.

Prior to 2009, pediatric cases of HPS under the age of 10 years were exceedingly rare. Yet, three such cases were reported in the U.S. in 2009, including two six year old boys in Colorado and the 9 year-old girl in Arizona. All three cases experienced lab findings and symptoms as seen in adult cases of HPS, including thrombocytopenia and respiratory distress. Young children infected with hantavirus can develop severe illness, and HPS should be included in the differential of any unexplained illness with respiratory distress and thrombocytopenia.

In 2009, an adult female resident of Minnesota contracted hantavirus infection during a family rafting trip down the Colorado River in northern Arizona. The family group was on the river for two weeks in late May, and camped many nights at different places along the river. It is not known when or where a mouse exposure may have occurred during the trip. The case patient had onset of symptoms in early June shortly after returning home to Minnesota. The illness proved fatal. The HPS diagnosis/confirmation was made post mortem through testing of autopsy specimens by the CDC.

In 2009, as in prior years, some false positive laboratory results were received from commercial laboratories. For this reason, any "positive" result reported from an outside lab should be treated as a screening test, and follow-up testing/confirmation at the Arizona State Health Laboratory (ASHL) or CDC is recommended.

WEST NILE VIRUS

In 2009 the nation and Arizona saw a decrease of West Nile virus (WNV) in humans, mosquitoes, horses, birds, and other animals. Not since 2003, the first year West Nile virus was detected in Arizona, has there been so little WNV activity in the state. Weather was likely a factor in the decreased activity. Hot summer temperatures came later than usual and there was very little monsoon activity in the state.

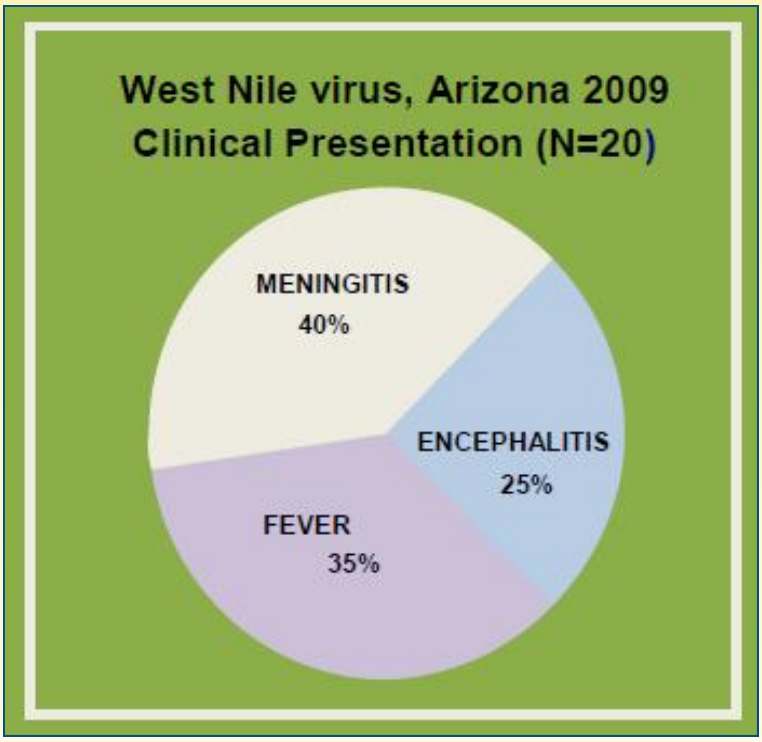
The first several months of 2010 have had significant precipitation both across the country and in Arizona. It is anticipated that WNV will be back to typical or higher than normal activity in the coming season.

The table below compares 2008 human WNV cases to 2009 human WNV cases. In 2008, 46 states reported WNV activity while in 2009 only 34 states reported activity.

West Nile Virus, Human Case Classification, United States, 2008 & 2009

Year	Encephalitis Meningitis	Fever	Other Clinical Unspecified	Total	Fatalites
2008	687	624	45	1356	44
2009	335	302	26	663	30

Visit the ADHS website for latest statistics: http://www.westnileaz.com



West Nile virus

Each year, the majority of WNV cases reported have clinical presentations of meningioencephalitis. Reporting of cases with neurologic involvement is typical because these patients are more often seen at hospitals due to the severity of the disease. Persons presenting with meningioencephalitis are also more likely to have long-lasting sequelae or die from West Nile virus infection.

West Nile virus is preventable. There are several recommendations, which when followed, can decrease a person's chance of getting the disease and can decrease mosquito populations.

- Regularly apply mosquito repellent such as DEET or picaridin when going outdoors after dark. Be sure to follow the label.
- Wear long sleeves/long pants when outdoors at night.
- Eliminate standing water, which allows mosquitoes to breed. Check for conditions outside the home that may provide potential for mosquito breeding, such as poorly maintained swimming pools, cans, bottles, jars, buckets, old tires, drums and other containers with water.
- Change water in flower vases, birdbaths, planters and animal watering pans at least twice a week.
- Repair leaky pipes and outside faucets, and move air conditioner drain hoses frequently.
- Report mosquito breeding problems (e.g. green pools) to your local environmental health office.

MOSQUITO DATA

During the 2009 arbovirus surveillance season 88 mosquito samples (or testing 'pools') from four counties tested positive for WNV. Of these, 75 (85%) tested positive by means of Rapid Analyte Measurement Platform (RAMP) tests performed by four county agencies, 8 (9%) tested positive by Polymerase chain reaction (PCR) testing performed by Virology staff at the Arizona State Laboratory (ASL), Phoenix, and five (6%) samples tested positive using both techniques (Table 1). No pools tested positive for the St. Louis Encephalitis (SLE) virus. (Since converting to PCR for arbovirus testing in 2005 the ASL no longer routinely tests for Western Equine Encephalitis or WEE virus'.)

Over half (62.5%) of the 2009 WNV positive samples were from Maricopa County (Table 2). Yuma County had the second highest (24 %) number followed by Pinal (12.5%) and Yavapai (1%) Counties. Similarly, a little over half of the WNV positive pools (60%) were composed of *Culex tarsalis* mosquitoes while 30% contained *Culex quinquefasciatus* (Table 3). The remaining 10% consisted of either *Culex erythrothorax*, *Culex* species or mixed species (i.e., mix of floodwater and *Culex* mosquitoes). Mosquitoes of the genus *Culex* are the acknowledged transmitters (or vectors) of arboviruses in Arizona.

Table 1. West Nile Virus Positive Mosquito Pools by Test Type, Arizona, 2009

Test Type	Number WNV+
PCR Only	8
RAMP Only	75
Both	6
Total	88

Table 2. West Nile Virus Positive Mosquito Pools by County, Arizona, 2009

County	Number of WNV+ Mosquito Pools
Maricopa	55
Pinal	11
Yavapai	1
Yuma	21
Total	88

Table 3. West Nile Virus Positive Mosquito Pools by Mosquito Species, Arizona, 2009

Mosquito Species	Number of WNV+ Mosquito Pools
Culex tarsalis	53
Culex quinquefasciatus	26
Culex erythrothorax	2
Culex species	5
Mixed species*	2
Total	88

CASE DEFINITION CHANGES

The following reportable diseases have had changes in the case definition:

- Anthrax*
- Brucellosis
- Dengue*
- Hantavirus pulmonary syndrome
- Malaria
- Psittacosis*
- Human rabies
- All Spotted Fever rickettsioses now use the revised definition for Rocky Mountain spotted fever*

**These definitions have had significant changes. They can be viewed in detail here: http://www.azdhs.gov/phs/oids/epi/surv_manual.htm*

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